

लोक सेवा आयोग

नेपाल इन्जिनियरिङ सेवा, सिभिल समूह, विभिन्न (जनरल, हाईवे, स्यानिटरी, ईरिगेशन, हाइड्रोपावर) उपसमूह
राजपत्राङ्कित तृतीय श्रेणी (प्राविधिक) पदको प्रतियोगितात्मक लिखित परीक्षा
मिति: २०७९/१०/१४

समय: ३ घण्टा

पूर्णाङ्क: १००

पत्र:- द्वितीय

विषय:- 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 $N_c=10$, $N_q=4$, $N_\gamma=2$. 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...

Section - C

25 Marks

7. What factors to be considered while selecting a location for airport? List down the factors. 10
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 BOD₅ of 5 mg/L to Bagmati River and Nagamati is designed to discharge 400 lps water to Bagmati River with BOD₅ 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 BOD₅ of 10 mg/L. Now, calculate the BOD₅ 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»»»