[This question paper contains 02 printed pages]

Roll Number: _____

HPAS Etc. Combined Competitive (Main) Examination, 2019

Civil Engineering-II

Time Allowed: 3 Hours Maximum Marks: 100

Note:

1. This question paper contains total eight questions. *Attempt any five questions including compulsory question No.1.*
2. Each question carries equal marks. Marks are divided and indicated against each part of the question. Write answer in legible handwriting. Each part of the question must be answered in sequence and in the same continuation.
3. Attempts of questions shall be counted in sequential order. Unless struck off, attempt of question shall be counted even if attempted partly. Any page or portion of the page left blank in answer book must be clearly struck off.
4. Use of I.S. Codes of Practice and Steel Section Handbook is permitted.
5. Assume suitable missing Data, if any.
6. *Re-evaluation / Re-checking of answer book is not allowed.*

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1. (a) In a highway I in 50 elevation gradient meets 1 in 400 fall gradient at a chainage of 1200m and at a reduced level of 150.00m. If the sight distance be 300m, determine the Length of the vertical curve and the reduced Levels of the Tangent Points and the Apex of the curve, using a 30m Chain. Assuming the Eye Level of a Driver to be 1.2m above the Road Surface and the height of the obstacle to be 0.1m. (10)

   (b) What are the functions of Rails. Draw the sketch of any two types of Rails on Indian Railways. (10)

2. (a) What are latitudes and departures. How will you balance a closed traverse? What are the checks for closed and unclosed traverses? (10)

   (b) The speeds of overtaking and overtaken vehicles are 70 and 40 kmph, respectively on a two way traffic road. The average acceleration during overtaking may be assumed as 0.99 m/s^2. (10)

   (i) Calculate safe overtaking sight distance.
   (ii) What is the minimum length of overtaking zone?
   (iii) Draw a neat sketch of overtaking zone and show the position of the sign posts.

3. (a) What are platforms. Explain briefly different types of platforms used in remote Sensing. (10)

   (b) Draw the neat and self explanatory sketches of the following: (5, 5)

(i) A single line wayside station
(ii) A double line wayside station.

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 40m to increase the capacity of system, an additional 2.5 km long 250mm 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 basin 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^o. (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 a 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 $2200m^3$/day and the recirculation is constant at $4000m^3$/day. The Filter depth is 1.5m. (10)

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