SEAL

201503

Roll No.

Candidate should write his/her Roll No. here.

Total No. of Questions : **6** No. of Printed Pages : **7**

SEM–2017(01)–I

CIVIL ENGINEERING

Paper—I

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

Instructions to the candidates :

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

*Candidates should attempt **FIVE** questions in all.*

*Question No. **1** is compulsory.*

*Out of remaining **SIX** questions attempt any **FOUR**.*

All questions carry equal marks.

The number of marks carried by a part of a question is indicated against it.

*Answers must be written in **ENGLISH** only.*

Unless otherwise mentioned, symbols and notations have their usual standard meanings.

Assume suitable data, if necessary and indicate the same clearly.

Abstracts of the Tables are given along with the questions.

Neat sketches may be drawn, wherever required.

All parts and sub-parts of a question are to be attempted together in the answer book.

Any pages left blank in the answer book must be clearly struck out.

Only non-programmable scientific calculator is allowed.

No codes/special publications/Tables published by BIS or otherwise are allowed.

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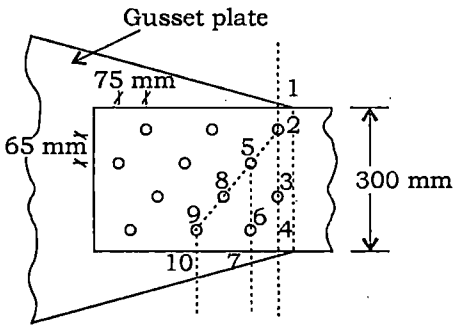
1. All parts carry equal marks : 6×10=60

(a) A uniform load of 2000 N/m, 5 m long crosses a girder of 20 m span from left to right. Calculate the maximum shear force and BM at a section 8 m from left-hand support.

(b) A 300 mm × 8 mm flat plate is used as tension member in a lattice guarder as shown in Fig. 1. It is connected to 12 mm gusset plate by 18 mm ϕ hand-driven zig-zag riveting. Calculate the force along the section 1-2-5-8-9-10 that the member can carry :



Zig-zag Riveting

Fig. 1

(c) Enumerate the different losses that may occur during the processes of pre-stressing.

(d) An RCC beam of section 300 mm × 500 mm is reinforced with 4 bars of 16 mm ϕ with an effective cover of 50 mm. The beam is simply supported over a span of 5 m. Find the maximum permissible u.d.l. on the beam. Use M20 grade concrete and Fe500 steel.

(e) Explain the two methods of planning and scheduling in detail.

(f) Describe base period, delta and duty. Give the relation between them.

(g) A three-hinged parabolic arch of span 40 m and rise 10 m is carrying a uniformly distributed load of 30 kN/m as shown in Fig. 2. Find the horizontal thrust at the springing :

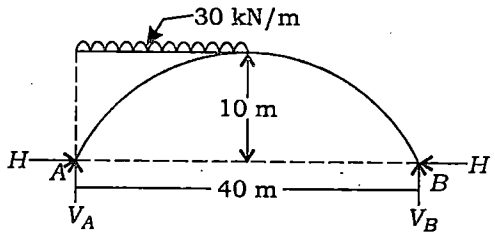
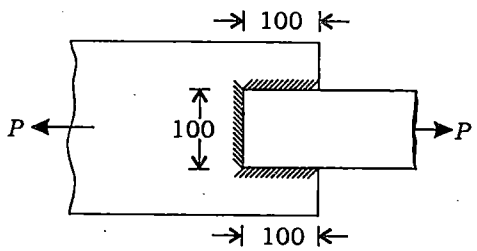


Fig. 2

(h) A 100 mm×12 mm plate is to be welded to another 150 mm × 10 mm plate by a fillet weld of 6 mm size on three sides as shown in Fig. 3. Determine the necessary overlap of the plate. Take allowable stress in plate as 140 MPa and allowable stress in the weld as 100 MPa.



(All dimensions are in mm)

Fig. 3

(i) Describe the following :

(i) Beta-distribution curve

(ii) Critical path

(iii) Free float

(iv) Slack time

(j) Describe the following :

(i) Greenhouse effect

(ii) Air pollution

(iii) Biological characteristics of sewage

(iv) Various treatment processes of sewage sludge

2. *(a)* Determine the support moments for the continuous beam using slope-deflection method. The relative values of moment of inertia is given in the Fig. 4. E is constant : 30

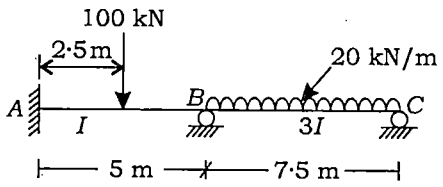


Fig. 4

(b) Determine the member force using the method of joints for the truss shown in Fig. 5 : 30

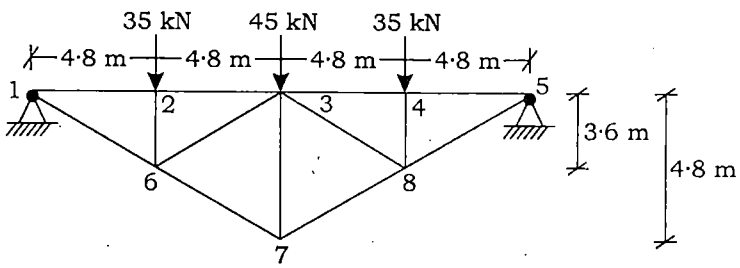


Fig. 5

3. *(a)* A beam of span l fixed at both ends has to carry a point load at a distance $l/3$ from the left end as shown in Fig. 6. Find the values of load at the collapse condition if the plastic moment of resistance of the left half of the beam is $2\,M_p$ while the plastic moment of resistance of the right half of the beam is M_p : 20

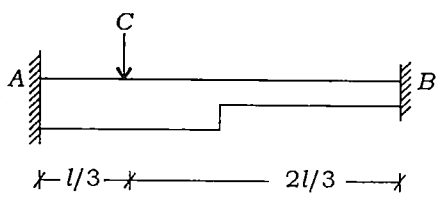


Fig. 6

(b) A square spread footing is to carry a column load of 1200 kN from a 400 mm square tied column containing 20 mm diameter longitudinal bars. Design the footing for *(i)* moment and *(ii)* shear action. The bearing capacity of soil is 100 kN/m^2. Consider the base of the footing at 1 m below ground level. Use M20 grade concrete and Fe415 grade steel : 40

Table : Value of τ_c for M20 concrete

$100A_s/bd$	0·15	0·25	0·50	0·75	1·0
τ_c N/mm^2	0·28	0·36	0·48	0·56	0·62

4. *(a)* What are the standard of water quality to be used for domestic purposes with respect to the following? 2×10=20

(i) Turbidity

(ii) Total solid

(iii) Hardness

(iv) Chlorides

(v) Iron and manganese

(vi) pH value

(vii) Lead

(viii) Arsenic

(ix) Dissolved oxygen

(x) BOD

(b) A pre-stressed concrete beam section is 250 mm × 300 mm as shown in Fig. 7. The initial pre-stressing force is 450 kN at an eccentricity of 60 mm. The beam has a span of 5·75 m and has to carry a superimposed load of 7·5 kN/m. Analyze the beam section for the stresses produced at the mid-span before and after the application of load. Allow a loss of 15% : 40

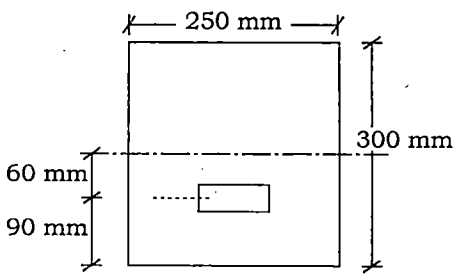


Fig. 7

5. *(a)* Design the eccentric riveted connection to the following requirements : 30

Load transfer to each bracket plate	= 120 kN
Number of vertical rows of rivets	= 2
Distance between the two rows	= 120 mm
Spacing of the rivets in each vertical row	= 100 mm
Eccentricity of the load	= 250 mm
Diameter of the rivets	= 20 mm
Thickness of the bracket plate	= 10 mm

Take $\tau = 100$ MPa and $\sigma_b = 300$ MPa.

(b) Estimate the quantity of cement, sand and coarse aggregate per m^3 of concrete if minimum void ratios are 60%, 40% and 45% respectively for 1 : 1·5 : 3 concrete mix having the water-cement ratio as 0·42. The density of cement, sand and coarse aggregate may be taken as 1500 kg/m^3, 1700 kg/m^3 and 1600 kg/m^3 respectively. 30

6. *(a)* Explain the following : 5×4=20

(i) Fuller's formula to calculate flood discharge

(ii) Discharge over a rectangular crest of a sarda fall

(iii) Formulae to calculate Lacey's silt factor

(iv) Relation given by Kennedy for critical velocity

(b) Describe the following : 10×2=20

(i) Classification of sedimentation tank

(ii) Sources of sanitary sewage

(c) A 30 cm diameter sewer having an invert slope of 1 in 150 was flowing full. What would be the velocity of flow and discharge? ($n = 0{\cdot}013$) What would be the velocity and discharge when the same is flowing 0·2 and 0·8 of its full depth? 20

Proportionate depth h/d	*Proportionate area* a/A	*Proportionate wetted parameter* p/P	*Proportionate hydraulic mean depth*	*Proportionate velocity* v/V	*Proportionate discharge* q/Q
0·20	0·143	0·296	0·482	0·615	0·0879
0·80	0·858	0·705	1·217	1·140	0·9781

★★★