**P.E.S. COLLEGE OF ENGINEERING**

**(AN AUTONOMOUS INSTITUTE)**

**CHH. SAMBHAJINAGAR-431002**

**Regular Winter Examination – 2025**

**Course: F.Y.M.Tech. Branch :Structural Engineering Semester : I**
**Subject Code & Name: MTPESSE103T –ADVANCED DESGIN OF STEEL STRUCTURES**

**Max Marks: 60 Date: Duration: 3 Hr.**

***Instructions to the Students:***

1. *All the questions are compulsory.*
2. *The level of question/expected answer as per OBE or the Course Outcome (CO) on which the question is based is mentioned in ( ) in front of the question.*
3. *Use of non-programmable scientific calculators is allowed.*
4. *Assume suitable data wherever necessary and mention it clearly.*
5. *Use of IS800:200, IS875-1987 is allowed.*

| | | (Level/CO) | Marks |
|---|---|---|---|
| **Q. 1** | **Solve Any one of the following.** | | |
| **A)** | Determine the strength and efficiency of joint connecting 2 plates 18mm thick by using double bolted double cover butt joint<br>**Solution:- Marking Scheme** | K3/CO1 | **12** |
| **B)** | Design welded connection for ISF 75 X 10 connected to 12mm thick gusset plate. Weld is provided along all 3 sides of the joint.<br>**Solution:- Marking Scheme** | K3/CO1 | **12** |
| | | | |
| **Q.2** | **Solve Any one of the following.** | | |
| **A)** | Design a bolted bracket connection of ISNT 100 connected to flange of ISMB 300 by using 20 mm diameter bolt of grade 4.6. The end reaction due to beam is 100 KN acting at distance 80 mm from the face of the column.<br>**Solution:- Marking Scheme** | K3/CO2 | **12** |

| **Content** | **Marks Distribution** |
|---|---|
| Shearing strength of bolt | 3 |
| Bearing Strength of bolt | 3 |
| Tensile strength of plate | 3 |
| Strength of joint | 1 |
| Efficiency | 2 |

| **Content** | **Marks Distribution** |
|---|---|
| Size of weld | 3 |
| Throat thickness | 3 |
| Full strength of member | 3 |
| Length of weld | 2 |
| Diagram | 1 |

| **Content** | **Marks Distribution** |
|---|---|
| Design strength of bolt | 3 |
| No. of bolts required | 2 |
| Check on force on bolt due to direct shear | 2 |
| Check on force on bolt due to | 4 |

| | | | | |
|---|---|---|---|---|
| | bending | | | |
| | Check for combined shear and bending | 1 | | |
| **B)** | A bracket plate is welded to the flange of column section ISHB 300 @ 618 N/m as shown in figure. Calculate the maximum load that can be placed over the bracket plates at a distance of 80mm from the phase of column. Take size of weld = 6mm.<br>**Solution:- Marking Scheme**<br>**Content** / **Marks Distribution**<br>Permissible stress in weld: 2<br>Resultant stress on weld: 5<br>Polar Moment of Inertia: 5 | | K3/CO2 | **12** |
| | | | | |
| **Q. 3** | **Solve Any one of the following.** | | | |
| **A)** | Determine live load per panel point for a pratt truss of span 15m with sloping angle $22^0$. Take weight of AC sheet roof covering = 175 $N/m^2$.<br>**Solution:- Marking Scheme**<br>**Content** / **Marks Distribution**<br>Live load intensity for purlin: 3<br>Live load intensity for truss: 2<br>total Live load on truss: 2<br>Intermediate panel point Live load: 2<br>End panel live load: 2<br>Diagram: 1 | | K3/CO3 | **12** |
| **B)** | Determine dead load per panel point for room of an industrial shed of size 16 m X 32 m is to be supported by truss and 4m center to center AC sheets to be provided (Roofing).<br>**Solution:- Marking Scheme**<br>**Content** / **Marks Distribution**<br>Dead load intensities: 2<br>Weight of roof covering: 2<br>Weight of purlin: 2<br>Weight of bracing: 2<br>Self weight of truss: 2<br>Intermediate panel point dead load: 1<br>End panel dead load: 1 | | K3/CO3 | **12** |
| | | | | |
| **Q.4** | **Solve Any one of the following.** | | | |
| **A)** | Explain the components of girder in detail.<br>**Solution:- Marking Scheme**<br>**Content** / **Marks Distribution**<br>Crane girder: 2<br>Trolley / Crab: 2<br>Rail section: 2<br>Hoist: 2<br>Wheel base: 2<br>Gantry girder and Stops: 2 | | K2/CO4 | **12** |
| **B)** | Explain the loads coming on girder in detail.<br>**Solution:- Marking Scheme** | | K2/CO4 | **12** |

| | | | |
|---|---|---|---|
| | **Content** / **Marks Distribution**<br>Vertical load — 3<br>Lateral load — 2<br>Longitudinal load — 2<br>Impact load — 5 | | |
| | | | |
| **Q. 5** | **Solve Any one of the following.** | | |
| **A)** | Explain the concept of plastic hinge. State and explain the fundamental conditions required for plastic analysis of structures.<br>**Solution:- Marking Scheme**<br>**Content** / **Marks Distribution**<br>Plastic hinge definition and formation — 4<br>Moment–rotation characteristics — 3<br>Fundamental conditions of plastic analysis — 3<br>Importance in collapse mechanism — 2 | K2/CO4 | **12** |
| **B)** | Explain various methods of plastic analysis used to determine collapse load of structures.<br>**Solution:- Marking Scheme**<br>**Content** / **Marks Distribution**<br>Static (equilibrium) method — 3<br>Kinematic (mechanism) method — 4<br>Combined method — 3<br>Comparison and applicability — 2 | K2/CO4 | **12** |
| | ***** End ***** | | |