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Question Paper Code : 11287

M.E./M.Tech. DEGREE EXAMINATIONS, APRIL/MAY 2019.

Second Semester

Structural Engineering

ST 5201 — ADVANCED STEEL STRUCTURES

(Regulation 2017)

Time : Three hours Maximum : 100 marks

IS 800 : 2007 Code of Practice General Construction in Steel.

SP 6 (1) : 1964 Handbook for Structural Engineers.

IS 875 (1-3) : 1987 Code of Practice for Design Loads (Other than earthquakes) for Buildings and Structures.

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1. Summarize the limitations of using Purlins in industrial buildings.
2. Classify the types of moment resistant bases.
3. What is semi rigid connection and compare with pinned and rigid connection?
4. The shear capacity of bolt is 58kN and the bearing capacity of bolt is 102kN. What type of failure will the bolt experience?
5. Classify the types of loads for which an industrial building is to be designed.
6. Discuss about sway and non sway frames.
7. Distinguish between the elastic modulus and plastic modulus of a section.
8. Explain a plastic hinge.
9. Discuss the uses of light gauge steel structural members.
10. State the effective width calculation in light gauged steel sections.

PART B — (5 × 13 = 65 marks)

11. (a) Design a channel purlin for roof truss using the following data:

(i)	Spacing of roof truss	- 4 m
(ii)	Spacing of purlin along the sloping length	- 1.9 m
(iii)	Pitch of the roof	- 1/5
(iv)	Weight of sheeting	- 133 N/m²
(v)	Wind load intensity normal to roof	- 1500 N/m².

Or

(b) Design a suitable moment resisting base for a column subjected to an axial load of 360kN and moment of 130 kNm. The column section is ISHB 400 @ 822 N/m. safe bearing pressure in concrete is 4000 kN/m².

12. (a) Design a seat angle connection for a beam ISLB 500 @ 75 kg/m carrying a total uniformly distributed load of 300kN over a span of 6 m is to be connected to the flange of steel stanchion ISHB 250 @ 51.0kg/m. Use M16 grade 4.6 bolts for connection.

Or

(b) A ISMB 500 @ 0.869 kN/m transmits an end reaction of 130 kN to the flange of column ISHB 250 @ 0.510 kN/m. Design an un-stiffened welded seat connection.

13. (a) The bottom chord of a truss is made up of two angles of ISA 100 × 100 × 10 mm and the unsupported length of the member is 1.5 m. Check whether the bottom chord member is safe to carry a factored tensile load of 150 kN under dead load and live load combination and a factored compressive load of 80 kN under dead load and wind load combination.

Or

(b) A fink roof truss is proposed to be constructed at Madurai. The size of the building is 18 x 40 m. The pitch of the roof is $\frac{1}{4}$. The trusses are spaced at 4m c/c. use G.I. sheeting. The height of the roof above the ground level is 12m. Estimate the dead, live and wind loads acting on the roof. The configuration of the girder is given in Fig. 1.

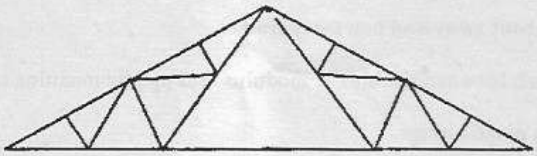

Fig. 1

14. (a) A propped cantilever of span L is subjected to uniform distributed load w per unit length. Determine the collapse load, if the plastic moment capacity of the beam is Mp. Also prove that in a propped cantilever subjected to a moving concentrated load, the worst position is at 0.414 L from propped end and its load carrying capacity is 5.828 Mp/ L.

Or

(b) Design the continuous beam with the service load as shown in the Fig.2. The load factor may be assumed as 1.7. Provide a uniform cross section throughout the beam.

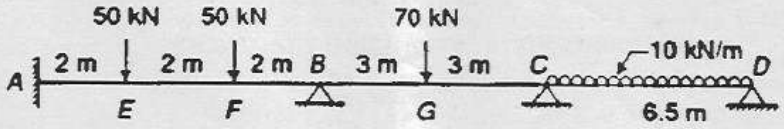

Fig. 2

15. (a) Two channels with 200 mm × 800 mm with bent lips are connected with webs to act as a beam. The thickness of the plate is 2.5 mm and the depth of lip is 25 mm. The beam has an effective span of 4 m. Determine the allowable load on the beam if the yield stress of steel is 235N/mm^2 and E = 2 × 10^5 N/mm^2.

Or

(b) Design a Stanchion 3.5 m long in a building subjected to a factored load of 550 kN both the ends of a stanchion are effectively restrained in direction and position. Use steel of grade Fe410.

PART C — (1 × 15 = 15 marks)

16. (a) In a framed connection an ISLB 500 @ 750 N/m transmit an end reaction of 150 kN and an end moment of 45 kNm to an ISHB 400 @ 822 N/m column section. Design a split beam connection. Check the safety of the connection if the moment increases to 80 kNm.

Or

(b) Design a suitable bolted gusset plate for a column ISHB 350 @ 661.2 N/m, carrying an axial compressive factored load of 2250 kN. The base rest on M20 concrete pedestal. Use 24 mm diameter bolts of grade 4.6 for making the connections.