

.....B.E.(Civil Engineering) 4th Year 1st Semester Supplementary..... EXAMINATION, 2024

SUBJECT Design of Structures - II

PAPER

Full Marks 100
(50 marks for each part)

Time: Three hours

Use a separate Answer-Script for each part

| No. of Questions | PART I | Marks |
|------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------|
| | <p>[Use of I.S. 800 and SP-6(1) are allowed in the examination hall.] (Consider 'yield stress' of steel = 250MPa)</p> <p style="text-align: center;"><u>Answer any TWO questions</u></p> <p>1. A steel floor beam is simply supported over a span of 5.4m. It is subjected to uniformly distributed load of intensity 40kN/m (D.L.+L.L.) acting over the entire span of the beam. Design a rolled steel ISMB-section for this beam if the compression flange of the beam is laterally unrestrained /laterally unsupported along its length. Show all checks. Assume any reasonable data, if required.</p> <p>2. Design a rolled steel ISMC section, under 'dead load, live load and wind load (suction)' combination, for a purlin member in an industrial shed having the following data: a) Angle of truss = 18°; b) Spacing of truss = 4.2 m c/c; c) Span of truss = 20.0 m; d) Spacing of purlins = 1.6 m c/c; e) Net intensity of wind pressure = 1.8 kN/m²; f) Weight of galvanized sheet = 150 N/m², g) Intensity of live load = 0.45 kN/m². Also check whether the section is safe under 'dead load, live load and wind load (thrust)' combination. Assume any reasonable data, if required.</p> <p>3. a) An ISMB 450 @72.4kg/m has been used as a column of effective length 5.5m. Calculate the load carrying capacity (P_d) of the column. b) Design a suitable 'bolted gusseted base plate' for the above mentioned column if it subjected to maximum axial load as calculated above. The base plate is to rest on a concrete pedestal having the safe bearing capacity of 9.0MPa. Assume any reasonable data, if required. Draw a neat sketch to show the details of the column with base-plate. Use 24mm diameter bolts of grade 4.6 having $A_{nb} = 353\text{mm}^2$.</p> <p style="text-align: center;">=== E N D ===</p> | <p>25</p> <p>25</p> <p>25</p> |

[Turn over

Ref. No.: Ex/CE/5/T/404/2024(S)

BACHELOR OF ENGINEERING (CIVIL ENGINEERING) FOURTH YEAR FIRST SEMESTER SUPPLEMENTARY EXAM 2024

Subject: DESIGN OF STRUCTURES-II

Full Marks:100

Time: 3hours

(Use Separate Answer scripts for each Part)

Part- II (Marks 50)

(IS 875 Part III:2015, IS 800:2007, Steel table or SP 6 are allowed in the examination hall)

(Answer any two questions)

1. Determine the nodal wind load on the roof truss of a factory shed of following information. **25**
 - a. Truss spacing-----4.0m
 - b. Span of truss-----27m
 - c. Pitch of truss-----0.25
 - d. Number of truss-----9
 - e. Eaves height-----10.8m
 - f. Node to node distance at rafter level-----1.26m
 - g. Location---Kolkata

2.
 - a) Design a single angle discontinuous strut to carry a factored compressive load of 180 kN. The length of the member is 3.0m between the intersections. Assume Fe 410 steel with $f_y=250\text{MPa}$. **12**

 - b) A single equal angle **ISA 80×80×8** is connected to a 10mm gusset plate at the end with 4nos 20mm bolts to transfer tensile force. Determine the design tensile strength on the angle. **13**

3.
 - a) A tie member of truss consist an angle section **ISA 100×100×8** of Fe 410 grade is welded to 10mm gusset plate. Design the weld to transmit a factored load of 350 kN. Assume shop weld. **8**

b) Determine the number of bolts for the joint shown in Fig.1

17

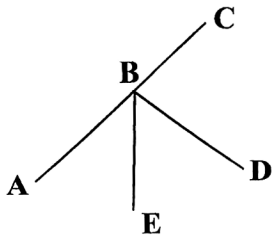


Fig. 1

| Member | Maximum Force in kN | Section Provided |
|--------|---------------------|------------------|
| AB | 140 Compressive | 2no-ISA 60×60×6 |
| BC | 113 Compressive | 2no-ISA 60×60×6 |
| BD | 98 Tensile | 1no-ISA 80×80×8 |
| BE | 76 Compressive | 1no-ISA 80×80×8 |

Use M20, 4.6 grade of bolt. Assume thickness of gusset as 10mm.