

GUJARAT TECHNOLOGICAL UNIVERSITY**BE - SEMESTER-VIII (OLD) EXAMINATION – SUMMER 2019****Subject Code: 180604****Date: 20/05/2019****Subject Name: Structural Design-II****Time: 10:30 AM TO 01:30 PM****Total Marks: 70****Instructions:**

1. Attempt all questions.
2. Make suitable assumptions wherever necessary.
3. Figures to the right indicate full marks.
4. Use of IS:456, IS:800, IS:875, IS:1893, SP:16 and Steel Table is permitted.
5. For RCC, wherever not mention use M20 grade of concrete and Fe 415 steel.
6. For STEEL, wherever not mention use Fe 410 grade.

- Q.1** (a) Explain with sketches, basic structural configurations of steel towers. **07**
(b) Estimate design wind load for a multi storey building of plan area 25 m X 30 m situated in Chennai for the given data. Bay width in both direction = 5 m , Height of building = 30 m with uniform storey height, Terrain Category= III , Topography = plane with upwind slope less than 3°, Life of building = 100 years. **07**
- Q.2** (a) A Cantilever Retaining Wall is used to retain the earth 4 m high. The wall retains soil having unit weight (density) of 17 kN/m³ up to its top. Angle of internal friction is 30°. The material under the wall base having soil bearing capacity = 150 kN/m². Co-efficient of friction between base and soil = 0.55. **07**
(1) Work out Preliminary Dimensions of wall.
(2) Do Stability Calculation with check.
- (b) Do Structural Design of Stem for cantilever retaining wall of Q-2 (a). Also sketch reinforcement detail for stem as per design. **07**
- OR**
- (b) Do Structural Design of Heel for cantilever retaining wall of Q-2 (a). Also sketch reinforcement detail for Heel as per design. **07**
- Q.3** (a) Prepare a typical structural layout for G+3 building having 4 bays of 5 m in x-direction and 5 bays of 4 m in y-direction. Also plot load distributions diagram for typical floor any interior continuous beam. Take thickness of slab = 120 mm, Floor finish = 0.5 kN/m², Live load = 4 kN/m², Thickness of interior wall = 115 mm, Height of wall = 3 m, size of beam = 230mm x 450 mm **07**
- (b) Design a two way slab with one short edge discontinuous for prepared structural layout of Q-3 (a). Take Floor finish = 0.5 kN/m², Live load = 4 kN/m², width of support = 230 mm. **07**
- OR**
- Q.3** Find dimensions for overhead circular water tank of capacity 4.5 lacs litre with flat bottom and supported on ring beam. Design (a) top spherical dome (b) top ring beam (c) Cylindrical wall. Use M25 and Fe 415. **14**
- Q.4** Design a welded plate girder 25m in span and laterally restrained throughout. It has to support a uniform load of 80 kN/m throughout the span exclusive of self-weight. Design the plate girder without intermediate transverse stiffeners. Design the cross section and the end load bearing stiffener with necessary checks. Do not design connections. **14**
- OR**
- Q.4** Design a gantry girder is carrying an electric overhead crane to the following data : Capacity of crane = 200 kN, Self weight of crab (trolley) = 40 kN, self weight of crane = 200 kN, minimum approach of crane hook = 1.2 m, wheel base = 3.5 **14**

m, distance between c/c of gentry = 15 m, span of gantry girder = 7.5 m, weight of rail section = 300 N/m. Take yield stress of steel = 250 MPa. Assume no lateral restraints along the span.

- Q.5 (a)** A N-type lattice girder used as foot over bridge has span of 24 m and width 4 m. Consider live load = 5 kN/m², Floor finish = 0.75 kN/m² and flooring = RCC slab 110 mm thick, $f_y = 250 \text{ N/mm}^2$. Design a cross beam. Also design a bottom chord member in which maximum force developed. **14**

OR

- Q.5 (a)** Determine dead load, live load and wind load per panel point for the roof truss of a workshop shed constructed at Ahmedabad for the following requirements. Span of truss = 15 m, spacing of truss = 4 m c/c, rise of truss = 3 m, Height of truss above G.L. = 20 m, dead load of A.C.C. roofing sheet = 150 N/m², weight of purlin and other fixtures = 120 N/m² Total no. of panel = 8, opening of wall area = 10%, life period of truss = 25 years, terrain category = 3, structures = class A, topography = plain horizontal ground and upwind slope less than 3°. **14**

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