Roll Number: _____

HPAS Etc. Combined Competitive (Main) Examination, 2019

Civil Engineering-I

Time Allowed: 3 Hours   Maximum Marks: 100

<u>Note:</u>

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. Draw the Sectional Plan and the elevation showing the details of 1/3 panelled and 2/3 glazed door. (20)

2. (a) A square prism of wood 50x50mm in crosssection and 300m long is subjected to a tensile stress of $4t/cm^2$ along its longitudinal axis and lateral compressive stress of $2t/cm^2$ along one pair of sides and a lateral tensile stress of $1.0t/cm^2$ acting along the other pair of sides. If the value of E of the material is 1.5×10^5 kg/cm^2, calculate its changed dimensions. Poisson Ratio for wood = 0.4. (10)

   (b) The distance between the centre lines of the Rails of a broad-Gauge Track is 168 cm. Assuming a uniform upward soil pressure distribution on the sleeper, determine the Length of the Sleeper for the most efficient distribution of bending Moment on the Sleeper. (10)

3. Draw the influence lines for (i) horizontal thrust (ii) bending moment at crown of two hinged parabolic arch of span 'L' and rise 'h' Assume secant variation of moment of inertia. Hence evaluate the thrust and the moment at crown when the arch is subjected to u.d.l. over the entire span. (20)

4. A Rivet Group consists of 10 Rivets, 22mm. dia. arranged in two vertical rows of 5 rivets each at a pitch of 8 cm. centre to centre. The horizontal distance between the rows is 10 cm. Which Rivet is most heavily loaded and what is the stress in it if the joint carries a point load of 10 tonnes at an eccentricity of 20 cm.? (20)

5. (a) A rectangular slab of size 4m x 6m is simply supported on all four edges. Design the slab for a service load of $14KN/m^2$. Assume p = 0.7, use M25 concrete and Fe415 steel. (10)

   (b) A prestressed concrete beam 400 mm wide and 600 mm deep has a span of 6 m. The beam is prestressed with a tendon bent as shown in Fig. I. There is a central concentrated load of 180 KN acting on the beam. Effective prestressing force = 1200 kN. Calculate the extreme fibre stresses at mid span taking into account the self weight of beam also. (10)
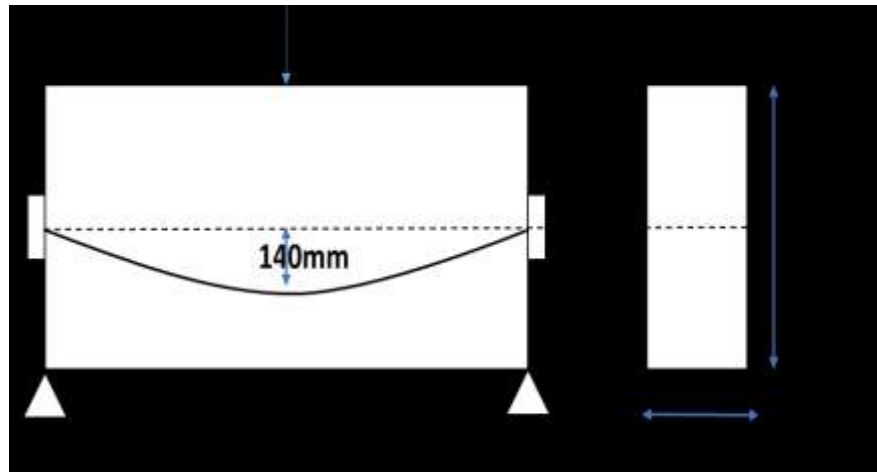

Fig I

6. A project consists of 8 activities. Code-name based on the type of work as A, C, E, K, P, R, T and Y. A and E are initial activities; T and Y are Terminal activities: T follows C; R follows P; A precedes K; R precedes Y; P follows E; and K is followed by C. The a, m and b durations have been estimated as under (Fig I). (Data on Area under the normal probability curve are also given for information). What is the probability of the project being completed in 28 months. (20)

Activity	A	C	E	K	P	R	T	Y
a (in months)	5	3	4	6	6	2.5	7.5	5
m (in months)	6	3	8	12	7	3.5	9.5	7
b (in months)	7	3	10	14	8	7.5	14.5	9

Fig I

	0.00	0.02	0.04	0.06	0.08
0.00	0.5000	0.5080	0.5160	0.5239	0.5319
0.10	0.5398	0.5478	0.5557	0.5636	0.5712
0.20	0.5793	0.5871	0.5948	0.5987	0.6103
0.30	0.6179	0.6255	0.6331	0.6406	0.6480
0.40	0.6554	0.6628	0.6700	0.6772	0.6844
0.50	0.6915	0.6985	0.7054	0.7123	0.7190

Extracts : Area under Normal Probability Curve

7. A vertical wall, 5m high, supports a saturated cohesive backfill with horizontal surface. The top 3m of the backfill weighs 1.76g/cm^3 and has an apparent cohesion of 0.15kg/cm^2. The Bulk Density and the apparent cohesion of the bottom 2m of the backfill are respective 1.92g/cm^3 and 0.2g/cm^2. Determine the likely depth of the tension cracks behind the wall. If tension cracks develop, what will be the total active pressure? Sketch the Pressure Distribution Diagram and locate the point of application of the resultant Pressure.   (20)

8. (a) Two Clay specimens A and B, of thickness 2cm and 3cm have equilibrium void ratios 0.65 and 0.70 respectively under a pressure of 200KN/m^2. If the equilibrium voids ratio of the two soils reduced to 0.48 and 0.60 respectively when the pressure was increased to 400KN/m$^{2.}$ Find the ratio of the coefficients of permeability of the two specimens. The time required by the specimen A to reach 40% degree of consolidation is one-fourth of that required by specimen B for reaching 40% degree of consolidation.   (10)

   (b) Explain the various defects of Timber and their remedies in Construction Work.
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