[This question paper contains 03 printed pages]

Roll Number: _____

HPAS (Main) Examination-2018

CIVIL ENGINEERING-II

Time: 3 Hours Maximum Marks: 100

Note:

1. This question paper contains eight questions. Attempt total five questions including question No.1 which is compulsory.

2. Each question carries equal marks. Marks are divided and indicated against each part of the question.

3. Write legibly. Each part of the question must be answered in sequence in the same continuation.

4. If questions are attempted in excess of the prescribed number only questions attempted first up to the prescribed number shall be valued and the remaining answers will be ignored.

5. Assume suitable missing Data, if any.

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1. (a) The scale of an aerial photograph is 1 cm = 100 m. The photograph size is 20 cm x 20 cm. Determine the number of photographs required to cover an area of 100 sq. km. if the longitudinal lap is $60^0/_0$ and the side lap is $30^0/_0$. (10)

   (b) The staff readings in Levelling were taken as follows:-

1.550	2.250	1.350	1.050	0.895
0.750	1.345	1.870	2.315	1.320
1.805	2.350	0.705	1.750	2.300

   The level was shifted after 3rd, 6th and 8th readings, If the RL of the first point was 240.800, find the reduced level of all the points by Rise and Fall method. Apply the mathematical check. (10)

2. (a) Calculate the stopping sight distance for:-
   (i) Two lane highway having two way traffic.
   (ii) Single lane road having two way traffic.
   Design speed = 40 kmph f=0.35 t=3 seconds.
   (10)

   (b) Draw a neat diagram of simple left-hand turn out and show its various component parts. Explain the working principle of the turnout. (10)

3. (a) A National Highway with a design speed of 100 Kmph has a horizontal curve of radius 360 m in plain Terrain. Design all the relevant Geometric features for a Two-Lane Highway. (10)

   (b) A compound railway curve ABC is to have the radius of arc AB as 600 m and that of BC 400 m. Angle of intersection at the intersection point V is 35. If the arc AB is to have length of 200 m. Calculate distances VA and VC. (10)

4. (a) Petrol of specific gravity 0.8 flows upward through a vertical pipe. A & B are two points in the pipe. B being 0.3 m higher than A. Connections are led from A&B to a U-Tube containing mercury. If differential pressure is 0.18 kg/cm^2, find the reading of the manometer. (10)

   (b) How can you describe the flow patterns and give the individual description of each pattern. (10)

5. (a) Derive an expression for Energy equation used in compressible fluid flow system. (10)

   (b) A straight 250 mm pipe 5 km long is laid between two reservoirs having a difference in levels of 40 m. To increase the capacity of system, an additional 2.5 km long 250 mm pipe is laid parallel from the first reservoir to the midpoint of the original pipe. Find the percentage increase in discharge due to installation of the new pipe assuming friction factor as 0.025 for both the pipes. (10)

6. (a) For a basis having a number of recording type rain gauges, explain how will you prepare depth-area duration curves for a particular storm? (10)

(b) How would you determine analytically the position of the PHREATIC LINE for a homogeneous embankment with inclined discharge face (without filter) when the downstream slope angle is 45^0. (10)

7. (a) Explain the procedure of designing an irrigation channel, using Kennedy's theory, given Q, Kutter's N, m and S. (10)

(b) What are the loads considered in the analysis of ARCH DAMS and how they differ when compared to the gravity dam design. (10)

8. (a) Describe in brief various types of settling tanks. Design a primary settling tank of rectangular shape for a town having a population of 50,000 with a water supply of 180 litres per capita per day. (10)

(b) Calculate the diameter required for single-Stage Trickling Filter which is to yield an effluent $BOD_5@20^0C$ of 20 mg/l when treating Settled Domestic Sewage with $BOD_5@20^0C$ of 120 mg/l. The waste water flow is 2200 m^3/day and the recirculation is constant at 4000 m^3/day. The filter depth is 1.5 m. (10)