



[This question paper contains 03 printed pages]

Himachal Pradesh Administrative Service Combined Competitive (Main /
Written) Examination, 2020

CIVIL ENGINEERING (PAPER-II)

Time allowed: Three Hours

Maximum Marks: 100

QUESTION PAPER SPECIFIC INSTRUCTIONS

Please read each of the following instructions carefully before attempting questions.

1. There are EIGHT questions printed in English.
2. Candidate has to attempt FIVE questions in all.
3. Question No.1 is compulsory. Out of the remaining SEVEN questions, FOUR are to be attempted.
4. All questions carry equal marks. The number of marks carried by a question / part is indicated against it.
5. Write answers in legible handwriting. Each part of the question must be answered in sequence and in the same continuation.
6. Wherever any assumptions are made for answering a question, they must be clearly indicated.
7. Diagrams / Figures, wherever required, shall be drawn neatly. Unless otherwise mentioned, symbols and notations carry their usual standard meanings.
8. Use of I.S. Codes of Practice and Steel Section Handbook is permitted.
9. Attempts of questions shall be counted in sequential order. Unless struck off, attempt of a 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.
10. Re-evaluation / Re-checking of answer book of the candidate is not allowed.

1. (a) Explain quality control practices during construction of CC pavements? (10)
(b) Calculate the maximum permissible speed on a curve of high speed B.G. track having the following particulars: (10)
Degree of curve = 1
Amount of superelevation = 8.0 cm
Length of transition curve = 130 metres
Maximum speed of the section likely to be sanctioned = 153 kmph.
2. (a) Explain advantages and disadvantages of Plane Tabling? (10)
(b) The maximum quantity of water expected in one of the open longitudinal drains of the clayey soil is $0.90 \text{ m}^3/\text{s}$. Design the cross section and longitudinal slope of

trapezoidal drain assuming the bottom width of the trapezoidal section to be 1.0m and cross slope to be 1.0 vertical to 1.5 horizontal. The allowable velocity of flow in the drain is 1.2m/s and Manning's roughness coefficient is 0.02. (10)

3. (a) What is active and passive remote sensing? What are the basic elements of remote sensing? (10)
- (b) If a cross-over occurs between two M.G. parallel tracks of same crossing number 1 in 12 with straight intermediate portion between the reverse curves and the distance between the centres of track is 3.5m, find the intermediate straight distance and overall length of cross-over. (10)
4. (a) A cylindrical vessel 12 cm in diameter and 30 cm deep is filled with water up to the top. The vessel is open at the top. Find the quantity of liquid left in the vessel when it is rotated about its vertical axis with a speed of 3000 r.p.m. (10)
- (b) The velocity potential function is given by $\phi = 5(x^2 - y^2)$. Calculate the velocity components at the point (4, 5). (10)
5. (a) Calculate the bottom width of the channel required to carry a discharge of 15 m³/s as a critical flow at a depth of 1.2m, if the channel section is trapezoidal with side slope of 1.5 horizontal : 1 vertical. (10)
- (b) A pipe line AB of diameter 300mm and of length 400m carries water at the rate of 50 litres/s. The flow takes place from A to B where point B is 30 metres above A. Find the pressure at A if the pressure at B is 19.62 N/cm². Take $f = 0.008$. (10)
6. (a) The peak of flood hydrograph due to 3-h duration isolated storm in a catchment is 270 m³/s. The total depth of rainfall is 5.9 cm. assuming an average infiltration loss of 0.3 cm/h and a constant base flow of 20 m³/s, estimate the peak of the 3-h unit hydrograph of this catchment.
If the area of the catchment is 567 km², determine the base width of the 3-h unit hydrograph by assuming it to be triangular in shape. (10)
- (b) Explain important considerations for siting a rain gauge. (10)
7. (a) Describe in brief various types of groynes used for river training? (10)

- (b) Design a concrete lined channel to carry a discharge of 45 cumecs at a slope of 1 in 10,000. The side of the channel are 1.25:1 and Manning's N may be taken as 0.018. (10)
8. (a) Determine the surface area of a settling tank for $0.5 \text{ m}^3/\text{sec.}$, design flow, using the design outflow rate as $32.5 \text{ m}^3/\text{day}/ \text{m}^2$. Find the depth of the clarifier for this overflow rate and detention time of 95 minutes. Assume length to width ratio for settling tank between 2:1 and 5:1 and length not to exceed 100m. Recommend the dimensions of the tank. (10)
- (b) A population of 40,000 resides in a town covering an area of 75 hectares. Calculate the discharge for a combined system of sewers. Given: (10)
- (i) Coefficient of run off = 0.70
 - (ii) Rain concentration = 40 minutes
 - (iii) Water consumption = 120 l/d/person; and
 - (iv) 70% of wastewater reaches the sewers.
