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C020611(020)

B. Tech. (Sixth Semester) Examination, April-May 2022

(AICTE Scheme)

(Civil Engg. Branch)

STRUCTURAL ENGINEERING DESIGN-II

Time Allowed : Three hours

Maximum Marks : 100

Minimum Pass Marks : 35

Note : *Attempt all questions. Part (a) of each question is compulsory and carries 4 marks. Solve any* ***two*** *parts from part (b), (c) & (d) and carries 8 marks each. Assume suitable data if required. Use of IS800:2007 & Steel table is permitted.*

Unit-I

1. (a) How Limit State method of design is differing from WSM? 4

(b) Determine the collapse load of a fixed beam with a concentrated load at mid-span as shown in Fig. 1. 8

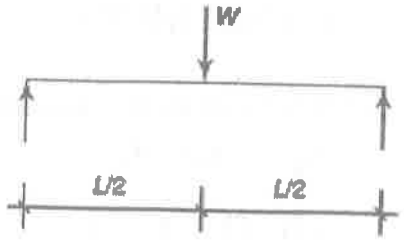

Fig. 1

(c) Explain the semi-compact, compact section & Plastic Section from moment-rotation curve diagram. 8

(d) Determine the plastic moment capacity and shape factor of the I-section shown in Fig. 2. This section is ISMB 400 with the root radius omitted. Assume $f_y = 250$ N/mm^2. 8

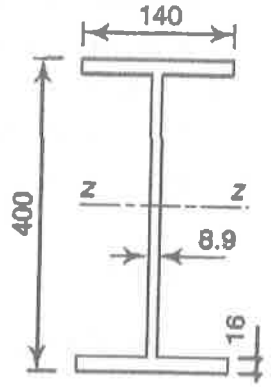

Fig. 2

Unit-II

2. (a) Explain with diagram block shear failure. 4

(b) A tie member consists of an ISA 80×50×8 mm (Fe 410 grade steel) is welded to a 12 mm thick gusset plate at site. Design weld to transmit load equal to the design strength of the member. Sketch the welded connection. 8

(c) A tie member of roof truss consists of an ISA 65 × 65 × 6 mm of Fe 410 grade, is welded to an 8 mm gusset plate. Design a weld to transmit a load equal to the full strength of the member. Assume shop welding. Also sketch the details showing length of weld L_1 and L_2. 8

(d) Design joint B of roof truss as shown in Fig. 3. The members are connected with 16 mm diameter bolts of grade 4·6 to the gusset plate 12 mm thick. 8

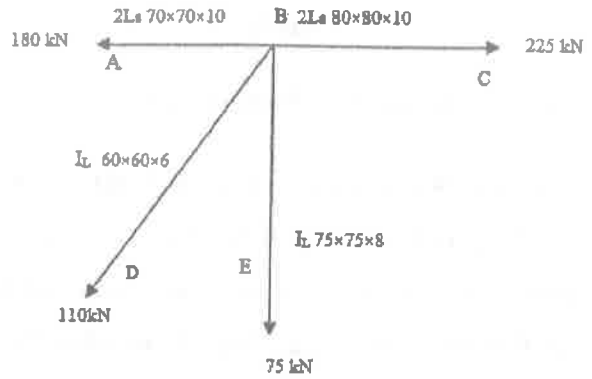

Fig. 3

Unit-III

3. (a) What are the factors affecting the strength of tension member? 4

(b) Determine the tensile strength of a roof truss diagonal 100 × 75 × 6 mm f_y = 250 MPa connected to the gusset plate by 4 mm welds in Fig. 4. 8

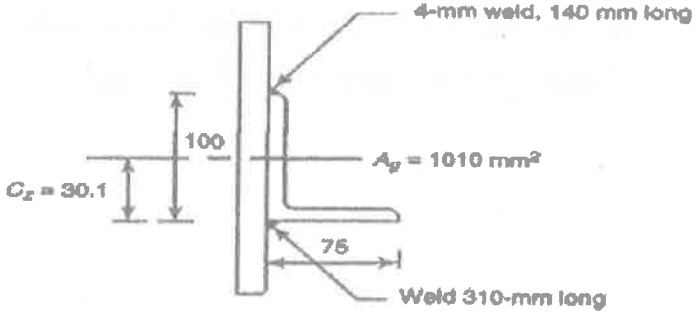

Fig. 4

(c) Select a suitable angle section to carry a factored tensile force of 290 kN assuming a single row of 20 mm diameter bolts and assuming design strength as f_y = 250 N/mm². 8

(d) Design a single angle to carry 350 kN. Assume that the length of the member is 3 m and f_y = 250 N/mm². 8

Unit-IV

4. (a) What is lacing and battening in compression member. 4

(b) Calculate the design compressive load which the member shown in Fig. 5 can support, if the member is of 5·5 m effective length. Use steel of grade Fe 410. 8

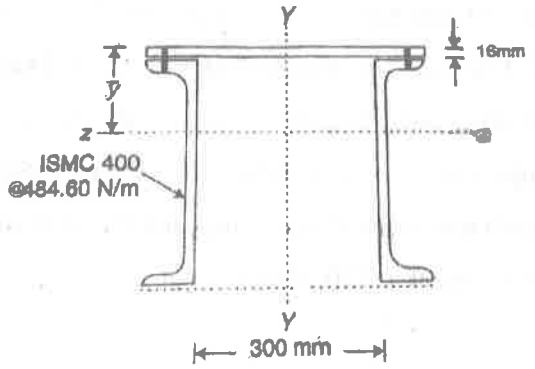

Fig. 5

(c) Design a column to support a factored axial load of 1900 kN. The column has an effective length of 6·0 m with respect to z axis and 4 m with respect to y axis. Use steel of grade Fe 410. 8

(d) Design a base plate for an ISMB 500 column to carry factored load of 1500 kN. Assume Fe 410 grade steel and M25 concrete. 8

Unit-V

5. (a) Define Flexural member. 4

(b) Discuss the design procedure of laterally unsupported beam. 8

(c) Steel beams having a clear span of 9 m are resting on 150 mm wide end bearings. The beams spacing is 3 m and the beams carry a dead load of 5 N/mm^2, including the weight of the section. The imposed load on the beam is 15 kN/m^2. The beam depth is restricted to 575 mm and the yield strength of the steel is 250 N/mm^2. 8

(d) A simply supported steel joist of 4·0 m effective span is laterally supported. It carries a total uniformly distributed load of 40 kN (inclusive of self weight). Design an appropriate section using steel of grade Fe 410. 8