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## GIET MAIN CAMPUS AUTONOMOUS GUNUPUR – 765022

B. Tech Degree Examinations, June – 2021

(Sixth Semester)

**BCEPC6010 – Design of Steel Structure**

(Civil Engineering)

Time: 2 hrs

Maximum: 50 Marks

**Answer ALL Questions****The figures in the right hand margin indicate marks.****IS 800 – 2007, IS 808 and Steel Tables are permitted to use in the Examination****Missing data may be suitably assumed and indicated****PART – A: (Multiple Choice Questions)****(1 x 10 = 10 Marks)**

- Q.1. Answer ALL questions** [CO#] [PO#]
- a. Which of the following is a disadvantage of Steel? CO1 PO1
- (i) High strength per unit mass (ii) High durability
- (iii) Fire and corrosion resistance (iv) Reusable
- b. Which of the following format is used in limit state method? CO1 PO1
- (i) Single safety factor (ii) Multiple safety factor
- (iii) Load factor (iv) Wind factor
- c. What is the yield strength of bolt of class 4.6? CO2 PO2
- (i) 400 N/mm<sup>2</sup> (ii) 240 N/mm<sup>2</sup>
- (iii) 250 N/mm<sup>2</sup> (iv) 500 N/mm<sup>2</sup>
- d. Pin connections are provided when \_\_\_\_\_ required CO2 PO1
- (i) hinge joint (ii) fixed joint
- (iii) irrotational joint (iv) Rigid joint
- e. What is beam? CO3 PO1
- (i) structural member subjected to transverse loads (ii) structural member subjected to axial loads only
- (iii) structural member subjected to seismic loads only (iv) structural member subjected to transverse loads only
- f. What is slenderness ratio of a tension member? CO2 PO2
- (i) ratio of its least radius of gyration to its unsupported length (ii) ratio of its unsupported length to its least radius of gyration
- (iii) ratio of its maximum radius of gyration to its unsupported length (iv) ratio of its unsupported length to its maximum radius of gyration
- g. Effective length of compression member is \_\_\_\_\_ CO3 PO2
- (i) distance between ends of members (ii) distance between end point and midpoint of member
- (iii) distance between points of contraflexure (iv) distance between end point and centroid of member
- h. What are residual stresses? CO4 PO2
- (i) stresses developed during construction (ii) stresses developed due to seismic load
- (iii) stresses developed due to vibration (iv) stresses developed during manufacturing
- i. What is lateral torsional buckling? CO5 PO1
- (i) buckling of beam loaded in plane of its weak axis and buckling about its stronger axis (ii) buckling of beam loaded in plane of its strong axis and buckling about its weaker axis

- |       |  |      |  |         |
|-------|--|------|--|---------|
|       | accompanied by twisting  |      | accompanied by twisting  |         |
| (iii) | buckling of beam loaded in plane of its strong axis and buckling about its weaker axis and not accompanied by twisting | (iv) | buckling of beam loaded in plane of its weak axis and buckling about its stronger axis and not accompanied by twisting |         |
| j.    | Provision of intermediate lateral supports _____   |      | lateral stability of beam  | CO5 PO2 |
| (i)   | increases  | (ii) | decreases  |         |
| (iii) | does not change  | (iv) | cannot say   |         |

**PART – B: (Short Answer Questions)**

**(2 x 5 = 10 Marks)**

Q.2. Answer ALL questions

- |   | [CO#] | [PO#] |
|---|-------|-------|
| a. How the design of structure mostly depends on?                     | CO1   | PO1   |
| b. What are the rules for joining?                                    | CO2   | PO1   |
| c. Define connection and joint.                                       | CO3   | PO2   |
| d. What are the factors that affect the efficiency of tension member? | CO4   | PO2   |
| e. How the beam failure occurs?                                       | CO5   | PO1   |

**PART – C: (Long Answer Questions)**

**(6 x 5 = 30 Marks)**

Answer ANY FIVE questions

- |  | Marks | [CO#] | [PO#] |
|--|-------|-------|-------|
| 3. Draw the stress – strain diagram and discuss on salient points  | (6)   | CO1   | PO1   |
| 4. How will you fix the selection of steel as a building material?   | (6)   | CO1   | PO1   |
| 5. Determine the bolt value of 20 mm diameter bolt connection 10 mm plate in (i) Single shear and (ii) double shear. Bolts used are 4.5 grade, Fe410 grade. Take area of bolt as 245 mm <sup>2</sup>   | (6)   | CO2   | PO4   |
| 6. Design a suitable long fillet weld to connect two plates as a lap joint of pull equal to full strength of the small plate. Given plate thickness of 12 mm thick. Grade of plates Fe410 and welding to be made in the workshop. First plate is of width 160 mm and second plate is of width 200 mm respectively. | (6)   | CO2   | PO4   |
| 7. Design a plate/flat tension member to take a tensile force of 100 kN working load and imposed load. Using IS 2062 material for which $f_y = 250$ MPa. Check for yield strength and rupture of net section.  | (6)   | CO3   | PO4   |
| 8. Determine the design load carrying capacity of a single angle discontinuous ISA 50 x 50 x 5 mm which is used as compression member in a roof truss if it is connected to a gusset by tow bolts. The centre-to-centre distance between the end connection is 1.5 m the grade of steel is E 250.                  | (6)   | CO3   | PO4   |
| 9. Design an I section purlin of the span of 4m subjected to an udl of 1.5 kN/m in the plane of the minor axis and 0.5 kN/m in the plane of the major axis under service condition. Assume that the purlin is continuous over supports and no lateral buckling occurs. The grade of steel is E250.                 | (6)   | CO4   | PO4   |
| 10. The effective span of a beam is 8.3 m. The beam is subjected to a factored load of 25.95 kN/m Determine the design shear force. The available section is ISMB 400. Check for web crippling if stiff bearing is over a length $b_1 = 75$ mm.  | (6)   | CO4   | PO4   |

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