Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY BE - SEMESTER-V EXAMINATION – WINTER 2015

Subject Code: 2150610 Subject Name: Advanced Structural Analysis Time: 10:30am to 1:00pm

Instructions:

- 1. Attempt all questions.
- 2. Make suitable assumptions wherever necessary and mention it clearly.
- 3. Figures to the right indicate full marks.
- 4. Draw neat and clean figures wherever required.
- Q.1 (a) Differentiate between flexibility method and stiffness method of 07 analysis.
 - (b) Give the characteristics of flexibility and stiffness matrix. 07
- Q.2 (a) Derive the equation of meriditional stress and hoop stress for a 07 conical dome subjected to uniformly distributed load.
 - (b) A spherical dome of 110 mm thickness, base diameter of 15 m and 07 central rise of 4.0 m supports total uniformly distributed load of 5.0 kN/m² over the surface inclusive of self weight. Determine the meridional and hoop stress at ring beam level.

OR

- (b) Formulate the flexibility matrix [F] and $\{D_{QL}\}$ for the structure **07** shown in the **Figure 1**.
- Q.3 (a) Derive the equation of meriditional stress and hoop stress for a 07 conical dome subjected to point loads W at vertex.
 - (b) Determine the shape factor and plastic moment capacity of the I 07 section, shown in Figure 2. Take fy = 250 MPa.

OR

- Q.3 (a) A conical dome of 5 m diameter and central rise of 3.5 m supports 07 total uniformly distributed load of 10 kN/m² including self weight over the entire surface. The thickness of dome is 110 mm. Calculate meridional stress and hoop stress at the base of the dome.
 - (b) A spherical dome having 10 m span and 3 m rise, subjected to udl of **07** 15 kN/m² including self weight. The thickness of the dome is 110 mm. Calculate meridional and hoop stresses at each $\theta = 10^{\circ}$ interval from crown to base of the dome.
- Q.4 (a) Determine the shape factor for circular section of diameter D. 07
 - (b) Determine the collapse load for the continuous beam loaded as 07 shown in Figure 3.

OR

- Q.4 Analyse the beam shown in Figure 1 using stiffness method. Draw 14 SF and BM diagram
- Q.5 Analyse the beam shown in **Figure 3** using flexibility method. Draw 14 SF and BM diagram

OR

Q.5 (a) Explain term "Plastic hinge". State (i) Upper bound theorem and (ii) 07 Lower bound theorems for collapse load in plastic analysis.

Total Marks: 70

(b) Define term "collapse load". Determine collapse load in terms of $07 M_p$, for the beam fixed at both ends and subjected to udl 'w' kN/m throughout its length 'L' m.







Figure 3