

GUJARAT TECHNOLOGICAL UNIVERSITY**BE – SEMESTER V • EXAMINATION – WINTER - 2012****Subject code: 150605****Date: 22-01-2013****Subject Name: Structural Analysis-III****Time: 02:30 pm to 05:00 pm****Total Marks: 70****Instructions:**

1. Attempt all questions.
2. Make suitable assumptions wherever necessary.
3. Figures to the right indicate full marks.

- Q.1** (a) (i) Differentiate between flexibility method and stiffness method of analysis. **04**
 (ii) Write assumptions made in plastic analysis. **03**
 (b) Derive an expression for stresses in spherical dome subjected to concentrated load at crown. **07**

- Q.2** (a) A beam semicircular in plan with both the ends fixed has radius of 5 m. It is loaded with a concentrated load of 40kN at the mid-point of the semicircle. Draw the twisting moment, bending moment and shear force diagrams. **07**
 Take $GJ = 0.8EI$.
 (b) A beam circular in plan has radius of 5 m and is supported on 6 columns spaced equally along the circumference. It is loaded by a U.D.L. of 20 kN/m. Calculate twisting moment and bending moment at support and mid-span. **07**

OR

- (b) Formulate the flexibility matrix $[F]$ and $\{D_{QL}\}$ for the structure shown in the **Figure 1**. **07**
- Q.3** (a) Formulate the stiffness matrix $[S]$ and load vector $\{A_D - A_{DL}\}$ for the structure shown in the **Figure 1**. **07**
 (b) Calculate the joint displacements using stiffness method for the above problem Q.3 (a) and draw the shear force diagram and bending moment diagram. **07**

OR

- Q.3** (a) Analyze the plane truss shown in **Figure 2** by flexibility matrix method. Take $EA = \text{constant}$ for all members. **07**
 (b) A beam quarter circular in plan with both the end fixed has radius of 5 m. The beam is carries a U.D.L. of 30 kN/m. Draw the twisting moment, bending moment and shear force diagrams. Take $GJ = 0.8EI$. **07**

- Q.4** (a) A spherical dome of 100 mm thickness, base diameter of 14 m and central rise of 3.5 m supports total uniformly distributed load of 4.0 kN/m² over the surface inclusive of self weight. Determine the meridional and hoop stress at ring beam level. **07**
 (b) A conical dome of 100 mm thickness and 3.5 m rise is to be used to cover a hall of 20 m diameter. The live load of 2.0 kN/m² is acting over the dome surface. Calculate meridional stress and hoop stress at the base of dome. Density of the concrete is 25 kN/m³. **07**

OR

- Q.4** (a) A spherical dome of 100 mm thickness, base diameter of 14 m and central **07**

rise of 3.5 m is subjected to a lantern load of 5 kN at the crown. Determine the meridional and hoop stress at ring beam level. Assume density of the concrete is 25 kN/m^3 .

- Q.4 (b)** A fixed beam of 5 m span carries a U.D.L. of 100 kN/m over 3 m length from left side support. Determine the plastic moment for the beam and plastic section modulus required. Take $f_y = 250 \text{ MPa}$. **07**

- Q.5 (a)** Determine the shape factor and plastic moment capacity of the I - section, shown in **Figure 3**. Take $f_y = 250 \text{ MPa}$. **07**

- (b)** Calculate the collapse load in terms of M_p for the fixed beam shown in **Figure 4**. **07**

OR

- Q.5 (a)** Determine the collapse load for the continuous beam loaded as shown in **Figure 5**. **07**

- (b)** A beam semicircular in plan with both the ends fixed has radius of 5 m. It is loaded with a U.D.L. of 20 kN/m . Draw the twisting moment, bending moment and shear force diagrams. Take $GJ = 0.8EI$. **07**

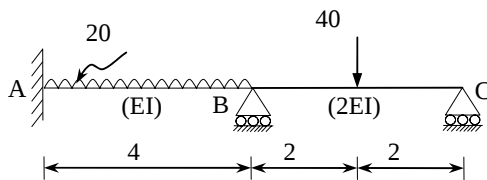


Figure 1 [OR Q-2(b), Q-3(a)]

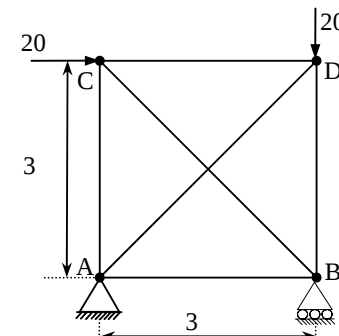


Figure 2 [OR Q-3(a)]

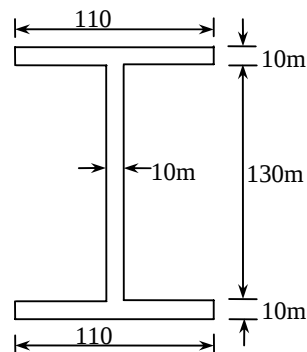


Figure 3 [Q-5(a)]

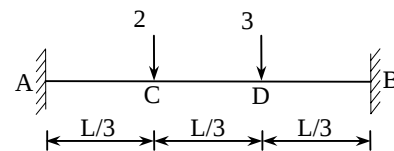


Figure 4 [Q-5(b)]

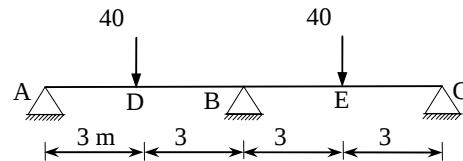


Figure 5 [OR Q-5(a)]