

.....B.C.E.[Evening] 4th Year 1st Semester..... EXAMINATION, 2018SUBJECT *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 Fe410 steel i.e. 'yield stress' of steel = 250MPa)</p> <p style="text-align: center;"><u>Answer any TWO questions</u></p> | |
| 1. | <p>A steel floor beam is simply supported over a span of 4.0m. It is subjected to one concentrated load of magnitude 150kN (D.L.+L.L.) acting at mid-span of the beam. Design a rolled steel I-section (ISMB section) for this beam if the compression flange of the beam is laterally unrestrained / laterally unsupported along its length. Consider stiff bearing length as 150mm. Show all checks. Assume any reasonable data, if required.</p> | 25 |
| 2. | <p>Design a rolled steel channel section (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 = 20.0°; b) Spacing of truss = 4.0 m c/c; c) Span of truss = 15.0 m; d) Spacing of purlins = 1.4 m c/c; e) Net intensity of wind pressure = 1.6 kN/m²; f) Weight of galvanized sheet = 150 N/m², g) Intensity of live load = 0.7 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> | 25 |
| 3. | <p>A column made of ISMB 550 @103.7kg/m is fixed at both the ends. Its effective length is 5.0m. It is subjected to factored axial compressive load of 1200kN and a factored moment of 110kNm about its major axis at both the ends. Check whether the column section is safe or not.</p> | 25 |
| 4. | <p>a) An ISMB 500 @ 86.9 kg/m has been used as a column of effective length 3.5m. Calculate the load carrying capacity (P_d) of the column. b) Design a suitable 'bolted / welded 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 $A_{nb} = 353\text{mm}^2$ for bolted connection and 'shop weld' for welded connection.</p> | 25 |

.....**B. Civil Engineering (Part Time) 4th Year...** EXAMINATION, 2018
(1st / 2nd Semester / Repeat / Supplementary / Annual / Bi-Annual)

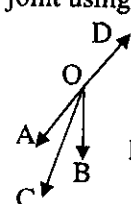
SUBJECT**Design of Structures -II**
(Name in full)

PAPER**XX**.....

Full Marks 100
(50 marks for part II)

Time: ~~Two hours~~/Three hours/~~Four hours~~/Six hours

Use a separate Answer-Script for each part

| No. of Questions | PART II | Marks | | | | | | | | | | | | | | | |
|----------------------------------|--|------------------|------------------|------------------|--------------|--------------|----------------------------------|----------|----------|---------|---------|------------------|------------------|------------------|------------------|------------------|----|
| | <p>Assume reasonable data if not given, IS 800, IS875, Section Hand Book are allowed in the examination hall</p> | | | | | | | | | | | | | | | | |
| | <p>Answer any two questions</p> | | | | | | | | | | | | | | | | |
| 1) | <p>a) A single angle (100×100×8) is connected to the gusset plate at the ends with 6 nos 16φ bolts to transfer tensile force. Determine the design tensile strength of the angle assuming $f_y=250MPa$ and $f_u=410MPa$. Use Limit State Method of design.</p> | 17 | | | | | | | | | | | | | | | |
| 2.) | <p>b) A tie member of truss consisting an angle section ISA 65×65×8 of Fe410 grade is welded to 8mm gusset plate. Design a weld to transmit a factored load of 175kN. Assume shop weld.</p> | 8 | | | | | | | | | | | | | | | |
| 2.a) | <p>Design a double angle discontinuous strut to carry a factored load of 275kN. The length of the strut is 3.5m between the intersections. The two angles are placed back to back and are tack bolted. Use Limit State Method of design.</p> | 10 | | | | | | | | | | | | | | | |
| b) | <p>The member forces in a joint (Fig. 1) of a roof truss is given in the table below. Design the joint using M16 bolt of class 4.6. The thickness of gusset is 8mm.</p> <div style="text-align: center;">  <p>Fig. 1</p> </div> <table border="1" data-bbox="406 1489 1429 1780" style="width: 100%; border-collapse: collapse; text-align: center;"> <thead> <tr> <th>Member</th> <th>OA(Rafter)</th> <th>OD(Rafter)</th> <th>OC(Inclined)</th> <th>OB(Vertical)</th> </tr> </thead> <tbody> <tr> <td>Force from DL and LL combination</td> <td>185kN(C)</td> <td>171kN(C)</td> <td>18kN(T)</td> <td>15kN(C)</td> </tr> <tr> <td>Section provided</td> <td>2 nos 65×65×6</td> <td>2 nos 65×65×6</td> <td>1 nos 60×60×6</td> <td>1 nos 60×60×6</td> </tr> </tbody> </table> | Member | OA(Rafter) | OD(Rafter) | OC(Inclined) | OB(Vertical) | Force from DL and LL combination | 185kN(C) | 171kN(C) | 18kN(T) | 15kN(C) | Section provided | 2 nos 65×65×6 | 2 nos 65×65×6 | 1 nos 60×60×6 | 1 nos 60×60×6 | 15 |
| Member | OA(Rafter) | OD(Rafter) | OC(Inclined) | OB(Vertical) | | | | | | | | | | | | | |
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| Section provided | 2 nos 65×65×6 | 2 nos 65×65×6 | 1 nos 60×60×6 | 1 nos 60×60×6 | | | | | | | | | | | | | |

2018

Marks 100
part II)

Marks

| | | |
|------|---|----|
| 3.a) | Design a bolted torsion-shear bracketed connection to carry a factored vertical load of 250kN. The load is acting at a distance 425mm from the centre of the column. The cross section of the column is <u>ISMB450@72.4kg/m</u> . | 17 |
| b) | Calculate design wind pressure, external and internal pressure coefficients as per IS:875, part-3 on the wall of the factory shed with the following dimensions: i) Location---Delhi ii) Length ---48m iii) Span of truss/width of building--16m iv) Height of eaves from GL---12m v) Pitch ---1/4 | 8 |

17

8

10

5