प्रदेश लोक सेवा आयोग

कोशी प्रदेश, विराटनगर

प्रदेश निजामती तथा स्थानीय सरकारी सेवा अन्तर्गत प्राविधिक तर्फ इन्जिनियरिङ्ग सेवा, सिभिल समूह, जनरल उपसमूह, अधिकृतस्तर सातौं तह, इन्जिनियर वा सो सरह पदको खुला प्रतियोगितात्मक लिखित परीक्षा

मितिः- २०८१/११/०७

समयः ३ घण्टा | पत्रः द्वितीय | पूर्णाङ्कः १००

विषयः सेवा सम्बन्धी

सबै प्रश्नहरु अनिवार्य छन् । प्रश्नहरुको उत्तर खण्ड (Section) अनुसार बेग्लाबेग्लै उत्तरपुस्तिकामा लेख्नुपर्नेछ अन्यथा उत्तरपुस्तिका रद्द हुनेछ । परीक्षामा मोवाइल लगायत विद्युतीय उपकरणहरु प्रयोग गर्न पाइने छैन ।

Section –A Marks-25

1. Explain the factors influencing the selection of bridge types in Nepal. [5]
2. Discuss the key principles, advantages and limitations of working stress philosophy and the limit state philosophy in the design of reinforced concrete structures. Provide examples of their applications in the context of Nepal's construction industry. [4+4+2=10]
3. What are the typical factors that affect the selection of foundation? Should foundation be differed as per the geographical conditions of Nepal? Suggest typical foundation that should be designed as a prototype in Terai and Himal with reasons? [5+2+3=10]

Section –B Marks-25

4. Briefly explain the water resource use priority as per Water Resource Regulation, 2050. [5]
5. Nepal is characterized by diverse topography and climatic conditions. Discuss the challenges and considerations associated with accurate rainfall measurements and related analysis in this context. Provide examples of how these challenges impact flood forecasting in Nepal. [7+3=10]
6. What are the major problems in operation and management of irrigation systems of Nepal? Describe the pros and cons of peaking ROR storage. [5+5=10]

Section –C Marks-25

7. Highlight the significance of the Asian Highway in Nepal's transportation system. [5]
8. Discuss the challenges and design considerations specific to hill roads in Nepal, covering alignment selection, gradient determination and the integration of retaining and slope protection structures. [10]
9. Describes the types of road maintenance practiced in Nepal. Highlight its short coming and recommend suitable measures. [6+4=10]

Section –D Marks-25

10. What is Biological Oxygen Demand? Why is the important in designing wastewater systems? [5]
11. Describe various step involved in engineering, design, cost estimate and detailed study of a rural water supply system? [10]
12. What are the key indicators mentioned in Sustainable Development Goals 6 related to water supply and sanitation? How can Nepal achieve the goal? [5+5=10]

<<The End>>

लोक सेवा आयोग

नेपाल इञ्जिनियरिङ्ग सेवा, सिभिल समूह, जनरल/हाइवे/स्यानिटरी/इरिगेशन/हाइड्रोपावर उपसमूह
राजपत्राङ्कित तृतीय श्रेणी (प्राविधिक) पदको प्रतियोगितात्मक लिखित परीक्षा
मिति: २०८१/१०/१९

समय: ३ घण्टा | पूर्णाङ्क: १००

पत्र: द्वितीय
विषय: Technical Subject

निम्न प्रश्नहरूको उत्तर Section अनुसार छुट्टाछुटै उत्तरपुस्तिकामा लेख्नुपर्नेछ।

Section – A — 30 Marks

1) Define the permeability of soil and explain with neat sketches and formula. Elucidate the methods of determing the coefficient of permeability. 5

2) What are the three strengths of a riveted lap joint system of steel? How is the design strength of the joint determined? Explain with neat sketches and formula. 5

3) Mention the major principles and steps to be followed in the design of T-beam bridge using carbon's method. 10

4) A site investigation has to be done for a 6-lane bridge to be constructed in Karnali river. The client seeks the information on bearing capacity and settlement of foundation for the bridge. What method of site investigation and in-situ tests would you advise as a project engineer? Explain the in-situ test you advised in detail. 10

Section – B — 25 Marks

5) Explain the concept of Bernoulli's equation. Show each component of Bernoulli's equation in case of a uniform diameter of pipe flow. Also, draw the HGL and TEL for this case. 5

6) Describe the significance of hydrological analysis for a hydropower project. What are the different parameters of hydrological analysis? How do you estimate and use these parameters in the project? State. 3+3+4=10

7) Design concrete-lined irrigation canal to carry a discharge of 45 cumes. The bed slope of canal is 1:3000. Take side slope 2:1 and Manning's coefficient η =0.015. Assume any data you need. 10

Section – C — 25 Marks

8) Write down about California Bearing Ratio (CBR) test. How is a pavement designed with CBR value? State. 2+3=5

9) State traffic control devices that are used on roads with their functions. What are the factors that should be considered while designing a road intersection? Elaborate. 4+6=10

10) Explain the factors that influence the selection of an airport location. How these factors impact the safety management systems and aerodrome certification process? Describe. 5+5=10

contd.....

Section – D

20 Marks

11) What are the factors affecting the self purification of natural streams? Explain. Discuss on the concept of oxygen Sag Curve in reference to self purification of natural streams. 10

12) Answer the following. 2×5=10

a) Estimate the stormwater volume generated during the heaviest rainfall in Godawari Municipality, Lalitpur using the Rational Method. The following information is given.

Population: 100,000, Rainfall: 240 mm in 24 hours, Area of the municipality: 70 square kilometers, Land cover: One fourth of the municipality is built-up, and the rest is covered by agriculture and forest. The formula is: Q=CIA/360 where; Q=Peak discharge (stormwater runoff) in cubic meters per second, C= Runoff coefficient, I = Rainfall intensity in mm/hour, A = Area in hectares.

b) Estimate the sewage generated in the municipality assuming that per capita water consumption is 120 L per day and assuming evaporation loss of 20 percent. Compare the figure with the results obtained in (a).

«« The End »»

लोक सेवा आयोग

नेपाल इञ्जिनियरिङ्ग सेवा, सिभिल समूह अन्तर्गत हाइवे, स्यानिटरी र हाइड्रोपावर उपसमूह, राजपत्रांकित तृतीय श्रेणी (प्राविधिक) पदको प्रतियोगितात्मक लिखित परीक्षा

मिति: २०८१/१०/१२

समय: ३ घण्टा

पूर्णाङ्क: १००

पत्र: द्वितीय

विषय: Technical Subject

तलका प्रश्नहरूको उत्तर Section अनुसार छुट्टाछुट्टै उत्तरपुस्तिकामा लेख्नुपर्नेछ।

Section – A

30 Marks

1. For a soil sample with maximum dry density 1.86 t m^{-3} at 15% water content and of specific gravity 2.7, calculate degree of saturation, air content and percentage of voids at the maximum dry density. Assume any relevant data if you need. 5

2. Describe in brief the advantages and limitations of pre-stressed concrete. 5

3. Using suitable formula and diagrams, carry out the stability analysis of an earth retaining wall. 10

4. Explain the different considerations for structural design of bridges focussing on live load, impact load, wind load and centrifugal force. In addition, provide the design principles for solid slab bridges. 5+5=10

Section – B

25 Marks

5. How can one estimate depth and frequency of irrigation for an irrigation command area for irrigation scheduling? Write down. 5

6. What are the advantages of concrete gravity dams? Show the different forces acting on gravity dams with a neat sketch. How do you analyze the stability of concrete gravity dams against sliding and overturning? Elaborate. 2+3+5=10

7. The mean monthly flow of a typical Nepalese River is given below. The headwater level is 1,200 m, whereas Tailwater level is 800 m and can be considered as constant. Assuming a design discharge as 50 m^3/s, total head loss as 3%, overall efficiency of the plant as 90%, compute firm and secondary energy produced by the plant. What is the contribution of dry energy (Dec-May) to the total generation? Assume any relevant data you need. 10

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Year
11	10	13	20	31	63	134	164	111	56	31	17	55

Section – C

25 Marks

8. Introduce International Civil Aviation Organization (ICAO) and briefly describe its roles. 2+3=5

9. Explain the importance of highway drainage systems and state the different types of drainage in hill roads. 4+6=10

10. Give an introduction of 'Flexible' and 'Rigid' pavements with their suitability. How do you calculate different loads on highway pavement? Explain the construction method of concrete pavement. 3+3+4=10

Contd...

Section – D

20 Marks

11. Differentiate clearly between slow and rapid sand filter. Also, explain cleaning and maintenance of slow sand filter. 6+4=10

12. Why is environmental study necessary before executing an infrastructure development project? Mention the process of EIA study and its approval. 3+7=10

«««The End»»»

लोक सेवा आयोग

नेपाल इञ्जिनियरिङ्ग सेवा, सिभिल समूह अन्तर्गतका जनरल, हाइवे, हाइड्रोपावर, इरिगेशन, स्यानिटरी, एयरपोर्ट उपसमूह, राजपत्राङ्कित तृतीय श्रेणी (प्राविधिक) पदको प्रतियोगितात्मक लिखित परीक्षा

मितिः- २०८०।१०।२०

समयः ३ घण्टा

पत्रः द्वितीय

पूर्णाङ्कः- १००

विषयः Technical Subject

निम्न प्रश्नहरुको उत्तर Section अनुसार छुट्टाछुट्टै उत्तरपुस्तिकामा लेख्नुपर्नेछ।

Section – A — 30 Marks

1. Define simply supported and cantilever beams. Derive maximum bending moment for the beams in uniformly loaded condition. 2+8=10
2. Describe the advantages and disadvantages of prestressed concrete. 10
3. What forces should we consider while designing the retaining wall to stabilize the slope during road construction in hills? Enumerate. 10

Section – B — 25 Marks

4. What is a Unit Hydrograph (UH) ? How do you estimate design flood using UH? Mention. 5
5. Assume that you are assigned with a responsibility of investigating a case of failure of a bridge immediately after its construction. What steps would you follow to investigate whether hydrology is a potential cause of the failure? Illustrate the steps with appropriate examples. Also, show a template of report (with notes on expected contents under different chapters/sub-chapters) of such investigation to submit to a higher authority. 7+3=10
6. What are the differences between a weir and a barrage? What factors govern the design of a weir or a barrage? Explain. 4+6=10

Section – C — 25 Marks

7. Why is selecting the runway length important in airport? Mention. What factors influence the length of a runway in airport design? State. 5
8. Describe the factors to be considered in design of pavements. Explain about CBR method of flexible pavement design. 6+4=10
9. What are the design criteria for designing a rigid pavement in a highway construction? Elucidate. Specify the conditions where rigid parament is applicable. 10

Section – D — 20 Marks

10. Draw a schematic diagram of a Gravity flow water supply scheme and explain the function of each parts. 5
11. Ideally, water supply system should run for 24 hours and 365 days a year. This system is known as Continuous Water Supply System (CWS). But because of various reasons, many cities supply water few hours of a day or even per week. This system is called Intermittent Water Supply System (IWS). There is an agreement that CWS system is better than IWS in terms of network's durability and maintaining the water quality. Why the network's durability and water quality are compromised in IWS? Explain the reasons. 5
12. Point out the sources of water supply in Nepal. Describe the standard of drinking water quality prescribed by WHO. Also, clarify the processes for treatment of water. 2+4+4=10

«« The End »»

प्रदेश लोक सेवा आयोग

बागमती प्रदेश

इन्जिनियरिङ सेवा, सिभिल समूह, सातौं तह, इन्जिनियर पदको
अन्तर तह तथा खुला प्रतियोगितात्मक लिखित परीक्षा
परीक्षा मिति: २०८०/१२/१७

पत्र: द्वितीय — पूर्णाङ्क: १००
विषय: सेवा सम्बन्धी — समय: ३ घण्टा

निम्न प्रश्नहरूको उत्तर Section अनुसार छुट्टाछुट्टै उत्तरपुस्तिकामा लेख्नु पर्नेछ अन्यथा उत्तरपुस्तिका रद्द हुनेछ।

Section - A [30 Marks]

1. Describe the methods and importance of soil compaction in the context of road and earthen dam construction. [5]
2. Discuss the factors affecting the effective stress in soils and explain the phenomenon of capillary rise and quick sand condition. [5]
3. Design a two way slab for a room having clear dimension 5m×4m. The superimposed load 200 kg/m^2 using M15 mix and Fe415. Assume corners of the slabs are not held down. [10]
4. Introduce working stress and limit state philosophy for design of RCC structures. Compare both methods with logics for choosing any method over other. [5+5]

Section - B [25 Marks]

5. What is a hydrograph analysis? Illustrate with examples where such analysis is mandatory. [5]
6. Mention the design steps of a de-sanding basin for a river with high sediment load. Discuss the factors that influence the sediment velocities and the methods used for flushing sediments from the de-sanding basin. [5+2+3]
7. What do you mean by concrete gravity dams? With a neat stretch, show the different forces acting on it. How do you check the stability of dam against sliding and overturning? [2+3+5]

Section - C [25 Marks]

8. Introduce and compare the rigid and flexible pavement in road construction [5]
9. What are the factors affecting the sitting, orientation and number of runway, its length and surface treatment required while designing a runway of aerodrome? [10]
10. What are the major attributes considered for selecting highway alignment? Discuss the importance of economic and environmental viability assessment on highway planning. [5+5]

Section - D [20 Marks]

11. Why water treatment is necessary in water supply system? Explain the different methods of removal of iron and manganese in ground water that is common in Kathmandu Valley and in Terai region. [2+4+4]
12. Compare the separate and combined sewer system. What is self-cleaning velocity and non-scouring velocity in sewer? Why sewers are not designed to full flow? [4+3+3]

•समाप्त•

प्रदेश लोक सेवा आयोग

गण्डकी प्रदेश

इन्जिनियरिङ सेवा, सिभिल समूह, जनरल, इरिगेशन र स्यानिटरी उपसमूह, अधिकृत सातौं तह, इन्जिनियर पदको (अन्तर तह, खुला तथा समावेशी) प्रतियोगितात्मक लिखित परीक्षा

परीक्षा मिति: २०८०/०५/२०

समय: ३ घण्टा | पत्र: द्वितीय | पूर्णाङ्क: १००

निम्न प्रश्नहरुको उत्तर Section अनुसार छुट्टाछुट्टै उत्तरपुस्तिकामा लेख्नु पर्नेछ, अन्यथा उत्तरपुस्तिका रद्द हुनेछ।

Section-A

1. Briefly describe the design considerations for column. (5)
2. Mention the factors affecting compaction. (5)
3. Define and differentiate between compaction and consolidation of soil mass. Write down assumptions for Terzaghi's one dimensional consolidation theory. (5+5)
4. Compare the concepts behind the working stress and limit state design of concrete structures. What type of "limit states" are considered in the limit state design approach? (7+3)

Section-B

5. What are the assumptions of unit hydrograph? Describe the limitations of unit hydrograph. (3+2)
6. Explain the different terms in the Bernoulli's Equation. What assumptions must be met for this equation to be applicable? How can it be applied in using a Pitot tube? (4+3+3)
7. Despite the huge potential of horticulture and vegetable farming in the mild-hills cannot be achieved due to shortage of irrigation, please suggest the appropriate methods of irrigation system to be adopted. Can it be tied with reservoir hydropower projects? (5+5)

Section-C

8. Briefly discuss the challenges in hill road construction. (5)
9. Can you explain what the difference between a roadway, a highway, and a freeway? Write the categories of roads as provisioned on Nepal Roads Standard 2070? Explain the use of tunnels and high bridges in highways in Nepal. (3+4+3)
10. Road condition in Nepal is poor to fair. What are the reasons behind it? How can we improve the condition of road? Please suggest the best practices of road maintenance in the world. (3+3+4)

Section-D

11. What is the principle behind an activated-sludge treatment plant? Explain with a neat flow diagram. Also compare the conventional and step-aeration activated-sludge processes. (3+3+4)
12. What are the important uses of water? What is the per capita average demand for a Nepali Town for different uses? Explain the impurities in water and the purification mechanism of water at household level in Nepal. (2+4+4)

-The End-

प्रदेश लोक सेवा आयोग,मधेश प्रदेश

जनकपुरधाम ।

ईन्जिनियरिङ्ग सेवा, सिभिल समूह, जनरल, हाईवे, ईरिगेशन, स्यानिटरी उप-समूह, अधिकृत सातौं तह वा सो सरह पदको खुला प्रतियोगितात्मक लिखित परीक्षा

२०८०/०६/१३

समय : ३ घण्टा | पत्र : द्वितीय | पूर्णाङ्क : १००

विषय : Technical Subject

निम्न प्रश्नहरुको उत्तर छुट्टाछुट्टै उत्तरपुस्तिकामा लेख्नुपर्नेछ अन्यथा उत्तरपुस्तिका रद्द हुनेछ ।

Section – A

1. As per Nepal National Building code, elaborate on characteristics and requirements of Earthquake resistant building. What are the pertinent factors to be considered in structural design? [10]
2. Discuss the various causes of slope movement and failure. Explain different ways of stabilizing slopes. [4+6=10]
3. What is bearing capacity of soil? What are the factors that affect the bearing capacity? What are the different design types that are usually selected for shallow as well as deep foundations? [5]
4. Describe the advantages of providing closed box shape in hollow box Girder Bridge and show the arrangement of closed box shape girder through a free hand diagram. [5]

Section – B

5. A. In the Terai region on Nepal, there is heavy damages to the life and property due to frequent floods. Give major reasons to such damages and possible measures to address the issues in a sustainable manner.

   B. Where do we provide Guide Banks? Discuss on the design concept of Guide Banks. [5+5=10]

6. What do you mean by Duty of Water? Explain the influence of several factors which affects duty and how duty of water can be improved. [10]
7. What is a hydrograph? Explain the use of hydrograph in rainfall assessment? [5]

Section – C

8. Compare the rigid and flexible road pavement from various criteria. [10]
9. What are the desirable properties of bituminous mixes? Briefly explain the ductility test of bitumen and its engineering application. [10]
10. What are the factors to consider in site selection of Airport? [5]

Section – D

11. What are the merits and demerits of slow sand filter and rapid gravity filter? Please compare on the basis of suitability, design and operation. [10]
12. Describe the process of initial environmental examination (IEE) of a municipal solid waste management project. [10]

The End

प्रदेश लोक सेवा आयोग

कोशी प्रदेश, विराटनगर

प्रदेश निजामती सेवा अन्तर्गत प्राविधिक सर्फ प्रदेश इन्जिनियरिङ सेवा, सिभिल समूह, जनरल/हाइवे/हाइड्रोपावर/स्यानिटरी/इरिगेसन उपसमूह, अधिकृतस्तर सातौं तह, इन्जिनियर पदको खुला प्रतियोगितात्मक लिखित परीक्षा

समय: ३ घण्टा

मिति:- २०८०/१०/२७

पत्र: दितीय

विषय: सेवा सम्बन्धी

पूर्णाङ्क: १००

सबै प्रश्नहरु अनिवार्य छन्। प्रश्नहरुको उत्तर खण्ड (Section) अनुसार बेग्लाबेग्लै उत्तरपुस्तिकामा लेख्नुपर्नेछ अन्यथा उत्तरपुस्तिका रद्द हुनेछ।

Section –A

Marks-25

1. A soil sample has an initial volume of 200 cubic centimeters (cm^3) and a void ratio of 0.4. After a compaction test, the soil's void ratio is reduced to 0.2. Calculate the final volume of the soil sample in cubic centimeters, assuming no change in its mass. [5]
2. Discuss the causes of slope failures. Explain the concept of bioengineering and its advantages in slope stabilization in Nepal's challenging terrains. [3+3.5+3.5]
3. Write down the typical earthquake safety measures mentioned in the Building Code? How should the safe management of waste water be ensured in Building codes? [7.5+2.5]

Section-B

Marks-25

4. What is water hammer? What is its significance in system design? [2+3]
5. Explain the suitability, advantages and limitations of run-off river and peaking ROR storage hydropower projects with examples. [5+5]
6. Explain the waterlogging. What are the causes of waterlogging? Discuss in detail the precautionary measures for waterlogging. [2+3+5]

Section –C

Marks-25

7. Enlist the requirement of highway. Write the process of detailed engineering survey of highway alignment. [2+3]
8. A highway curve with a radius of 500 meters is designed for a design speed of 80 km/h. Calculate the required superelevation (banking) of the curve, assuming a coefficient of lateral friction (friction between tires and road surface) of 0.15. [10]
9. Discuss different types of maintenance operations for flexible pavements. [10]

Section –D

Marks-25

10. Analyze the problems and issues of solid waste management in urban areas of Nepal. Give your suggestions for alleviating the problems. [2+3]
11. Differentiate between IEE and EIA. What are the various stages or process involved in carrying out IEE of a project? [5+5]
12. Describe the construction of slow sand filter with neat sketches and its design considerations. [5+5]

<<The End>>

प्रदेश लोक सेवा आयोग

बागमती प्रदेश

इन्जिनियरिङ सेवा, सिभिल समूह, सातौं तह, इन्जिनियर पदको खुला प्रतियोगितात्मक लिखित परीक्षा-२०७९

परीक्षा मितिः २०७९/१०/२१

पत्रः द्वितीय — पूर्णाङ्कः १००

विषयः सेवा सम्बन्धी — समयः ३ घण्टा

निम्न प्रश्नहरूको उत्तर Section अनुसार छुट्टाछुट्टै उत्तरपुस्तिकामा लेख्नु पर्नेछ, अन्यथा उत्तरपुस्तिका रद्द हुनेछ।

Section - A [30 Marks]

1. What are the advantages of well foundation over the other foundations? [5]
2. Write short notes on methods and equipment of soil compaction in civil infrastructures construction. [5]
3. Nepal lies in earthquake prone zone and we have faced severe earthquake recently. So, what do you suggest in designing and construction of earthquake resisting building in urban areas? [10]
4. What do you mean by structural design of a bridge? List out the basic bridge components. Write down the stepwise procedure for the structural design of a RCC T-beam girder of 18 m length. [2+1+7]

Section - B [25 Marks]

5. In hydropower sector, what is the power demand analysis and how is it carried out? [5]
6. What do you mean by recharge of ground water? Why is it needed? Explain different methods for recharge of ground water. [3+3+4]
7. What could be the best ideas to convert a farmer managed irrigation system to well-equipped efficient irrigation system with all essential structures. Elaborates with engineering solutions. [10]

Section - C [25 Marks]

8. As per Nepal Road Standard, 2070 the administrative classifications of roads are of 4 types, what are they and shortly write down each type. [5]
9. What are the various factors to be considered in designing traffic islands? Briefly describe with figures, how the speed of vehicles is controlled by traffic islands at the intersection? [10]
10. What are the controlling factors for the selection of road alignment? And describe alignment selection criteria for hill road? [5+5]

Section - D [20 Marks]

11. What do you understand by community mobilization in infrastructure projects? How can it be utilized effectively in construction, operation and maintenance of rural water supply projects? [10]
12. Bagmati river is highly polluted in the Kathmandu valley due to various factors but it becomes clean and pollution free after flowing several Kilometers down to the Terai region and its water is being used for the irrigation purpose. What is the name of such natural process and describe the process with oxygen sag curve? [10]

•समाप्त•

लोक सेवा आयोग

स्थानीय तह अन्तर्गत प्राविधिकतर्फ इञ्जिनियरिङ्ग सेवा, सिभिल समूह, छैठौं तह,
इञ्जिनियर पदको प्रतियोगितात्मक लिखित परीक्षा

समय :- ३ घण्टा | पत्रः द्वितीय | पूर्णाङ्क :- १००

विषयः- जनरल इञ्जिनियरिङ्ग

निम्न प्रश्नहरूको उत्तर खण्ड (Section) अनुसार छुटाछुट्टै उत्तरपुस्तिकामा लेख्नुपर्नेछ, अन्यथा उत्तरपुस्तिका रद्द हुनेछ । परीक्षामा मोबाइल वा यस्तै सञ्चार उपकरणहरू प्रयोग गर्न पाइने छैन ।

खण्ड (Section) – A

1. Mention different types of road pavements. Explain how you would design an appropriate pavement for a hill road. 3+7=10
2. Write down some methods of Bio-engineering practices along hill side of Nepal. 10
3. (a) What are the various criteria that should be fulfilled while designing sub-surface drains? 5
   (b) What are the various tests that are used for assessing the suitability of road aggregates? 5

खण्ड (Section) – B

4. (a) What are the different types of distribution service reservoir used in water supply project in Nepal? How its storage capacity is determined? 5
   (b) What is self-clearing velocity and non-scouring velocity in a sewer? Why sewers are not designed to full flow? 5
5. Write down short note on:
   (a) Sources of solid waste 3
   (b) Design features of septic tank 3
   (c) Various types of joints used in pipes 4

खण्ड (Section) – C

6. Why river training is necessary? Describe the various methods of river control. 10
7. (a) What is berm? Why is it provided in the canal? 2+2=4
   (b) Draw sketches to show the section of canal.
   i) Partly in cutting and partly in filling 2
   ii) Wholly in cutting 2
   iii) Wholly in filling 2
8. (a) What types of alternative energy systems are feasible in Nepal? 5
   (b) Explain with the help of a neat sketch the hydrological cycle. 5

खण्ड (Section) – D

9. Differentiate Environmental Impact Assessment (EIA) with Initial Environmental Examination (IEE). 10
10. Explain with neat sketches the method of setting out of a school building in a municipal area. 10

«« The End »»

लोक सेवा आयोग

नेपाल इञ्जिनियरिङ्ग सेवा, सिभिल समूह, विभिन्न (जनरल, हाईवे, स्यानिटरी, ईरिगेशन, हाइड्रोपावर) उपसमूह
राजपत्राङ्कित तृतीय श्रेणी (प्राविधिक) पदको प्रतियोगितात्मक लिखित परीक्षा

मितिः २०७९/१०/१४

समयः ३ घण्टा

पूर्णाङ्कः १००

पत्रः- द्वितीय

विषयः- Technical Subject

निम्न प्रश्नहरूको उत्तर Section अनुसार छुटाछुट्टै उत्तरपुस्तिकामा लेख्नुपर्नेछ ।

Section - A ✓

30 Marks

1. What are the requirements of earthquake-resistant building construction? Describe. 10

2. A square footing is to be constructed at a depth of 3.6 m below ground level on a sandy clay for which the cohesion is 0.575 kg/cm^2 and the density is 1.73 g/cm^3. The total load applied on the soil is 375 tones uniformly distributed over the area of contact. Find the size of the footing using a load factor of 3. Take the relevant values of the factors as Nc=10, Nq=4, Nγ=2. 10

3. Explain the basic differences among the retaining wall design of gravity, cantilever and counter fort type wall. What will be the pressure exerted at base of height 'h' with half height of water table? Assume density of soil as 'γ'. 5+5=10

Section - B

25 Marks

4. "Hydraulic jump can dissipate energy". Justify this statement with appropriate illustrations (figures, examples, equations, where relevant). 5

5. How can we estimate groundwater storage potential in an aquifer? Describe and illustrate with appropriate examples the key concept of unsaturated zone groundwater hydrology and key factors that control the water flow in unsaturated zone. 4+6=10

6. Answer the following question. 5+5=10

a) How do you compare water hammer with tsunami? Provide freehand sketches of different types of surge tanks and label the components.

b) Water stands on the upstream side of the gravity dam of triangular section up to the full height of 35 m. The base width of the dam is 26 m. The uplift pressure intensity 'K' may be assumed to be 0.5. Show that;

i) No tension exists anywhere along the base of the dam

ii) The dam is safe against sliding

iii) The maximum compressive stress in the body of the dam is less than the allowable crushing stress of the material 11 kgf/cm^2

iv) The dam is safe against overturning

Take the coefficient of friction between base and the foundation as 0.75 and the unit weight of material of the dam as 2400 kgf/m^3.

Contd

प्रदेश लोक सेवा आयोग

प्रदेश नं. १, विराटनगर

स्थानीय सरकारी सेवा अन्तर्गत प्राविधिक तर्फ इन्जिनियरिङ्ग सेवा, सिभिल समूह, अधिकृतस्तर छैटौं तह, इन्जिनियर पदको प्रथम चरणको खुला प्रतियोगितात्मक लिखित परीक्षा

समयः- ३ घण्टा | मितिः- २०७९/०४/१४

पत्रः- द्वितीय | पूर्णाङ्कः- १००

विषयः- जनरल सिभिल इन्जिनियरिङ्ग सम्बन्धी।

सबै प्रश्नहरु अनिवार्य छन्। प्रश्नहरुको उत्तर खण्ड (Section) अनुसार बेग्लाबेग्लै उत्तरपुस्तिकामा लेख्नुपर्नेछ अन्यथा उत्तरपुस्तिका रद्द हुनेछ।

(Section A) – 30 Marks

1. What is bio-engineering? What are the best practices in bio-engineering along the hill road side? What are the advantages of bio-engineering along the road? [2+5+3]
2. Discuss the factors deciding the alignment of roads. Explain the special consideration for alignment of hill roads. [5+5]
3. Discuss the differences between flexible and rigid pavements. Explain different factors affecting design of flexible pavement. [4+6]

(Section B) – 20 Marks

4. With the help of flow diagram, describe water treatment process in brief. [2+8]
5. A village has designed year demand of water 25000 liters/day. The demand is met by a continuous system of supply from a spring source with measured of 0.45 Lps. The water consumption pattern of village is as follows.

Time (Hours)	5-7	7-12	12-17	17-19	19-5
Consumptions %	25	35	15	25	0

(a) Determine the balancing reservoir capacity for the village by using above data.

(b) Describe the problems and solution associated with Gravity and pumping gravity combined water supply systems in Nepal? [6+4]

(Section C) – 30 Marks

6. Discuss the major energy sources at present. Which is the most useful alternative source of energy for Nepal? Explain in brief. [7+3]
7. What is the difference between agency managed and farmer managed irrigation system? Write down the procedure for design of an irrigation canal having parameters: [3+7]
   Discharge, Maximum permissible velocity, Manning's coefficient, Bed slope and the side slope.
8. Describe about the water induced disaster problems and suggestion for its minimization. Explain on the River training classification, types, necessity and objectives. [10]

(Section D) – 20 Marks

9. The role of local construction materials is very important in construction works. How the quality standards in terms of production and application can be improved to meet the engineering and architectural requirements? Explain in brief. [10]
10. What is social mobilization? What are the steps of social mobilization in local infrastructure development and utilization? Why it is important for local infrastructure development and utilization? [2+4+4]

<<The End>>

लोक सेवा आयोग

नेपाल इञ्जिनियरिङ्ग सेवा, सिभिल समूह, जनरल/हाइवे/हाइड्रोपावर/स्यानिटरी/इरिगेशन उपसमूह,
राजपत्राङ्कित तृतीय श्रेणी (प्राविधिक) पदको प्रतियोगितात्मक लिखित परीक्षा

2067/9/19

समय :- ३ घण्टा | पत्र :- Second | पूर्णाङ्क :- १००

विषय:- Technical Subject

तलका प्रश्नहरुको उत्तर Section अनुसार बेग्लाबेग्लै उत्तरपुस्तिकामा लेख्नुपर्नेछ अन्यथा उत्तरपुस्तिका रद्द हुनेछ ।

Section -A

1. List out the rule of thumbs for RCC Buildings without masonry infill. (5)
2. Write short notes on factors affecting coefficient of permeability. (5)
3. Illustrate the types of slope failures with suitable sketches. A vertical cut is made in a clay deposit.
   [consider: c=30 KN/m², ϕ = 0, r = 16KN/m³ Fc= 1.00 and Sn=0.261] (5+5=10)
4. List out and discuss the loads, forces and stresses which are to be considered in the designing of a road bridge. (10)

Section-B

5. List out the points to consider for locating a reservoir site of a hydropower project. (5)
6. What are common formulae used to calculate velocity of fluid in open channel? Explain manning's formulae with its uses. (10)
7. What are the common criteria for selecting the type of dam for a particular site condition? What are the advantages and disadvantages of selecting rock-filled dam? (10)

Section-C

8. What are the different causes of traffic accidents? Explain various measures that may be adopted to prevent accidents. (2+3=5)
9. What are the types of bituminous pavements? Explain briefly. Also mention the tests that are carried out in laboratory and field for the quality control of bitumen mixes. (10)
10. Describe briefly the history of civil aviation in Nepal. Point out the factors considering in the selection of airport location. List out the factors considered in the design of runways. (3+3+4=10)

Section-D

11. A water supply company has to purify the turbid water for a city whose daily demand is 200000 liters. Design a suitable plain sedimentation tank fitted with mechanical sludge remover. Assume the velocity of flow in the tank as 20 cm/minute and the detention time as 10 hours. (10)
12. Describe the sewage treatment process with a typical lay out of sewage treatment plant. (5+5=10)

~ The End ~

Section – C

25 Marks

7. What factors to be considered while selecting a location for airport? List down the factors. 5

8. Enlist the various types of bitumens and their quality tests. Explain CBR test and its importance in design of flexible pavement. 10

9. Briefly discuss the governing factors for calculating sight distance as per the Nepal Road Standard-2070. Calculate the safe stopping sight distance for design speed of 50 kmph for the following: 4+6=10

   a) Two way traffic on a two lane road

   b) Two way traffic on a single lane road.
   (Assume: f : 0.37 and t : 2.5 seconds)

Section – D

20 Marks

10. You may be aware that the GoN planned to construct two dams near the source of Bagmati River. Dhap dam, the first of the two is already constructed and Nagamati is under preparation. Dhap dam is designed to discharge 40 lps water with BOD_5 of 5 mg/L to Bagmati River and Nagamati is designed to discharge 400 lps water to Bagmati River with BOD_5 of 8 mg/L. Both dams will be operated during 8 months of the dry period. Both dams will discharge at upstream of the river, which then passes through Gokarna, Guheshwori and Pashupati. Guheshwori has a new waste water treatment plant, which is in operation now. Guheshwori WWTP which is in operation, discharges 370 lps treated waste water with a BOD_5 of 10 mg/L. Now, calculate the BOD_5 of Bagmati River at Pashupati assuming Nagamati dam is also operational and there are no other sources that contribute water or waste water in the Bagmati other than these three sources. Your calculation is for the 8 months when dams are releasing water into the Bagmati. 5

11. Discuss the necessity of filtration in water treatment process. Also, explain the principles of filtration. 5

12. Defining Biochemical Oxygen Demand of waste water, explain a set of Primary and Secondary Treatment units to remove it. 10

«««The End»»»

लोक सेवा आयोग

नेपाल इञ्जिनियरिङ्ग सेवा, सिभिल समूह, विभिन्न उपसमूह

राजपत्राङ्कित तृतीय श्रेणी प्राविधिक पदको प्रतियोगितात्मक लिखित परीक्षा

2066/12/19

समयः- ३ घण्टा

पूर्णाङ्कः- १००

पत्रः- द्वितीय

विषयः- Technical Subject

तलका प्रश्नहरूको उत्तर Section अनुसार छुटाछुट्टै उत्तरपुस्तिकामा लेख्नुपर्नेछ, अन्यथा उत्तरपुस्तिका रद्द हुनेछ ।

Section - A

1. Briefly describe the requirements of earthquake resistant building construction. 5
2. Define soil compaction and consolidation. What are the factors affecting soil compaction? 5
3. What are different factors to be considered in designing foundation for buildings? Explain about different types of foundations used in commercial buildings? 10
4. a) What do you mean by economical span length of a bridge? Explain. 2
   b) What types of loads are required to be considered while designing a road bridge? 5
   c) Describe the classification of steelbridge with their suitability to use considering the span length. 3

Section - B

5. The slope of channel in alluvium is S=1 in 5000; Lacey's silt factor = 0.9 and channel side slope = 0.5:1; find the channel section and maximum discharge which can be allowed to flow in it. 5
6. Describe different methods of surface irrigation with their advantages and disadvantages. 10
7. What is simulation technique and how is it different from optimization? List two typical examples where simulation is used in water resources studies. 10

Section - C

8. Draw a neat sketch of a typical aerodrome, showing taxiways, aprons and holding bays. Describe in brief the functions of these components. 5
9. What are the controlling factors for the selection of road a alignment and write note on alignment selection criteria for a hill road. 10
10. List the various geometric elements to be considered in highway design. Calculate the stopping sight distances on a graded highway for a design speed of 90 kmph. Reaction time is 2 secs and value of μ is 0.35. 4+6=10
    a) When grade is 3% descending.
    b) When grade is 3% ascending
    c) When road is flat i.e. zero grade

Section - D

11. Explain the concept of environmental impact assessment in development projects. 10
12. What is activated sludge processes? Why BOD treatment for domestic waste water is important to discharge in natural water ways. 10

«««The End»»»

OLD SUBJECTIVE QUESTIONS

General– 2062

1. Describe the cross drainage structures and sub-surface drainage.
2. How many cables are there in a suspension bridge? Describe function of each type. How is the load on the bridge transferred to the ground?
3. In any transportation planning exercise, what are the major technical considerations to be given attention to. In your objective view, why very often our planning exercise fail to address the main issues?
4. In context of scarcity of land fill sites, solid waste management has become difficult task in Kathmandu valley. What are your suggestions to reduce and recycle the wastes so that pressure on land fill site could be out down? Provide pragmatic solutions.
5. You are required to supply drinking water to some community in a hilly region. Describe the various steps you will take to achieve this in the context of Nepal.
6. What is difference between the renewable and non-renewable energy? Also write down the advantages and disadvantages of solar energy, bio-gas and hydropower.
7. If you were to design an irrigation system to be totally maintained and managed by local farmers after construction. What factors would you consider in deciding about line and unlined sections of canal? Give technical and economical reasons and discuss.
8. Design an irrigation canal of 15 m/s capacity, whose side slope coefficient and bed slope are 0.65 & 0.02% respectively with Manning's roughness coefficient of 0.023 so that its flow velocity could be lay in between non-silting and non-scouring value.
9. a) What are the common building construction materials used for construction of residential buildings? Describe one building material in details.

   b) Write short notes on (any two)

   i) water cement ratio of concrete mix. ii) mixing concrete

   iii) Bulking sand iv) Curing of concrete
10. As EIA National Guidelines now it is mandatory to conduct EIA for significant roads in Nepal. How does it help environmental as well as the road network? Give a critical analysis.

Irrigation- 2063

1. Write short note on the following
   a) Status of irrigation development in Nepal
   b) Crop water requirements calculation by penman methods
   c) Types of irrigation
2. Describe the factors to taken into the account while fixing the alligment of irrigation cannals
3. What are the basic difference between kennedy and Darcy theory. Which theory is used in the design of cannal systems in Nepal and why? For a channel to be regime briefly mention the condition that is to be adhered.
4. Describe the effect of construction of a weir in the river regime. What are the main causes of failure of weir on permeable foundation and their ramedies?

5. What do you mean by hydraulic jump and why it is necessary to be formed in hydraulic structures ? for a stable and well balanced jump which valued of the froud numbers should to get the anticipation result?(1)fr-1(2)fr-1 to 1.7 (3)fr
6. River fliowing through Nepal carries large qunantity of sediment load within permissible limits to control the flooding of agricultural land?
7. Do you think ground water irrigation is suitable for the cultivation of crops which required more water like paddy or sugarcane if not why?
8. Explain with the help of a neat sketch the hydrologic cycle in nature indicating its various phase and describe briefly basic hydrological data require for planning irrigation projects
9. a) define the hydrograph .draw a single peaked hydrograph and indicate is various components.
   b) what are the basic propositions of the unit hydrograph theory?
10. Ihow many types of aquifer exist below the ground surface and what is the main difference between them? Briefly drscribe the what types of well , shallow or deep is feasible in confined and unconfined aquifer?

Sanitary- 2063

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1. How would you use shallow and deep tube wells for the water supply in the terai? Under what conditions each is used and why?
2. A village in mild western development region of Nepal has a design year population of 500per capita demand recommended for that particular villafe is 65 litre per day.the demand is tobe met by a continuos system of supply from a spring source with safe yield of 0.5 Ips .the consumption pattern is

Time(hr.)	Consumption(%)
5-7	25
7-12	35
12-17	20
17-19	20
19-5	0

   Is a balancing storage tank storage? Calculated its capacity if necessary
3. What is mean by treatment of water and why it is necessary what do you mean by flocculation?
4. Why aeration is used in water treatment plants? Is it more commonly used with ground water or surface water and why ? give reasons
5. Write short notes on
   a) Impounding reservoirs b) Break point chlorination c) Artesian well
6. What are the relative advantage and disadvantage of separate and combined sewer system?what are the design considerations for the two types of sewer systems?
7. Explain the aerobic and anaerobic decomposition of sewage
8. What is an oxidation pond? How does if function?what information (data) do you require for its design ?
9. Describe what do you know about the the physical, the chemical and the biological characteristics of sewage
10. a) What do you understand by greenhouse effect? What are its causes? How it can be mitigated?
    b)list in details the physical ,biological and socio-economic baseline information that have to be collected during EIA study of a water supply project.

लोक सेवा आयोग

राजपत्रांकित तृतीय श्रेणी, नेपाल इन्जिनिरिङ सेवा, सिभिल समूह, जनरल
उपसमूहको खुला प्रतियोगितात्मक लिखित परीक्षा
२०६४/११/५ गते

समयः – ३ घण्टा | पत्र :– द्वितीय | पूर्णांक :– १००

विषय : जनरलसम्बन्धी ।

निम्न प्रश्नहरूको उत्तर लेख्नुहोस् ।

1. What are the design and construction problems of hill roads? What do you understand by obligatory points? What are the special considerations which need to be followed in the selection of alignments for roads in mountainous regions? 10
2. Describe briefly the methodology used in the construction of gravel roads. Differentiate between surfaced dressing treatment and otter seal construction. 10
3. The time for a clay layer to achieve 99% consolidation is 10 years. What time would be required to achieve 99% consolidation if the layer were twice a thick, five times more permeable and three times more compressible? 10
4. Explain why safe disposed of waste water is necessary. Provide comparison between separate and combined sewer system. 10
5. What are the various types of treatment of water to make it safe for drinking. Explain briefly the competent of slow sand filter. 10
6. a) Describe about the components of a micro hydro system with neat sketches. 5
7. Describe with sketches various types of river training works and protection works needed for rivers in the mountains and in the plains. 10
8. What are the different methods of irrigation? Briefly explain their function and suitability. 10
9. Explain why urban planning is necessary in Nepal. Describe the challenges being faced in this sector. 10
10. a) Describe about the sources of pollution in Nepal. How these sources can be controlled? 5
    b) How can you related the technology development with environment and society? 5

The End

लोक सेवा आयोग

राजपत्रांकित तृतीय श्रेणी, नेपाल इन्जिनिरिङ सेवा, सिभिल समूह, हाइवे

उपसमूहको खुला प्रतियोगितात्मक लिखित परीक्षा

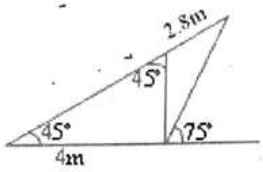
२०६४/११/६ गते

समय: – ३ घण्टा | पत्र :– द्वितीय | पूर्णांक :– १००

विषय : हाइवे उपसमूह सम्बन्धी ।

निम्न प्रश्नहरूको उत्तर लेख्नुहोस् ।

1. A hill road has a section as shown in the figure. Calculate the quantity of earthwork in a length of one kilometer. 10



2. a) Describe with sketches the elements of highway cross sections.
   b) Why are transition curve provided in the horizontal alignment of a highway explain with sketch. (5 + 5)
3. a) What are the criteria that should fulfilled while designing subsurface drains? 4
   b) What are the various tests that are used for assessing the suitability of road aggretages. 3
4. a) What is a rotary intersection? What are the advantages and limitations of traffic rotary intersection ? 5
   b) What are main causes of traffic accidents in Kathmandu? What measures should be taken to mitigate them?
5. a) What are the functions of highway drainage? list the data necessary to glean before deciding on the drainage system for a road. 5
   b) A bituminous mix has been prepared with 10% asphalt by weight of mixture. Assuming the specific gravity of asphalt to be 1 and that of void less specimen of the mixture to be 2.3, calculate the effective specific gravity of the aggregate. 5
6. a) What are the categories of maintenance as defined by DOR? What is the scope of periodic maintenance for paved road. 4
   b) How is the depth of scour determined for the design of bridge foundations. ? 6
7. a) Derive on expression for active earth pressure on the vertical back face of a E.W supporting granular soil having horizontal surface. 6
   b) What is the effect of (a) depth (b) breadth and (c) ground water level on the bearing capacity of cohesive soils as per Terzaghi's formula? (1 + 1 + 2) 4
8. a) Explain soil as three phase system with a neat sketch, define the following terms and give their interrelationship with usual notations: water content, degree of saturation, porosity, void ratio and unit weight of water, solid and soils at different states. 5
9. Write short notes on:
   a) Mohr coulomb theory of shear strength. 3
   b) Primary and secondary consolidation 3
   c) Causes of slope movements and failures. 4
10. a) What are the foundation conditions under which mat foundation is preferred? 5
    b) What is pile group efficiency ? How is the bearing capacity of a pile group determined in cohesive soils? 5

The End

लोक सेवा आयोग

राजपत्रांकित तृतीय श्रेणी, नेपाल इन्जिनियरिङ सेवा, सिभिल समूह, स्यानिटरी
उपसमूहको समावेशी प्रतियोगितात्मक लिखित परीक्षा
२०६४/१०/१९ गते

समय: – ३ घण्टा | पत्र:– द्वितीय | पूर्णांक :– १००

विषय : स्यानिटरी सम्बन्धी ।

निम्न प्रश्नहरूको उत्तर लेख्नुहोस् ।

1. What do you understand by' inverted cone of depression and circle of influence in the well? Name the different method of tube well boring and indicate the conditions where each one is suitable. Sketch and explain geological condition which give rise to an artesian well. 10
2. Explain the procedure for site selection permanent intake in ace when the water leveling fluctuating to large extent during dry and wet season. 10
3. What are the different types of distribution service reservoir used in water supply project so Nepal? How its storage capacity is determined? Discuss in brief. 10
4. It is required to supply water to a population of 20000 (twenty thousand) at a per capita demand of 150 liters per day. The disinfectant used for chlorination is much beaching power is required annually at the water works if 0.3 pm of chlorine does is required. 10
5. Outline the importance of community participation for sustainability of the water supply project point out the challenges. 10
6. a) What is self-cleaning velocity and non-scouring velocity in a sewer? Why sewers are not designed to flow full? 4

   b) Design a sewer to serve a population of 36000; the daily per capita water supply allowance being 135 liters, of which 80% find its way into the sewer. The slope available for the sewer to be laid is 1 in 625 and the sewer should be designed to carry 4 times the dry weather flow when running full. What would be the velocity of flow in the sewer when running full? Assume n = 0.012 in Manning's formula? 6
7. Sewage Treatment Plant मध्ये Oxidation Ditch को फाइदाको बारेमा उल्लेख गर्नुहोस् । 10
8. Describe different stages in sludge digestion process briefly. What are the different factors affecting sludge digestion and how they are controlled ? Do you think sludge disposal by laboring in case of Nepal is appropriate and why? 10
9. Define eco-sanitation. What can you suggest socio-economically poor village people of disposal septic tank effluent, whereas they are facing with their hand-to-mouth problems? 10
10. a) Explain the role of CO_2 on green house effect. 5

    b) Why Initial Environmental Examination (IEE) is necessary for water supply project. 5

The End

लोक सेवा आयोग

राजपत्रांकित तृतीय श्रेणी, नेपाल इन्जिनियरिङ सेवा, सिभिल समूह, इरिगेशन उपसमूहको समावेशी प्रतियोगितात्मक लिखित परीक्षा

२०६४/१०/२३ गते

समयः – ३ घण्टा | पत्रः– द्वितीय | पूर्णांक :– १००

विषयः इरिगेशनसम्बन्धी ।

निम्न प्रश्नहरूको उत्तर लेख्नुहोस् ।

1. a) What factors should be considered while formulating an irrigation scheme? 5

   b) What are the modes of irrigation? What are the advantages and disadvantages of each irrigation methods? 5

2. a) What do you understand by the Duty of water at the headwork's of an irrigation canal and at the outlet to the field? 5

   b) What measure would you suggest to improve "Duty" in an existing canal system? 5

3. What are the cross-drainage (C.D.) works required in an irrigation system? Define the salient features of each type of CD works? What should be the minimum foundation depth of aqueduct below river bed? State the formula used from the calculating of scour depth of CD structure. 10

4. a) What do you mean by Hydraulic Design Criteria of Cross Drainage Structures? Briefly mention Design procedure for Determining Uplift Pressures in a floor of hydraulic structures (Headwrks, CD structures, drops etc.) 7

   b) Write shourt note on: 3

   i) Scour Depth ii) Under Sluice

5. Define exit gradient. How is exit gradient represented? Describe how a structure fails if exit gradient is not balanced. 10

6. a) What are the main causes of soil erosion and landslide in context to hill and mountainous areas of Nepal? Briefly mention their remedial/mitigation measures. 4

   b) Mention cause of flood in terai and inner valley. What are the methods of river training works with flood control generally adopted in flood plain? Also mention best solution of river control in alluvial plain in the terai. 6

7. List the basic step by step logical design process for irrigation development of a medium scale irrigation project. 10

8. Answer the following questions:

   a) i) What is hydrological cycle and what is its importance?

   ii) What is meant by rain gauge and what is their use?

   iii) Explain intensity duration curves, infiltration and percolation.

   b) Enumerate the different methods of measuring discharge. How will you measure the discharge of (i) a river (ii) small stream (iii) a canal. 10

9. a) What are the advantages and disadvantages of ground water irrigation is compared to surface canal irrigation?

   b) A 30 cm diameter well penetrates 25 m, below the static water table. After 24 hours of pumping at 5400 liters per minute, the water level in a test well at 90.0 m is lowered by 0.53 m and well 30.0 m away, the drawdown is 1.11 m. Find out the transmissibility of the aquifer.

The End

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राजपत्रांकित तृतीय श्रेणी, नेपाल इन्जिनियरिङ सेवा, सिभिल समूह, जनरल उपसमूहको शा.अ. स्तर, समावेशी प्रतियोगितात्मक लिखित परीक्षा

२०६५/१०/१५ गते

समय:- ३ घण्टा | पद :- द्वितीय | पूर्णांक :- १००

विषय : जनरलसम्बन्धी ।

निम्न प्रश्नहरूको उत्तर लेख्नुहोस् ।

Section A

1. Draw a sketch of a suspension bridge and indicate its components. 10
2. Calculate the stopping sight distance for following 3 cases on a highway for a design speed of 80kmph, Reaction time is 2 secs and friction coefficient is 0.4. 10
   a) When grade is 4% descending
   b) When grade is 3% ascending
   c) When road is flat.
3. Explain the use of bio engineering in Hill roads and its advantages compared to other method. 10
4. Briefly explain the following: (4 + 3 + 3) 10
   a) Solid waste management
   b) Source of water supply, their selection and management.
   c) Sources of pollution for air, water and land
5. a) How the operation and maintenance of water supply and sewerage system can be improved? 5
   b) Community based water supply and sewerage systems are feasible and sustainable in Nepal. Justify this statement. 5
6. Write short notes on:
   a) Alternative Energy system in Nepal 5
   b) River diversion works 5
7. Explain the specific consideration to be provided for the design, operation and management of Hill irrigation system. 10
8. Write short notes on:
   a) Farmer managed irrigation system 5
   b) Flood control, its necessary and mitigation measures 5
9. Note the type of foundation employed in a building constructed recently in your area. List and explain briefly obvious reasons why this type of foundation was selected. 10
10. What do you mean by participatory approach in planning implementation maintenance and operation of local infrastructures ? Explain by giving examples. 10

The End

High Way- 2065

1. What are the technologiest available to determine best route location of highways?
2. a) what are the basic factors which influence the visible dimensions of a road ?
   b) what correction is required in horizontal curves to negotiate the speed and stability of vehicles?
3. It is argued that road that road construction in hills is one of the major causes of natural environmental degradation.examinine how the road construction project in hills effect the environment? What measures would you suggest to take up at various stages of the project for minimizing the environmental damages?
4. a) Explain the post card methods of O and D surveys. Discuss the advantage and disadvantage of this methods?
   b) how are the road intersection planned ? Enumerated the various traffic controls needed at an intersection.
5. What are flexible and rigid pavements? Describe the with sketch. Which types of pavements is suitable for hill roads in Nepal? Give reasons.
6. a) how planning for road maintenance operations are carried out?
   b) why is hydraulic analysis necessary for river bank and protection structures?
7. Draw a detail configuration of live load of IRC class A bridge loading for a design of a single lane R.C.C bridge
8. What is a veg etation structure? Describe with sketches vegeatative engineering techniques for slope stabilization
9. Coumpute the intensities of active and passive earth pressure at depth of 8 meteres in dry cohesionless sand an angle of internal friction of 30^0 and unit weight of $1.8t/m^3$ .what will be in tensities of active and passive earth pressures if the water level rises to the grund level? take saturates unit weight of sand as 2.2 t/m3..
10. What is the difference between pile and well foundation in bridges? Explain with sketches.

Irrigation- 2066

1. What is the present status of irrigation development in Nepal?what are the factors to be considered in accelerating the development of 'round the year irrigation' in Nepal
2. Name the method of applying water in irrigation fields.how do you define small scale irrigation project in context of Nepal. Write dowm in the brief its scope in Nepal.
3. Define critical depth of flow in canal.
   Design a regime canal for a discharge of 15m3/sec with slit factor=1. Assumes a trapezoidal section having side slopes ½:1(H:V)
4. Derive the manning's equation for the a regime flow of a cannal design with consideration of the chezy's equation
5. Write down the shorts notes on:
   i. Hydraulic jump
   ii. Advantage of canal lining
   iii. Exist gradient
   iv. Cause of failure of weir on permeable foundation
   v. Water measuring devices used in water management

6. How serious is the problems of water logging in irrigated areas in Nepal? State the various drainage systems required in removing water logging in irrigation fields/
7. What is river training works? Describe briefly the different types of river training works and its usefulness in the various conditions
8. What effect you foresee on hydrological cycle due to climate change? Suggest the ways and means in mitigating climate change effects on irrigation projects.
9. What do you mean by: "peak flow"? What is the importance of having a correct peak flow estimation? State the different methods of peak flow estimation.
10. Describe the different methods for recharging ground water table preserving ecological balance in nature of the south Asian regions.

Highway- 2066

1. a)How the roads are classified in Nepal? And which institutions are responsible for its development and maintenance?

   b) Within strategic road network how many highways and feeder roads are there?
2. a) Calculate the stopping sight distance for a road for which the design speed is 50 km ph. Assume that the roadway is level, the coefficient of friction between the road surface and tyres is 0.4 and the reaction time of the driver is 3 sec.

   b) What are the elements of highway cross section? Describe them with a sketch.
3. a) What are the different components of hill road drainage system? Make a sketch for a typical drainage system of hill road.

   b) Describe the difference between and tar. Explain the tests on bituminous materials: penetration test and viscocity test.
4. a) What are the object and scope of traffic engineering? Explain briefly.

   b) What are the different cause of traffic accidents? Discuss briefly .explain various measures that may be taken to prevent accidents.
5. a)what is the ESWL? Explain the concept in the determination of equivalent load.

   b) Distinguish between the full grouted and semi-grouted bituminous macadam.
6. a) Discuss in brief types and methods of maintenance road pavement.

   b) Write down the urgency and importance of highway maintenance. Classify the inspection procedures for the same.
7. What is the reason of providing reinforcement bars on the upper side of beam while designing cantilever beams? What is the purpose of designing double reinforced beams?
8. a) Discuss the various factors that affect the permeability of soil.

   b) What are the causes of slope failures?explain the use of bio-engineering in stabilizing slopes.
9. Write down the assumption of rankine's theory and derive the expression for active and passive pressures.
10. a) what types of foundations are used in bridge construction ? explain the each in brief

    b) how do determine the bearing capacity of soils? What are the factors influencing bearing capacity?

General– 2067 : Chaitra

Section-A

1. Enumerate the various mean of transport. Describe the considerations that lead to selection of a particular type of transport.
2. In context of our difficult terrain and topography at one hand and economics situation at other, how could Trail bridge network in our hilly region could play effective role to alleviate transportation access, elaborated with normal.
3. What are the steps to considered during the preparation of a wearing course of a metaled highway

Section-B

4. Write down the different water borne diseases transmitted through polluted water. Explain their transmission routes and preventive measures.
5. Draw a flow chart of each component of a typical rural water supply system and explain the function of each component.

Section-C

6. In view of emerging crisis in energy sector, what are your suggestions in context of alternate energy system which ought to be developed in Nepal so that we do not depend solely on conventional system?
7. What are the reasons that farmers managed irrigation system in Nepal seems to be pragmatic as well as cost effective? How the coverage the coverage of irrigation be could widened In Nepal so that farmers could be benefited?
8. Explain the objectives of river training works. Explain briefly the different methods of river training works.

Section-D

9. What are the roles of National Building codes in Nepal? Hoe does the code address the problem of earthquake? How could the code be made effective?
10. Name the various steps/process involved in the 'Environmental impact assessment of a project and explain the function of each step/process.

Highway–2067 : Chaitra

Section - A

1. a) Discuss the planning approach for highway construction and development in Nepal.
   b) Discuss the controlling factors that should be considered in the alignment of highways.
   c) How are roads classified in Nepal according to the provision made in NRS 2045?
2. a) What are the elements of cross-section of a highway? Make the sketches of typical cross section for:
   i) Embankment ii) Cutting ii) Urba
   b) What are the effects of centrifugal force acting on a vehicle moving on horizontal curve? How these effects are calculated?
3. a) What are the special points to be considered in the selection of alignments of hill road? Discuss
   b) Write short notes on
   i) Hair pin bend
   ii) Prevention of landslides in hills roads.
   c) How to manage drainage in hills roads? Discuss.

Section-B

4. a) give briefly how "traffic census" is conducted for estimating traffic volume for a given road.
   b) How are the road intersectins planned? Enumerate the various traffic controls needed at an intersection.
5. a) What are the flexible and rigid pavements?
   b) explain briefly the construction procedure for a double bituminous surface dressing.
   c) what are the factors on which the thickness of a pavement depends?
6. a) what do you understand by low cost pavement? Explain application of ottaseal.
   b) what do you understand by performance based maintenance contract? Explain its elements.

Section-C

7. an aqueduct 3m. Wide and 2m. deep is used to carry water over a span of 7m. design a suitable section for the aqueduct. Make necessary assumption.10
8. a) Define principle planes and principal stresses. Write down the coulomb's failure theory.
   b) Describe the settlement of structure of soil. What is the difference between consolidation and compaction?

Section-D

9. What are the assumptions of Rankin's theory? Derive the expressions for active and passive pressures.
10. Discuss the factors determining the selection of particular type of foundation for a bridge .illustarate your answer with examples.

Sanitary– 2067 : Chaitra

Section-A

1. What are the different sources of water? What are the considerations to be taken in selecting the source of water.
2. Write short note on:
   a) Ph valuae b) Water demand c) Hydraulic garde line

Section-B

3. Calculate average water demand in litre per second (lps) for typical village with population of 1000. Find future average and design flow after 20 years. Define peak factor.
4. It is possible to have no reservoir for a gravity flow schme? why are elevated reservoirs provided in water supply systems? Explain briefly.
5. What are the main differences between the basic principles of design of sewers and water mains? explain the significance of minimum and maximum velocities of flow in the design of sewers.
6. Write down short notes on:
   a) B.O.D
   b) Ecological sanitation
   c) Inverted siphon
7. What is self-cleansing velocity? How it is obtained in case of sewers?
8. Describe the procedures laid down in the guidelines on the implementation and management of water supply project,2047 for the formation of water usrr's committee. also mention its duties and responsibilities.
9. Give the definition of environmemntal impact Assessment(EIA). Explain some of the major government rules and regulations for EIA
10. The role of the government agencies has been transformed to the role of a facilator from the provider of the system. How do you look at this statement in the context of sustainable development of water supply and sanitation sector?

Irrigation– 2067 : Chaitra

1. Describe the cause food grain deficit in the country with highlight of functional management of irrigation system
2. Agency managed irrigation systems in Nepal are performing less efficiently .why are the main resons behind this? How can they be improved?
3. Describe the various types of head works and its main component and functions. Which types of head work is most suitable for the hilly and mountainous regions of Nepal. Give reasons.
4. Why canal lining is necessary in light soil? Describe in brief, the various types of lining is used in hills and terai of Nepal?
5. Write short notes on the following
   a. Hydraulic jump
   b) Launching apron
   c) Water logging
   d) Surface drainage
6. a)Write short notes on:
   i) Surface drainage and its application ii) Sub-surface drainage and its application
   iii) Drainage coefficient(D.C)
   b) determine the size at the outlet of a 6 hectare drainage system, if the D.C is 1cm and tile grade is 0.03%/. Assumes rigidity coefficient of the materials is 0.011.
7. What are the needs for controlling rivers in Nepal? list the summary of design procedure for river training works in the hills and plains of Nepal.
8. What is run-0ff ?what are the factors that affect run off from a catchment area? Describe the hydrological cycle in brief with neat sketch.
9. Given below are observed flows from a storm of 6 hours duration on a stream with a catchment area of 500km^2. Assumes the base flow to be zero .derive the ordinates of a 6 hour unit hydrograph.

Time hours	0	6	12	18	24	30	36	42	48	54	60	66	72
Observed flow m^3/s	0	100	250	200	150	100	70	50	35	25	15	5	0

10. What is aquifer? Describe the different types of wells and their classification .describe different types of wells for different types aquifer.

Building Technology– 2069 : Bhadra

1. What are the requirements of ventilation ? explain the moisture movement through building components.
   b) What do you understand by thermal performance of building components? explain the various methods of thermal insulation for exposed walls and roofs.
2. a) define foundation. Describe types of foundation with necessary sketches.
   b)What are the types of flooring? Explain the process of terrazzo finish floor.
3. a) draw and explain different components of timber collar beam roof with their sizes. Explain the different types of roof covering for pitched roof.
   b) explain the preparation of cement sand mortar(1:6).Differentiate between random rubble, coursed rubble and ashlar stone masonry with fig.
4. a) Define stair .illustrate the elements of staircase with fig.
   b)with the help of neat sketches, differentiate between solid and suspend ground floor.
5. a)how do you make a brick masonry buildings earthquake resistant? Explain with sketches various measures adopted.
   b) Illustrate components of the rooftop rain water harvesting system.

लोक सेवा आयोग

राजपत्रांकित तृतीय श्रेणी, नेपाल इन्जिनियरिङ सेवा, सिद्धिल समूह, जनरल उपसमूहको प्रतियोगितात्मक लिखित परीक्षा

२०७०/११/९ गते

समयः- ३ घण्टा | पद :- द्वितीय | पूर्णांक :- १००

विषय : जनरलसम्बन्धी ।

निम्न प्रश्नहरूको उत्तर खण्ड (Section) अनुसार छुट्टाछुट्टै उत्तर पुस्तिकामा लेख्नुहोस् ।

Section A

1. What do you mean by transport plus concept? Which agency in Nepal is adopting this concept? Why this concept is important in Nepalese mountainous and hilly roads? Write down pros and cons of this concept. 10
2. Draw a typical cross section of road with all elements. Describe briefly about each element of cross section of road. 10
3. Differentiate the specific planning and design considerations for the suspension bridge from those for the suspended trial bridge. 10

Section B

4. List the various impurities present in surface water sources. What are their effects on human health? Describe the various components of water treatment plant generally used for purification of water from such sources. 10
5. Describe the causes of various water borne diseases transmitted into human body with their resources of transmission routes and preventive measures. 10

Section C

6. Mention the points to be considered topographically, geologically, hydrologic ally and economically at the planning, layout and design stage of a small hydropower project. 10
7. What is uplift? How can uplift be determined? Show this with a neat sketch of the cross section of a weir with two rows of sheer piles at the ends. Explain how will determine the uplift pressure at any point of the weir foundation. 10
8. Describe about the river training work. Give classification and types of river trainings work in Nepal. 10

Section D

9. Write short notes on: 5 + 5 = 10
   a) Indigenous technology in building construction.
   b) Urban planning needs in Nepal.
10. a) Explain the impacts of modern construction technology in the society. 5
    b) Explain the participatory approach in local infrastructure constructin at various stages of construction. 5

The End

लोक सेवा आयोग

राजपत्रांकित तृतीय श्रेणी, नेपाल इन्जिनियरिङ सेवा, सिभिल समूह, हाइवे उपसमूहको प्रतियोगितात्मक लिखित परीक्षा

२०७०/११/११ गते

समय: – ३ घण्टा | पत्र:– द्वितीय | पूर्णांक :– १००

विषय : हाइवेसम्बन्धी ।

निम्न प्रश्नहरूको उत्तर खण्ड (Section) अनुसार छुट्टाछुट्टै उत्तर पुस्तिकामा लेख्नुहोस् ।

Section A

1. Explain the necessity of highway planning in Nepal. What are the uses of fact finding surveys? How are these used and interpreted? 10
2. The radius of a horizontal circular curve is 10 meters, the design speed is 50 kmph, and the design coefficient of lateral friction is 0.15. Calculate the super elevation if full lateral friction is called into play. 10
3. a) Define bio-engineering. Discuss its functions and limitations. 5
   b) Los Angles abrasion test. 5
4. Draw highway intersection in detail and show the traffic directions. 10
   a) Four legged intersections. b) Multi legged intersections
   c) Channelized intersections d) Three legged intersections

Section C

7. What do you understand by Pretensioning and Post tensioning in prestressed concrete bridges. Explain the special features of prestressed concrete. (2 + 2 + 6 = 10)
8. What are the different types of soil classification? Describe the soil classification by unified soil classifications system method. 10

Section D

9. Design a combined footing for two columns 32 cmx 32 cm carrying load of 60,000 kg and 40 cm carrying load of 80,000 kg. The column are spaced at 3.4 m centers and the bearing capacity of soil is 15 tones/m^2. Calculate the depth of the footing, reinforcement required at transverse section and cantilevers. 10
10. What are the different types of foundation for bridge ? Describe briefly when each of these types is used. 10.

The End

Irrigation– 2070/11/16

Section-A

1. Define wilting point .explain crop-water requirements for crops: paddy, wheat, maize and potato grown in the mahabharat region of Nepal
2. What are the various methods of applying irrigation water to land?

   It is said that user's participation is a must from planning state of an irrigation project for its success. explain?

   How do you proceed for the preparation and development of an irrigation project?

   Also mention the various types of survey to be conducted.

Section-B

3. a) Write short notes on the following :

   i) Free board in canals ii) Berm of canal

   b) What do you understand by a fall in a canal? Why it is necessary ? How do you select in its location?
4. State manning's formula for cannal design. Define its various component. What is the effect of change in manning "N" in the flow f canals?
5. What is hydraulic jump? How it occurs and what is its use in the hydraulic structures. What is the importance of water management work in distribution system of canal?

Section-C

6. What do you water logging of a land? What are the factors responsible for infertility of water logged land? Describe in the brief the anti-water logging measures.
7. What are the steps you consider necessary in the planning and design of Janata ko Baandh ? is it a feasible and sustainable option in mitigating water induced disaster in in Nepal?

Section-D

8. Define point of rainfall. Describe the procedures for slope area method of computing flow discharge in a river.
9. Flood flow estimation of 1 in 5o years return period needs to be estimated to design a head works and intake structures. The method used will also depend on the validity of a data at a point of interest. Keeping in mind of the above, describe various methods practiced in Nepal to estimate the flood flows of catchment?
10. Distinguish clearly between a shallow well in confined aquifer? Show with the help of sketches various types of wells?

Hydropower– 2070/12/06

Section-A

1. Define flow duration curve of a river . Describe the role of flow discharge curve of a river in the hydraulic design of headworks and powerhouse structures.
2. Define probable maximum flood (PMF).Explain its importance in design hydraulic structures.
3. What are the basic equations for steady flow? What are the major causes for head loss in pipelines? Elaborate pipe friction head loss in pipelines.

Section-B

4. Explain about the current hydropower generation and demand situation in Nepal. what are the reasons for slow development policy of Nepal ?
5. Explain about the current hydropower development policy of Nepal. Give your views for improvements needed in the policy?

Selection-C

6. Explain about the daily electricity demand variation in Nepal. Which types of hydropower project is needed to meet the gap in dry season? Explain with reason?
7. Draw cross section of a typical high (say 300m) Earth-Rock fill Dam. Explain how the stability of its slope (upstream) is determined.
8. What is hydraulic tunel? Explain the condition of application and location of the desanding basin in a hydropower project.

Section-D

9. What do you understand by water hammer? Explain the several types of surge tank with schematic drawings.
10. Describe selection criteria for different types of turbines used in hydroelectric plants.

Hydrology– 2070/11/20

Section-A

1. Describe standard method of computing discharge in a stream after measurement of velocity at various verticals by current meter.
2. What are the data to be obtained the from the field measuring to determine the discharge by slope area and current meter methods? Explain how the discharge is obtained?
3. a) A watershed has five rain gauges. the annual rainfall recorded by those gauges for 2007 are as follows:

Rain gauges	1	2	3	4	5
Annual rainfall (cm)	88	106	150	80	100

Calculate the optimum number of rain gauges for the watershed if a 10% error in the mean areal rainfall is acceptable.

b) Explain the risks from GLOFs?

Section-B

4. a) 60 mm of runoff depth is obtained from a catchment of area 2000km^2.calculate the run off volume in million cubic meters, cumec-day and hectaremetres.

   b) Briefly describe how a flow duration curve is constructed.

   c) Give three important application of flow duration curve.
5. Derive an expression for the steady radial flow to a well in an unconfined aquifer.

Section-C

6. The annual peak discharge of a river follows the Gumbel's extremes value distribution with s mean of 10000m^3/s and a standard deviation of 3000m^3. What is the probability that the annual peak discharge is more than 15000m3/what is the magnitude of the peak discharge with an exceedance probability of 0.1?
7. How you fixed the height of dam for the particular site? What do you understand by trap efficiency of the reservoir?
8. Describe with neat sketch how the storage volume of reservoir for the given rate of draft is fixed through mass curve analysis?

Section-D

9. a) Describe two techniques to measures suspended-sediment discharge. How do they differ in the evaluation of suspended sediment concentration?

b) Calculate the suspended sediment discharge (in kilonewtons per day) for a suspended sediment concentration of 22,000 ppm and a flow of 155m^3/s.

10. What do you understand by hydrological forecasts and warnings? Describe the classification of hydrological forecasts and types of warnings.

Civil (Building and Architect)– 2070/Falgun

Section -A

1. What are the sources of dampness in buildings and its negative effects? Skethes the section to show internal waterproofing of basement using tar felt.
2. Describe with neat sketches of the following:
   a) Framed and paneled doors b) Sky light
3. Compare the briefly between the stone masonry and brick masonry.

Section-B

4. Draw opinions on the merits and demerits and B.M diagram for the cantilever of 4.om carrying a uniformly varying 6ggest ways for enhance
5. Describe with sketches general, the requirements for earthquake resistant construction in terms of (a) shape and proportion of plan (b) size and placing of opening in wall.

Section-C

6. Mention with examples hierarchy of urban settlements in Nepal.
7. Apartment housings are drawing attention in Nepal, describe your opinion on the merit and demerits, also illustrate the norms for apartments in inside and outside the of ring road in Nepal
8. Why is it necessary to involve private sector in the housing development project of Nepal. Suggest ways for enhancing public private partnership in housing and urban development of Nepal.

Section-D

9. Whatare the to keep in mind while designing and building a house? Describe briefly about each other's.
10. Which building has been designed by LOUIS KAHN in Kathmandu? What are the main features of that building?

Civil (General)– 2071/11/02

Section-A

1. Why feasibility study of road projects is important and what are the main activities?
2. What do you mean by "Pavement Distress"? Mention in tabular form, symptoms, causes and treatments of defects in bituminous surfacing of Nepal
3. Write difference between suspension and suspended trial bridge. Explain briefly the components that are to be covered in feasibility study of Trial Bridge.

Section –B

4. Define break pressure tank. explain the hydraulic specifics in pipeline network system planning and design keeping minimum head loss in mind in this system/
5. You are required to design a water supply scheme based on gravity flow system. Describe specific stage selection from sources, design of the system up to distribution of water supply to the community.

Section-C

6. What is the importance of small hydro-project in Nepal? Describe briefly the elements that are to be considered in the design of such hydro power projects.
7. If you have to design an irrigation system to be totally maintained by local farmers after construction, what factors would you consider in deciding about lined and unlined section of the canal? Give technical and economical reasons and discuss.
8. A canal has bed width of 6m, full supply depth 1.6m,bankwidth 2.5 m, cutting slope 1:1, filling slope 1:5:1 and free board 0.4 m. calculate balancing depth.

Section-D

9. Discuss on techniques and technology adopted in traditional building construction in Nepal to make earthquake resistant .show the elements in sketches.
10. New technological innovation has resulted into a lot of benefits to the society. Justify this statements with appropriate examples.

Highway– 2071/11/9

Section-A

1. Explain the advantage and disadvantage of road transport. Explain the factors that affects the factors that affect the selection of highway alignment.
2. The radius of a horizontal highway curve is 450 m, super-elevation provided is 1 in 15 and the width of pavements curve is 7.5. if the rate of change of centrifugal acceleration is not to exceed 0.45 m/sec^2 and the rate of introduction of supper elevation (about the inner edge of pavement) is not to exceed 1:150, design the length of horizontal transition curve for a design speed of 100km.ph.
3. Explain in detail the special points that must be considered in the alignment of hill road of Nepal.

Section-B

4. a) What are the general requirements of traffic control devices?
   b) What are traffic islands? c) Briefly describe various types of traffics islands.
5. a) What is EAL or ESA? Describe its significance in design of road pavements.
   b) What are the various methods of design of road pavements?
6. Why road maintenance is necessary? Describe different type of road maintenance. Explain the maintenance of the bituminous pavement.

Section-C

7. a)what are the different types of landslide ? Describe them briefly.
   b) How can slope stability improved by plants?
8. a) What is tunneling? Briefly describe ventilation and lighting requirements for tunnels.
   b) if you are given an opportunity to select an idle bridge site, what do you consider? And, why?

Section-D

9. Define active and passive earth pressure in soil. Derive an expression for active and passive earth pressure by Rankine's method.
10. a) Describe briefly the design procedure of a mat foundation using conventional method of design.
    b) How do you determine linear water way for a bridge to be constructed in an alluvial plain? What will happen if the linear water way is not sufficient?

Sanitary- 2071/11/4

Section-A

1. What do you mean by aquifers? What are its types? Derive an expression for obtaining discharge from a confined aquifer.
2. What are the principal sources of water pollution ?explain their effects on the quality of water.

Section-B

3. A village of Nepal with design year population of 500 has water demand of 65 liters/capita/day. The demand is to be met by a continuous system of supply from a spring source with a safe yield of 0.3 IPs.The consumption pattern of the village is as follows:

   Is a balancing reservoir necessary? Calculate the its capacity if necessary.

Time(hr)	Consumption pattern (%)
5:00-7:00	25
7:00-12:00	35
12:00-1700	15
17:00-1900	20
19:00-5:00	5

4. Sketch typical layout of water supply schemes in

   I) Hilly zone of Nepal. ii) Tarai zone of Nepal

   Discus in what cases you design following structures in water supply projects

   i) Sedimentary tank ii)Filtration unit iii) Aeration chamber

Section-C

5. Calculate the 5 day's 20^0c BOD of a sewage of sample whose 5 days 30oBOD is 110 mg/ltr. Assume the deoxygenation constant at 20^0,K_{20}=0.1
6. What are the different types of sewerage system? What are their advantage and disadvantage?
7. Suggest which one is best suited for Kathmandu valley and why?

   Also list the logic behind your selection of the particular type of treatment.

Section-D

8. What do you understand by community participation in water and sanitation sector? Why user's committee is necessary in implementation, operation and maintenance of water supply and sanitation projects. What are the critical features of community management in water and sanitation sector?
9. a) Discuss in briefly how global warming is affecting water supply sector in nepal and what will be the proper remedial measures?

b) As per environment protection Act/Environment protection Regulation of Government of Nepal discuss in the brief the criteria for conducting IEE/EIA for development projects.

10. Design a septic tank for a hotel of any school where 125 residential students are regularly living that school. Also design the soil absorption system for the disposal of the septic tank effluent the percolation rate as 20 minutes per cm.

Irrigation– 2071/11/16

Section-A

1. What do you understand by crop- water requirement? Explain various factors affecting crop-water requirement.
2. Name various type of irrigation methods. Describe in brief the advantage and disadvantage of each methods.

Section-B

3. a) write manning's uniform flow equation used for canal design.
   b) Design a regime channel (using lacey's equation) for a discharge of 30 m^3/sec.with silt factor=1.Assume trapezoidal section having side slopes ½:1
4. What is meant by scour? What precautions do you take against it in weir design? Explain.
5. write short notes on:
   a) exit gradient
   b) Hydraulic jump.
   c) Retrogression.
   d) Water measuring devices used in water management.

Section-C

6. What are various stages of river? Why river training is necessary? Describe briefly the different methods of river training methods adopted in Nepal.
   What is the purpose of providing a spur in river training in Nepal?
7. What is water logging? What are its effects? Explain various methods of reclamation of water logged areas?

Section-D

8. Define confine and unconfined aquifer. if an artesian well produces 250 litre per minute with a drawdown of 3m in the pumping well, what will be the discharge with 4m drawdown?
9. The following stream flow records are obtained from a gauging station.

Time (Hr.)	0	12	24	36	48	60	72	84	96
Q(cumec)	5	8	20	50	30	20	10	6	5

   Determine volume of flood run off, base flow, surface run off and peak flood.
10. Define "infiltration" of rain water and "infiltration capacity" of the area. Describe the factors affecting ''Infiltration capacity"

Hydropower– 2071/11/15

Section-A

1. What do you understand by flood frequency Analysis (FFA)? Explain the method of conducting FFA and the importance of FFA in hydropower development.
2. Explain various method of determining flood discharge in a stream.
3. a) What are the forms of energy contained in flow through pipes? Explain with the help of the energy (Bernoulli) equation an neat sketch.

c) How are losses in head in pipe contractions, expansions and bends expressed and estimated?

Section-B

4. In Nepalese context, draw your opening on comparative benefit of each Thermal, Hydro, Wind and solar power.
5. Explain the procedure for obtaining a "License for electricity generation" of a 100 MW run of river hydropower project as per the provisions of the Electricity Act, 2049 and Electricity regulation,2050.

Section-C

6. a) what is meant by

   I) Load factor Ii) Secondary energy

   Iii) Firm energy iv) Seasonal Energy

   b) How can secondary energy be utilized?
7. Classify embankment dams. Discuss the stability of an embankment dam.
8. Explain the major design criteria of De-sanding basin. For conventional settling basin, explain why the inlet angle of basin is much smaller than that of outlet? Explain with neat sketch.

Section-D

9. Explain types and advantages of underground power stations.
10. How can we classify turbines? Indicate their suitability for different ranges of heads and specific speeds. Also discuss other important factors that are considered in the selection of turbines.

लोक सेवा आयोग

नेपाल इन्जिनियरिङ् सेवा, सिभिल समूह, जनरल उपसमूह

राजपत्राङ्कित तृतीय श्रेणी (प्राविधिक) पदको प्रतियोगितात्मक लिखित परीक्षा

२०७२/११/२२

समय– ३ घण्टा | पत्र :– द्वितीय पत्र | पूर्णाङ्क :– ३००

विषय :– जनरलसम्बन्धी

निम्न प्रश्नहरूको उत्तर खण्ड (Section) अनुसार छुट्टाछुट्टै उत्तरपुस्तिकामा लेख्नुपर्नेछ । अन्यथा उत्तरपुस्तिका रद्द हुनेछ ।

Section– A

1. Explain the specific consideration for the feasibility study report stage of a road project in hill regions in the comparison of terai (plane) one. 10
2. State importance of hill road drainage with examples. Show the surface drainage system for effective drainage of water with sketch. 10
3. How many types of cables are there in suspension bridge? Describe the function of each type. How is the load on the bridge transferred to the ground? Illustrate with simple sketches. 10

Section– B

4. What is meant by onsite sanitation system? Design a septic tank for 200 users, rate of water supply 45 liters/capita/day, detention period 24 hours and cleaning of sludge as per 5 years. 10
5. Explain the treatment process of waste in detail with sketches. 10

Section– C

6. Maintain Principal Components of Hydroelectric Schemes. Explain in detail about forebay, penstocks and intake structures with sketch. 10
7. What do you mean by River training works? Describe various types of river training works and protection works. 10
8. Explain the specific considerations for planning, layout and design of the headworks in hill regions as compared to those in the terai (plane) region. 10

Section– D

9. "New Technological Innovation has resulted a lot of benefit to the society". Justify this statement with appropriate examples. 10
10. Describe the different construction technologies that can be used in the construction of low cost housing for urban poors. Mention indigenous technology to be adopted in building design and construction. 10

The End

लोक सेवा आयोग

नेपाल इन्जिनियरिङ सेवा, सिभिल समूह, हाइवे उपसमूह

राजपत्राङ्कित तृतीय श्रेणी (प्राविधिक) पदको प्रतियोगितात्मक लिखित परीक्षा

२०७२/११/८

समय :– ३ घण्टा | पत्र :– द्वितीय पत्र | पूर्णाङ्क:– १००

विषय : हाइवेसम्बन्धी

निम्न प्रत्येक खण्ड (Section) को प्रश्नहरूको उत्तर छुट्टाछुट्टै उत्तरपुस्तिकामा लेख्नु पर्नेछ अन्यथा उत्तरपुस्तिका रद्द हुनेछ।

Section – A

1. What are the various systems of classification of roads? Briefly outline the classification based on location and function. Discuss in details the provision made in Nepal Road Standards (NRS) with respect to functional classification of Road Network of Nepal. (3 + 2 + 5)
2. Calculate the minimum sight distance required to avoid a head on collision of two cars approaching from the opposite direction, if both cars are at a speed of 90 km/hr. Assume a total perception and break reacton time of 2.5 seconds, coefficient of friction of 0.7 and a brake efficiency of fifty percent. 10
3. Explain: Why design, construction and maintenance of hill road of Nepal need special consideration ? What are the special points to be considered in the alignment of hill road? (5 + 5) = 10

Section – B

4. Define Traffic Engineering. A vehicle of weight 2 tonnes skids through a distance equal to 50 meter before colliding with another parked vehicle of weight 1 tonne. After collision, both the vehicles skid through a distance equl to 15 meters before stopping. If the weight of both vehicles are equal, compute the initial speed of moving vehicle. Take coefficient of friction as 0.4 10
5. a) Define tack coat, seal coat and priming. 3
   b) Discuss the types of seal coat and process of their application. 4
   c) State in brief the classification of road maintenance activities in Nepal. 3
6. Describe the construction procedure for single or double bituminous surface dressing widely used in Nepal by DoR. What do you know about cutback bitumen and bitumen emulsion? (6 +4) = 10

Section – C

7. a) What are the main types of foundation used for bridges? 5
   b) Describe in detail about underpinning with an aim to stabilize foundations of a bridge? 5
8. a) Suggest methods for improving bearing capacity of weak soil for making foundation. 5

b) Describe in brief the field methods of exploration of soil strata and survey for the construction of foundation of a bridge. 5

Section– D

9. Mention about Rankine's earth pressure theory 10
10. Explain the well sinking operation during bridge construction. How to avoid 'tilt and shifts' and measures to correct "tilt and shifts"? 10

The End

लोक सेवा आयोग

नेपाल इन्जिनियरिङ् सेवा, सिभिल समूह, स्यानिटरी उपसमूह

राजपत्राङ्कित तृतीय श्रेणी (प्राविधिक) प्रतियोगितात्मक लिखित परीक्षा

२०७२/११/१४

समय :- ३ घण्टा | पत्र: द्वितीय पत्र | पूर्णाङ्क :-१००

निम्न प्रश्नहरूको उत्तर खण्ड (Section) अनुसार छुट्टाछुट्टै उत्तरपुस्तिकामा लेख्नुपर्नेछ अन्यथा उत्तरपुस्तिका रद्द हुनेछ।

Section– A

1. Discuss the merits and demerits of river water source (Melamchi Khola) and ground water source (in Kathmandu valley) for water supply scheme in Kathmandu. 10
2. Describe the different types of living organisms found in natural water. Explain their effects on water quality. (6 + 4) =10

Section– B

3. Write short notes on: (4 + 2.5) = 10
   a) Infiltration gallery
   b) OMIT
   c) Hydrolic grade line
   d) Break pressure tank
4. Differentiate between slow and filter and rapid sand filter. Write down their merits and demerits. (4 +6) = 10

Section – C

5. What do you understand by self purification of streams? Explain the various factors affecting self purification. (4 + 6) = 10
6. Classify the sedimentation tanks. How can we increase the setting efficiency of particles? 10
7. What are preliminary and secondary treatment process? Describe the working principle of activated sludge processes. 10

Section– D

8. Why are community mobilization and participation important? Define special role of women participation in WSP. 10
9. a) What are different onsite sanitation systems practiced in Nepal? 4
   b) Describe the principles and benefits of Ecological Sanitation. 6
10. Elaborate pour– flush toilet and VIP toilet with neat Sketches. (5 + 5) = 10

The End

लोक सेवा आयोग

नेपाल इन्जिनियरिङ सेवा, सिभिल समूह, बिल्डिङ एन्ड आर्किटेक्ट उपसमूह

राजपत्रांकित तृतीय श्रेणी (प्राविधिक) को प्रतियोगितात्मक लिखित परीक्षा

२०७२/११/१७

समय:- ३ घण्टा | पत्र :- द्वितीय पत्र | पूर्णांक :- १००

विषय :- बिल्डिङ एन्ड आर्किटेक्टसम्बन्धी ।

निम्न प्रश्नहरूको उत्तर खण्ड (Section) अनुसार छुट्टाछुट्टै उत्तरपुस्तिकामा लेख्नुपर्नेछ अन्यथा उत्तरपुस्तिका रद्द हुनेछ ।

Section A

1. Define shoring and describe it's types with neat and clean sketches. (3 + 7)
2. Draw a typical wall section of an earthquake resistant single storey building with load bearing walls.
3. Write briefly the bonds in brickwork and describe English bond with sketches of alternate layers and isometric view.

Section B

4. Describe singly reinforced section and doubly reinforced section of concrete structure particular for RCC beam section. State the main use of both sections and exemplify of both sections with sketches emphasizing on earthquake resistant need. (3 + 3 + 4)
5. Define Hook's law. Calculate shear force and bending moment of the simply supported beat ... with span 4 m (c/c) and a point load of 10 kN at the centre of the span. Also draw the shear force and bending moment diagram.

Section C

6. What are the different kinds of urban housing? Describe in detail about "site and services" (5)
7. What do you understand b y the term "land use planning" ? Write the importance of land planning in urban development which agencies are involving for urban development Nepal? (3 + 4)
8. What is a periodic plan of a municipality? How can municipality play its roles in ... development of Nepal?

Section D

9. Write on vernacular architecture of Nepal in general and Kathmandu in particular.
10. What do you understand by traditional architecture in Nepal? Illustrate three architectur... landmarks in Nepal.

The End

लोक सेवा आयोग

नेपाल इन्जिनियरिङ सेवा, सिभिल समूह, हाइड्रोपावर उपसमूह

राजपत्रांकित तृतीय श्रेणी (प्राविधिक) को प्रतियोगिताको लिखित परीक्षा

२०७२/११/१९ गते

समयः– ३ घण्टा | पद :– द्वितीय | पूर्णांक :– १००

विषय : हाइड्रो पावरसम्बन्धी ।

निम्न प्रश्नहरूको उत्तर खण्ड (Section) अनुसार छुट्टाछुट्टै उत्तर पुस्तिकामा लेख्नुपर्नेछ, अन्यथा उत्तरपुस्तिका रद्द हुनेछ ।

Section A

1. Define Area Elevation Curve and Capacity Elevation Curves. How does the shape of these curves govern the reservoir simulation in reservoir projects? 10
2. Enlist the various methods of discharge measurement in rivers. Briefly explain the way of developing stage-discharge and flow duration curves. (5 + 5) = 10
3. Water flows in a horizontal channel with velocity of 6.0m/s at depth of 1.2 m. Find the conjugate depth and the energy loss on the jump. 10

Section – B

4. What is a run-of-river project? How does it differ from a storage project? Sketch a general arrangement (plan) of such a scheme showing the typical components. (3 + 3 + 4) 10
5. Explain the role of Ministry of Energy, NEA and DOED for developing of hydropower project in Nepal and state the importance of Electricity Act, 2049. 10

Section C

6. Write short notes on: (4 × 2.5)
   a) Plant Utilization factor
   b) Firm Energy and Secondary Energy
   c) General Layout of Storage Power
   d) Power Demand Curve.
7. What is primary, secondary and exceptional loads on dams? What loads fall into those classification?
8. Differentiate De-sanding basins with respect to flushing. Mention any one of the methods of designing de-sanding basin. 10

Section C

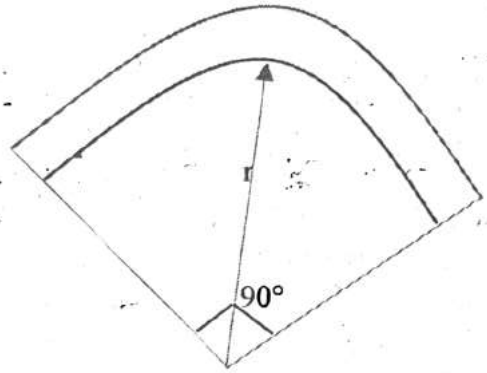
6. Write short notes on: (4 × 2.5) = 10
   a) Plant Utilization factor
   b) Firm Energy and Secondary Energy
   c) General Layout of Storage Power
   d) Power Demand Curve
7. What is primary, secondary and exceptional loads on dams? What loads fall into those classification? 10
8. Differentiate De-standing basins with respect to flushing. Mention any one of the methods of designing de-sanding basin. 10

Section D

9. What is a surge tank ? Mention its functions. Also discuss with reasons the appropriate location for a surge tank. Present a sketch to clarify your answer. (2 + 3 + 5) = 10
10. Describe layout arrangement of turbines. Discuss important factors that are considered in the selection of turbines. (5 + 5) = 10

The End

Subject: Nepal Food Corporation, Civil (Building and architect): 2071/6/28

1. What are the main characteristics of hollow concrete blocks? Can this be used for load bearning walls of a building? What are the advantages and disadvantage?
2. a) Describe with sketch common water proofing problems of a building in Nepal and their remedial measures taken.
3. a)An arch of 2.5m span subtends an angle of 90^0 at the center. The thickness of arch is 30 cm and thickness of wall is also 30cm. Calculate the quantity of arch masonry work.
4. 

   b)what do you mean by a "kingstone"
5. what do you know about roof truss? With sketch give the types, and properties of truss used in Nepal .what types of loads are considered in designing roof truss?
6. What is the principle of earthquake design of buildings? is it practical and normal to design a building earthquake proof?
7. a) Describe with sketch design steps of a foundation footings of a building structure.
   b) Name types of footings of common buildings as practiced in Nepal
8. a) Describe the present and past practices in building construction in different zones of Nepal
   b) Drawing a plan and vertical section of a storage building constructed in jumla showing all elements and details.
9. What are the general ethics of architects in professional practice? Illustrate the provisions being followed internationally and that included in Nepal acts.
10. Explain the environmental issues in urban and rural development of our country and how those should be dealt with while designing a storage building of Nepal food corporation.
11. You are assigned to design a storage building for Nepal Food Corporation in Nepalgunj. Write step by step procedure you follow to design such a building.

Kathmandu Metro-Politian City
Civil Engineer : 2071/11/08

Answer all the questions **[10 × 10=100]**

Section – A

1. The radius of a horizontal curve is 80 m. The design speed is 45 kmph and design coefficient of lateral friction is 0.15. Determine the super elevation required if full lateral friction is assumed to develop and coefficient of friction needed if no super elevation is provided.
2. How is implementation of bolsters help to stabilize the unstable slope? Describe with appropriate sketches the steps of implementation of bolster for purpose of stabilization of degraded slopes.
3. State the basic differences between the suspension and suspended bridges. How are the roads transferred into foundation in a typical suspension bridge? Show all important elements of suspension bridge in a neat sketch.
4.

Section– B

5. In the treatment of 25×10^3 m/day of water, the amount of chlorine used is 15 Kg/day. The residual chlorine after 10 min contact is 0.2 mg/ltr. Determine chlorine demand in mg/ltr.
6. Describe the various steps involved in " Detailed Feasibility Study and Engineering Design" of an urban water supply system and explain importance of each steps.
7. Describe the various types of sewerage system. A sewerage system having a radius of 70 cm is laid with a gradient of 1 in 500. What will be the velocity of flow and discharge through the sewer when running one half full? Assume N=0.012 in Manning's formula.

Section – C

8. Describe the various renewable and non-renewable source of energy used for Neapal.
9. Describe the factors, which should be considered in the construction of Hill irrigation canals. Also list the environmental aspects of hill irrigation.

Section - D

10. Discuss about roles of construction materials and technology on strength of buildings. What are the local and modern construction materials and their implications in cost of buildings in Nepal?
11. Discuss the present state of urban environment of Kathmandu valley. How do you think this situation can be made bette?

Civil Aviation Authority of Nepal
Technical Service Civil Engineering Group
Senior Officer, Level – 7
Open Competition Exam– 2072

Time 1.5 hours | **विषय:– सेवासम्बन्धी** | **Full Marks: 100**

Long Questions (2 × 20 = 40)

1. If Civil Aviation Authority of Nepal (CAAN) appointed you as pavement engineer for review the design report of Runway of XYZ International Airport submitted by international consultant which is going construction immediately after finalization of design. CAAN instructed you to check the runway which should be operated by B747 aircraft or equivalent (ICAO Code 4E). How can you start your assigned works and what types of element are you considered? Describe briefly.
2. Make a survey team for detailed survey of the STOL airfield proposed in remote area of the country and make a list that is necessary to carry out the said survey. Also explain the problems that may encounter in carrying out the detailed survey in remote area.

Short Questions (6 × 10 = 60)

1. Describe briefly about runway, taxiway and apron with necessary sketch.
2. Describe the basic steps to be considered for the airport site selection.
3. What is the project management? Describe various phases of project management.
4. What are the facilities that may be required for the planning and design of the terminal building?
5. What is pavement evaluation and why is it necessary? Explain briefly the pavement evaluation process. Describe the meaning of PCN 80/R/V/|N/T.

नेपाल नागरिक उड्डयन प्राधिकरण
प्राविधिक सेवा, सिद्धिल इन्जिनियरिङ समूह, वरिष्ट अधिकृत (तह– ७)
खुला प्रतियोगितात्मक परीक्षा, २०७२

समय : १:३० | **पूर्णांक : ७०**

विषय: प्रशासन तथा व्यवस्थापन र ऐन नियम ।

तर्कयुक्त विश्लेषणात्मक समस्या समाधान प्रश्नहरू (२ × २० = ४०)

१. संगठनात्मक व्यवहार भन्नाले के बुझ्नुहुन्छ ? संगठनलाई गतिशील र उद्देश्यपरक ढंगले अघि बढाउनु महत्वपूर्ण भूमिका निर्वाह गरेको संगठनात्मक व्यवहारलाई नेपालका संगठनहरूमा कतिको ख्याल गरेको पाउनुहुन्छ ? यसमा देखिएका कमीकमजोरीहरूलाई सुधार गरी कसरी अघि बढ्न सकिन्छ ? विश्लेषणात्मक उत्तर दिनुहोस् ।

२. नेपाल सरकारको राष्ट्रिय पर्यटन नीतिबारे जानकारी गराउँदै यो नीतिको प्रभावकारिताबारे आफ्नो राय दिनुहोस् । साथै यो नीतिमा समयसापेक्ष सुधार गर्न के-कस्ता प्रावधानहरू थप गर्नुपर्ला ? तर्कपूर्ण सुझावहरू प्रस्तुत गर्नुहोस् ।

छोटो प्रश्नहरू (३ × १० = ३०)

१. नेपाल नागरिक उड्डयन प्राधिकरणको वर्तमान सांगठनिक स्वरूपबारे जानकारी गराउँदै यो संगठनलाई चुस्त, प्रभावकारी र क्रियाशील बनाउन के-कस्तो सुधारको आवश्यकता देख्नुहुन्छ ? राय दिनुहोस् ।

२. नेपाल सरकारको वर्तमान हवाई नीतिको आलोचनात्मक समीक्षा गर्नुहोस् ।

३. नेपालका सार्वजनिक संस्थानको सञ्चालनका क्रममा देखिएका समस्याहरू उल्लेख गर्दै समाधानका ठोस उपायहरू औंल्याउनुहोस् ।

ललितपुर उपमहानगरपालिका कार्यालय पदपूर्ति समिति
इन्जिनियरिङ सेवा, अधिकृतस्तर छैठौं तह स्ट्रस्चरल इन्जिनियरिकङ पदको
खुला प्रतियोगितात्मक लिखित परीक्षा
मिति : २०७२/११/२९

समय : ३ घण्टा | द्वितीय पत्र | पूर्णांक : १००

विषय : स्ट्रक्चरल इन्जिनियरिङसम्बन्धी

Section 'A'

1. Differentiate between stiffness matrix and flexibility matrix methods. Draw influence line diagram for shear force at D. 4 + 6 = 10
   Figure
2. What are concrete admixture ? Briefly explain about use of prestress concrete. 4 + 6 = 10
3. What are the main components of analysis of item rates. Give an example of analysis of an item rate. 10
4. What is Quality Assurance plan? Explain it with as example? 10

Section 'B'

5. A) What do you mean by …What are the steps of the Environmental… of building in Nepal? 5
   B) What are the provisons relating to the construction of building as per Local Government Act 20… … and regulation 2056 ? 5
6. … defect in temper Design circular … column … meter long for axial load for … N. 2 + 8 = 10
7. In recent Gorkha earthquake, significant number of temples and monumental structures were severely damaged in Kathmandu Valley. As a structural engineer of LSMC, what would be your recommendation to improve the seismic strength of such temples and structures to prevent damages in future earthquake? Shall modern construction materials permitted to be used in repair and restoration of such structures? 7 + 3 = 10
8. a) For a saturated soil, given w = 40% and G… = 2.71, determine the saturated and dry nit weight of soil.
   b) A 5 m high retaining wall having angle of repose 30 degree, C = 5KN/m^2 and unit weight 17.5 KN/m^3. Determine the active pressure on the wall a) Before the formation of crack b) After the formation of crack. 10
9. Determine the ultimate moment capacity. By Limit State Method, of a rectangular concrete beam section of 300 mm width and 550 mm effective depth, with 3 numbers of 20 mm diameter Fe 415 steel as tension reinforcement. Take M 20 as the grade of the concrete and 25 mm clear cover. 10
10. Illustrate with sketches about the various classes of live loads used in design of vehicular bridge. What other loads in addition to live load is essential to be considered while designing superstructure of Reinforced Concrete Bridges? 8 + 2 = 10

The End

पद पूर्ति समिति

थाहा नगरपालिका कार्यालय, दामन, मकवानपुर

इन्जिनियर/अधिकृतस्तर छैठौं तह, इन्जि सेवा, सिभिल समूह, जनरल उप-समूह

समय : ३ घण्टा | दोस्रो पत्र : जनरलसम्बन्धी | पूर्णांक : १००

1. What are the design and construction problems of hill roads? What special considerations need to done in the selection of alignment for roads in high altitude mountainous region? (10)
2. Write short notes on: [5 + 5]
   A. Role of social mobilization in rural road development.
   B. Importance of maintence of roads.
3. What do you understand by water hammer? Explain different types of surge tanks with scheme drawings. [10]
4. Has technology brought changes in education and employment opportunity of Nepal? Discuss. [10]
5. What is the different between renewable and non-renewable energy? Also write down advantages solar energy, bio-gas and hydropower. [10]
6. Describe various types of river training and protection works. [10]
7. What are the roles of National Building Codes in Nepal? How does the code address the problem earthquake? How could the code be made effective? [10]
8. Write short notes on: [5 + 5]
   A. Farmers managed irrigation system.
   B. Specific consideration in design of buildings in Nepal.
9. Briefly Explain the following: [5 + 5]
   A. Remedial measures of water logging.
   B. Indigenous technology in building designs.
10. Write short notes on: [5 +5]
    A. Initial Environment Examination.
    B. Labour based, Environment friendly and participatory Approach for local infrastructure development in Nepal.

Nepal Electricity Authority- 2067

Section- A

Answer the following questions shortly. (8 × 5 = 40)

1. What do you mean by Flow Duration Curve? How do you plot it?
2. Discuss in brief about basic design, hydraulic design and structural design if hydroelectric project components or structures.
3. What do you understand single circle and double circle circuit of high voltage transmission line? what is maximum voltage of transmission line existing in Nepal?
4. When the first hydropower was commissioned in Nepal? describe hydropower development history in Nepal.
5. Describe the stage of project studies and elements of field investigation required for these studies.
6. What is difference between economic and financial analysis?
7. What is procedure generally to be followed as per existing environmental regulation for conducting initial environmental examination (IEE) of a small hydropower project.
8. Application of safety rules and regulations is almost necessary during construction of hydro power project. Discuss it.

Set- B

Give answer in detail. **(3 × 20 = 60)**

9. If you have to develop a small hydropower project of capacity 10 MW in a cost effective manner in a remote area of Nepal, what are the stages of study that have to be undertaken before the construction start? Discuss it.
10. What are the major constraints in development of Hydropower in Nepal? What are your suggestions to overcome such constraints?
11. What do you mean by multipurpose projects? What are merits and demerits of multipurpose projects?

Nepal Electricity Authority - 2068

Set - A

Answer shortly. **(8 × 5 = 40)**

1. Discuss in brief about the differences of below mentioned types of hydropower development schemes.

   (i) Run-off-river scheme (ii) Storage scheme (iii) Pumped Storage Scheme
2. Mention some differences between geological and geotechnical investigation works that have to be carried out during field investigation of any hydropower project.
3. What do you understand by economic and financial analysis of any run-off-river types of hydropower project? Mention its importance.
4. What do you understand by economic and financial analysis of any development project? Whichone of above mentioned analysis is generally carried out by the private power producers for development of hydropower project? Mention some important indicators of financial analysis.
5. Describe importance of reservoir type of project in power system of Nepal.
6. Give list of electrical and mechanical equipment commonly installed in hydropower plant.
7. What are major benefits of river basin development and integrated water resource development?
8. Describe concept of IEE and EIA.

Set – B

Answer the followings in detailed.

9. What do you mean by screening and ranking of hydropower projects? Discuss its advantages and disadvantages.
10. What is optimization? Describe the principles of optimization of a water conveyance system.
11. In view of existing safety rules and regulation, what are the safety measures which need to be adopted in storage and handling of explosive in construction of a hydropower project?

नेपाल विद्युत प्राधिकरण

प्राविधिक सेवा, सिभिल समूह, सिभिल उपसमूह तह- ७, इन्जिनियरिङ

पदको खुल्ला प्रतियोगितात्मक लिखित परीक्षा- २०७०

समय : २ घण्टा ३० मिनेट | द्वितीय पत्र | पूर्णांक : ७०

विषय :- हाइड्रोपावर इन्जिनियरिङ

खण्ड (क)

छोटो उत्तर दिनुहोस् । (८ × ५ = ४०)

1. How is the hydropower situation in Nepal? Describe briefly. Make sketch of run-off-river (ROR) project, and show its all components.
2. Elaborate the importance of reservoir project in the context of Nepal.
3. Briefly explain the safety measures needed to be considered inside the underground power house.
4. Classify the institutions involved in hydropower development in Nepal and explain their roles.
5. A hydropower plant is to be installed in a river of which the firm flow is 100 cumecs The net head is 110m, and the plant's overall efficiency in 85%. Environmental Regulations restricts that 10% of the flow can not be divided as it has to be released downstream. What should be the installed capacity of the power plant, if it is to be operated for daily peking for six hours. Assume that 10% of the stored water in regulating pond will be lost in evaporation.
6. What are Return of Equity (ROL) and internal Rate or Ratum (IRR) ? What is the main factor, which generally makes ROE more than IRR in the context of financial analysis of a hydropower project?
7. What exactly are Reynolds number, Froude number and Mach number? Explain their significance with reference to their different values.
8. Water is flowing down through a vertical pipe of uniform cross section or crossection of height H. Leaving all other theoretical and practical constraints inside, where would you get maximum power. If a turine were installed – (i) Near the top and of the pipe (ii) At the mid height of the pipe (iii) Near the top end of the pipe. (iv) Location of turbine does not make any difference ? You need to justly your answer Quantitatively.

खण्ड (ख)

लामो उत्तर दिनुहोस् । (३ × १० = ३०)

9. Starting from the definition, derive a relationship for 'specific speed' as a function of speed power and head. What is the significance and use of specific speed ?
10. What are the sources of loss of energy stored in hydropower and how it is measured ? The supply to a pressure turbine is under a head of 20m. As the turbine draws $0.5m^3/s$ of water the head lose in the 300 mm diameter supply line is 2.5m. calculate the pressure intensity at the entrance to the turbine. Determine the energy absorbed by the turbine in kW. Ignoring the functional losses between the entrance and end of turbine, when a negative pressure 3×10^4 pa exists at the 500mm diameter section of the drat tube 1.5m below the supply line. Also find the output of the turbine, if its efficiency is 85%.
11. What is field investigation for a hydropower project ? Differentiate between geological and geotechnical investigations. Explain the step by step procedure to estimate probabilistic seismic intensity for target probability of exceedence in specified years at a hydropower project site.

The End

Nepal Electricity Authority - 2071

Section – A $(8 \times 5 = 40)$

Answer the followings shortly.

1) List out the activities to carry out IEE and EIA studies. How do you assess the sediment load of a river?
2) What is multipurpose water resource development in Nepalese context? Highlights the concept of screening and ranking of hydropower project.
3) What is GLOF? How do you consider the GLOF phenomenon or event while designing the storage and RoR projects?
4) What do you mean by hydraulic transient? How do you consider such phenomenon while designing a hydropower plant? A penstock pipe of internal diameter as 2 m is subjected to 100 m statistical head of water and 20% additional dynamic head of allowable stress of material is 120 N/mm^2 determine the wall thickness of pipe assuming the joint efficiency as 90%.
5) Write the major parameters to decide the type of dam for storage project. What major load you consider while designing the concrete gravity dam?
6) a) Define the terms load factor, capacity factor and utilization factor and relate them.
   b) Why it is necessary to predict future load demand. What are the methods of load forecasting?
7) a) write three financial indicators to decide financial viability of any hydropower project?
   b) Determine the discounted pay back period of a project that requires an investment of 100 million US$. Take minimum attractive rate of return as 15%.
8) a) why do you require the governor in a hydropower plant?
   b) What precautions will you take at blasting site if you are responsible for supervision of work?

Section – B

Answer the followings in detailed.

9) The mean monthly flow of typical Nepalese river is as follows.

Months	Jan	Feb	March	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Q(cumec)	8	7	6	7	10	38	90	100	60	30	16	10

Considering overall efficiency as o.88, net head as 200 m and minimum environmental release as 10% of minimum monthly flow determine:

a) Total potential (power and energy) in each months considering no spilling is allowed.
b) If the power plant will run only for 6 months what will be design discharge and installed capacity of plant?

10) Differentiate between the pipe flow and open channel flow. A hydropower plant has a circular surge tank of diameter 15 m at end of 2 Km long tunnel having diameter 4 m. Five penstocks each of diameter 1.525 m and 400 m long are used. Friction factor for tunnel is 0.018 and penstock is 0.03. acoustic wave velocity in penstock is 1370 m/s. In steady state, head reservoir level is 450 m with discharge at 25 m^3/s. Compute the water hammer pressure for sudden up closure, maximum upsurge and down surge and time of oscillation.
11) List out the major activities carried out to prepare a feasibility study of a hydropower. What are the purpose of sub surface explorations . Explain briefly how it is conduct?

Nepal Electricity Authority - 2072

Section – A

Answer the followings shortly. **(8 × 5 = 40)**

1. Describe the steps in development of hydropower in Nepal with basic characteristics. Name the hydropower development institution in Nepal.
2. Draw the typical layout of hydropower house showing all essential components.
3. What are the major factor needed to be considered while optimizing the dam height? Explain briefly.
4. How does a daily pondage basin in a PRoR project help to regulate the fluctuation in power demand? Explain.
5. How do you fix duration of construction of a hydropower project? Explain the concept of CPM in project planning.
6. Explain the safety issues and measures to be taken into consideration while constructing a tunnel?
7. What is risk analysis? How do you carried out risk analysis for a hydropower project? Name five major potential risks in the construction of a hydropower project.
8. Define specific speed, synchronous speed, run away speed, speed factor and design speed of turbine.

Section – B

Answer the followings detailed. **(3 × 10 = 30)**

9. Discuss the different issues and challenges associated with the sediment problem in hydropower project in Nepal. Explain how do you design run-off-river headworks of a hydropower project to overcome such sediment problem in sediment laden river. explain the feature of good headwork at Himalayan river.
10. Describe briefly about different types of field investigation required for hydro power project.
11. a) Define Froude Number.

    b) Estimate the tail water elevation required to form a hydraulic jump from the following datas:

- Spill way elevation = 150 m
- Elevation of energy line just U/S of spill way crest = 152.5 m
- Elevation of horizontal apron = 100 m
- Coefficient of discharge = 0.68
- Neglect the energy loss due to flow over spill way.