Roll No.

Candidate should write his/her Roll No. here.

Total No. of Questions : **5** No. of Printed Pages : **8**

SEM-2016(01)-II
CIVIL ENGINEERING
Paper – II

Time : **3** Hours] [Total Marks : **300**

Instructions to the candidates :

1. **All** questions carry equal marks.
2. Answer **all** questions. Question No. **1** does not have internal choice, while questions no. **2-5** have internal choice.
3. Marks of different parts of questions are given along side of the parts.
4. Answers must be written in **English** only.
5. Unless otherwise mentioned, symbols and notations have their usual standard meanings.
6. Assume suitable data (if necessary) and indicate the same clearly.
7. Neat sketches may be drawn at appropriate places.
8. **All** parts and sub-parts of a question must be answered together.
9. Any pages left blank in answer book must be clearly struck out.
10. Non-programmable scientific calculator is only permitted.
11. No tables and charts permitted.

1. Answer **all** the questions : **(10×6=60 Marks)**

(A) Explain any four types of irrigation efficiencies. **6**

(B) Explain Thiessen polygon method for estimating the mean precipitation over an area. **6**

(C) Classify each type of groynes based on function serves. **6**

(D) Differentiate between weir and barrage. **6**

(E) Calculate the safe SSD for a design speed of 50 kmph for a two-way traffic in a two-lane road. Assume a reaction time of 2.5 sec and coefficient of friction of 0.37. **6**

(F) What are the categories of traffic signs adopted in India ? Mention any two sub-heads of signs in each of the categories. **6**

(G) Calculate the capacity flow for a road section if its free mean speed is 80 kmph and jam density is 145 vehicles/km. **6**

(H) What are the types of overlay used for pavement rehabilitation ? **6**

(I) For a moist soil sample, the following are given 6

- Total volume : $V = 1.2\ m^3$
- Total mass : $M = 2350\ kg$
- Moisture content : $w = 8.6\%$
- Specific gravity of soil solids = 2.71

Determine the following Moist Density and Dry Density

(J) What is earth pressure ? What are the types of lateral earth pressure ? 6

2. Answer any **three** questions out of **four**. 60

(A) Derive a 3 hour synthetic unit hydrograph using Synder's method for a catchment area of 2500 km^2 with the following data :

Length of main stream = 120 km & Distance from central outlet = 80 km

Coefficients C_t and C_p for the catchment are assumed as 1.5 and 0.6 respectively. 20

(B) During a recuperation test conducted on an open well in a region, the water level in the well was depressed by 3 m and it was observed to rise by 1.75 m in 75 minutes. (a) What is the specific yield of open wells in that region ? (b) What could be the yield from a well of 5 m diameter under a depression head of 2.5 m ? (c) What should be the diameter of the well to give a yield of 12 lit/s under a depression head of 2.0 m ? Derive the expression used. 20

(C) Following data were obtained from the stability analysis of a concrete gravity dam :

(i) Total overturning moment about toe = 1×10^6 kN-m

(ii) Total resisting moment about toe = 2×10^6 kN-m

(iii) Total vertical force above base = 50,000 kN

(iv) Base width of the dam = 50 m

(v) Slope of the d/s face = 0.8 (H) : 1 (V)

Calculate the maximum and minimum vertical stress to which the foundation will be subjected to. What is the maximum principal stress at toe ? Assume there is no tail water. **20**

(D) Design a trapezoidal concrete lined canal to carry a discharge of 100 cumecs at a slope of 25 cm/km. The side slope of the canal are 1.5 : 1. The value of N may be taken as 0.016 and also assume the limiting velocity as 1.5 m/s. **20**

3. Answer any **three** questions out of four. **60**

(A) Calculate the stress at the interior edge region of a concrete pavement using Westergaard's analysis. Use the following parameters pertaining to a concrete pavement.

Wheel load = 4100 kg; Modulus of elasticity of cement concrete = 0.3 million kg/cm^3; pavement thickness = 15 cm; Poison's ratio = 0.15; modulus of subgrade reaction = 3 kg/cm^3 and radius of contact area a = 15 cm. **20**

(B) Monthly mean of average daily temperature for hottest month of the year and monthly mean of maximum daily temperature for the same month for a particular airport are 10 °C and 19 °C, respectively. Basic runway length was reported as 1400 m. The updated runway length after applying correction for elevation was 1645 m. Standard temperature at a given elevation is 10.13 °C. Further, effective gradient was reported to be 0.8%. Determine the actual runway length after applying necessary corrections as per relevant ICAO/FAA recommendations. **20**

(C) For a Broad Gauge rail route in India, the following information are available :

Degree of curve 1°; super-elevation 80 mm; Length of transition curve 120 m; and maximum speed likely to be sanctioned 160 kmph. Assume a maximum cant deficiency for the route to be 100 mm and Broad Gauge = 1.676 m. Determine the following :

(i) Safe speed

(ii) Speed based on the consideration of super-elevation

(iii) Speed based on the consideration of the length of transition curve. **20**

(D) Briefly mention the requirements of bituminous mixes for pavement construction. What are the parameters considered for Marshall method of mix design ? Draw the schematics of the association between the mix design parameters and bitumen content. **20**

4. Answer any **three** questions out of **four**. **60**

(A) A clay soil, tested in a consolidation, showed a decrease in void ratio from 1.20 – 1.10 when the pressure was increased from 0.25 to 0.50 kgf/cm^2. Calculate the coefficient of compression and coefficient of volume change. If the coefficient of consolidation determined in the test for the given stress increment was 10 m^2/year, calculate the coefficient of permeability in cm/sec. If the sample tested at the site was taken from a clay layer 3.0 m in thickness, determine the consolidation settlement resulting from the increase in stress. **20**

(B) In a direct shear test on a sand sample, the normal stress was 200 kN/m^2 and the sample failed at a shear stress of 120 kN/m^2. Draw the Mohr circle and the strength envelope. Determine (i) angle of shearing resistance of the soil (ii) magnitude of the major and minor principal stress and (iii) orientation of the principal stress. **20**

(C) Determine the undamped natural frequency of a machine foundation of a plan size 1.5 m × 1.5 m with the weight of 200 kN including the machine. If a damping of 10% is introduced, what is the damped natural frequency ? Assume the coefficient of elastic uniform compression as 4.5×10^4 kN/m^3. **20**

(D) (i) A granular soil γ_{sat} 19 kN/m^3, $\phi = 35°$. A slope has to be made of this material, if a factor of safety of 1.3 needed against slope failure then determine (a) the safe angle of the slope (b) also the safe angle of the slope, if seepage occur parallel to the slope.

(ii) Two samples of a soil were tested in a triaxial machine. The all-round pressure maintained for the first sample was 250 kN/m^2 and failure occurred at an additional axial stress of 800 kN/m^2. For the second sample, these values were 550 kN/m^2 and 1400 kN/m^2, respectively. Find c and ϕ for the soil. **20**

5. Answer any **six** questions out of eight. **60**

(A) Explain the function of cistern. Describe the various expressions to compute cistern in fall. **10**

(B) Describe the different types of cross drainage works that carrying drainage over the canal with figures. **10**

(C) Provide short notes of :

(i) Escape

(ii) SHP **10**

(D) Write the formula for computing the practical capacity of a weaving section of a rotary. Also, highlight each of the terms in the formula. **10**

(E) Mention types of conflicts at an intersection. With the help of a schematic, derive the total number of conflicts with one-way regulation on both roads. **10**

(F) Define railway yard. Briefly discuss about the types of railway yards. **10**

(G) Determine the ultimate bearing capacity and net bearing capacity of a strip footing, 1.5 m wide, with its base at a depth of 1 m, resting on a dry sand stratum. $\gamma = 17\ kN/m^3$, $N_q = 60$, $N_\gamma = 75$, $\phi = 38°$ and $c = 0$. **10**

(H) Enlist the various types of foundations. What are shallow and deep foundations ? **10**
