Enrolment No./Seat No_____

GUJARAT TECHNOLOGICAL UNIVERSITY

BE - SEMESTER–VII EXAMINATION – SUMMER 2025

Subject Code:3170626 Date:08-05-2025

Subject Name:Design of Industrial Structures

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.**
4. **Simple and non-programmable scientific calculators are allowed.**
5. **Permit use of IS 456: 2000, IS 13920: 2016, IS 800:2007, IS 4995 Part1, 2, SP-16, Steel Table, IS 875 Part3 2015**

Q.1	**(a)**	Enlist the different types of communication towers based on their structural action.	**03**
	(b)	Discuss structural usefulness of Steel towers.	**04**
	(c)	Briefly explain the procedure adopted in the design of chimneys and draw typical cross section showing details of reinforcements (Vertical and horizontal).	**07**
Q.2	**(a)**	Differentiate between bunker and silo.	**03**
	(b)	Explain various types of loads acting on the transmission line towers. Under What circumstances torsional load occur on them?	**04**
	(c)	Design a circular bunker to store 20 tonnes of coal. Density of coal is 9 kN/m^3 and angle of repose is 30 degree. Use limit state method of design and adopt grades M20 and Fe 415. Show reinforcement detailing with neat sketch.	**07**
		OR	
	(c)	How the total height of a transmission line tower is calculated? Explain in brief the factors governing the height of transmission line tower.	**07**
Q.3	**(a)**	Discuss importance of bracing in industrial structures.	**04**
	(b)	An industrial building of size 15 m x 44 m is situated in Ahmedabad. It is on the ground having terrain category 3 and class A. Spacing between two trusses is 5 m c/c. Rise of truss is 3.5 m. Consider 12% wall openings. The truss has total 10 segments. Roofing material is Corrugated GI Sheets with weight 120 N/m^2. Height of eaves above ground level is 15 m. Assuming required suitable data (if necessary) carryout the following. Fix the configuration of the truss and Calculate Dead Load, Live Load & Wind Load per panel point	**10**
		OR	
Q.3	**(a)**	Design a chimney of height 100 m and check the stresses at base in bars. Data given: a) External diameter at top = 1.7 m b) External diameter at base = 6.0 m c) Shell thickness at top = 210 mm d) Shell thickness at base = 500 mm e) Wind Intensity=1.8 kN/m^2 throughout f) Thickness of fire brick lining = 100 mm g) Air Gap=100 mm h) Temperature difference = 70 °C i) Coefficient of thermal expansion = 11 x 10^{-6} / °C	**14**

j) Es=210 x 10^3 N/mm^2
k) Density of brick lining = 20 kN/m^3
l) M35 grade of concrete and Fe 415 grade steel

Q.4 **(a)** Design a simply supported gantry girder to be used in an Industrial building for the following data: **14**
Crane Capacity = 160 kN
Weight of crab = 50 kN
Weight of crane (excluding crab) = 170 kN
Minimum clearance between crane hook and gantry girder = 1.5 m
Wheel base = 3.2 m
Distance between C/C of gantries = 22 m
Distance between centre to centre of gantry columns = 6 m Crane type = M.O.T.
Assume suitable data if neccesory.

OR

Q.4 **(a)** Briefly explain the approximate analysis of Grid Floors according to IS 456:2000 **04**

(b) A Reinforced Concrete Grid Floors is to be designed to cover a floor area of 12m X 16m for a Banquet Hall. The spacing of the ribs in mutually perpendicular directions is 2.0 m c/c. Live Load on floor is 2 kN/m^2. Adopt M20 grade concrete and Fe415 steel. Assume ends are simply supported. **10**
Analyse the Grid Floor by IS: 456:2000 Method or Rankine Grashoff Method.

Q.5 **(a)** Draw appropriate figure of square or rectangular bunker and show various structural elements. **07**

(b) Design an angle section for a continuous purlin having a segment span of 3m. It is subjected to UDL of 4 kN/m. Take angle of roof truss is 25° . **07**

OR

Q.5 **(a)** Give various loads and load combinations for design of steel structures as per codal provisions. **04**

(b) A square bunker having size 3.1m X 3.1m is to be used to store 300 kN coal. Density of coal is 9.5 kN/m^3 and angle of repose is 30^0. Considering grade of concrete and steel as M20 and Fe 415 respectively. Design and detail the following. **10**
(a) Side walls
(b) Hopper bottom

****