



K. K. Wagh Institute of Engineering Education & Research, Nashik
(An Autonomous Institute From A.Y. 2022-23)

	SUMMER-2023		
	Exam Seat No.:		
	Academic Year:2022-2023	Semester:I	
	Name of Programme:M.Tech	Pattern:2022	
	Name of Course:Elec.I Advanced Design of Steel Structures	Course Code:CIV225104a	
	Max. Marks:60	Duration:2.50	

	<p>Instructions: Candidates should read carefully the instructions printed on the Question Paper and on the cover page of the Answer Book, which is provided for their use.</p> <ol style="list-style-type: none">1. This question paper contains _____page(s).2. Answer to each new question is to be started on a new page.3. Assume suitable data wherever required, but justify it.4. Draw the neat labelled diagrams, wherever necessary.5. The last columns indicates the Course Outcome and level of Blooms Taxonomy of the Question/sub-question	
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Question No. 1 Attempt following Question

What are castellated beams? Explain with suitable sketches of different shapes. Also mention advantages and disadvantages of castellated beams (6)

Question No. 2 Attempt following Question

A 30 m high four legged square microwave antenna lattice tower is built near Nashik. The diameter of the hemispherical antenna disc, fixed at the top is 3m. The width of the tower, at the top is 3.5m. Determine the gravity load acting on all legs of the tower, for the following data: (6)

Weight of antenna disc and fixtures : 15 kN
Weight of platform at the top : 0.75 kN/m^2
Weight of railing at top: 0.45 kN/m
Weight of ladder and the cage : 0.65 kN/m
Weight of miscellaneous item: 2.5 kN.

Question No. 3 Attempt following Question

a) A steel tower is to be erected for transmission line of a single circuit three phase, 60 cycles/ sec, to transmit 65MW at 0.85 power factor for 259 km for following data-

- i. Voltage of transmission- 132 kV
- ii. Power conductor-
 - a. 40 mm diameter A.C.S.R. consisting of 54 strands of 3mm diameter of aluminium and 7 strands of 3mm diameter of steel shall be used
- b. Unit weight of conductor- 25 N/m
- c. Permissible axial tension- 35.25 kN
- d. Young's modulus of elasticity- $0.85 \times 10^5 \text{ N/mm}^2$
- e. Coefficient of thermal expansion- $0.00001992^\circ/\text{C}$
- f. Shape factor for conductor = 0.67
- iii. Variation of temp. range- 5°C to 60°C
- iv. Uniform intensity of wind = 1.50 kN/m^2
- v. Weight span of tower = Wind span = 235 m
- vi. Clearance requirement-
 - a. Vertical height of conductor above ground- 6.1 m. min
 - b. Vertical spacing between power conductors- 4.2m min.
 - c. Horizontal spacing between power conductors- 7.14m min.

Suggest the geometry of the tower (10)

OR

b) A steel tower is to be erected for transmission line of a single circuit three phase, 60 cycles/ sec, to transmit 55MW at 0.75 power factor for 269 km for following data-

- i. Voltage of transmission- 132 kV
- ii. Power conductor-
 - g. 30 mm diameter A.C.S.R. consisting of 54 strands of 3mm diameter of aluminium and 7 strands of 3mm diameter of steel shall be used
- h. Unit weight of conductor- 20 N/m
- i. Permissible axial tension- 41.25 kN
- j. Young's modulus of elasticity- $0.85 \times 10^5 \text{ N/mm}^2$
- k. Coefficient of thermal expansion- $0.00001992^\circ/\text{C}$
- l. Shape factor for conductor = 0.67
- iii. Variation of temp. range- 10°C to 50°C
- iv. Uniform intensity of wind = 2.50 kN/m^2
- v. Weight span of tower = Wind span = 250 m
- vi. Clearance requirement-
 - a. Vertical height of conductor above ground- 6.1 m. min
 - b. Vertical spacing between power conductors- 4.2m min.
 - c. Horizontal spacing between power conductors- 7.14m min.

Suggest the geometry of the tower (10)

Explain following terms along with neat and suitable sketch

- i. Normal span
 - ii. Wind span
 - iii. Weight span
 - iv. Maximum sag of the conductor
- (6)

OR

A steel tower is to be erected for transmission line of a single circuit three phase, 60 cycles/ sec, to transmit 55MW at 0.75 power factor for 269 km for following data-

- i. Voltage of transmission- 132 kV
 - ii. Power conductor-
 - a. 30 mm diameter A.C.S.R. consisting of 54 strands of 3mm diameter of aluminium and 7 strands of 3mm diameter of steel shall be used
 - b. Unit weight of conductor- 20 N/m
 - c. Permissible axial tension- 41.25 kN
 - d. Young's modulus of elasticity- $0.85 \times 10^5 \text{ N/mm}^2$
 - e. Coefficient of thermal expansion- $0.00001992^\circ/\text{C}$
 - f. Shape factor for conductor = 0.67
 - iii. Variation of temp. range- 10°C to 50°C
 - iv. Uniform intensity of wind = 2.50 kN/m^2
 - v. Weight span of tower = Wind span = 250 m
- Determine the maximum sag of the conductor at the mid span.

(6)

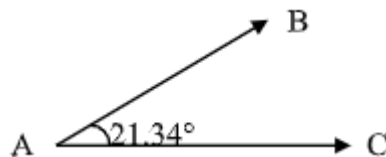
Question No. 4 Attempt following Question

Design members AB, AC and joint A of a roof truss, as shown in the fig. for the following data

Member	Length	Compressive force	Tensile force
AB	3.2m	83 kN	48 kN
AC	1.5m	59 kN	75 kN

(10)

Use tubes of grade Yst 210



OR

Two channels 200mm x 80mm with bent lips are connected back to back with webs to act as column. The thickness of plate is 4 mm and the depth of lips is 25mm. Determine the safe load carrying capacity if the effective length of column is 6m. Take $f_y = 235 \text{ N/mm}^2$

(10)

Define stiffened element, flat-width ratio and effective design width for cold formed light gauged section along with suitable sketches

(6)

OR

A hat section 100mm x 80mm x 4mm with lip 25mm is to be used as a concentrically loaded column of 3m effective length. (6)
Determine the allowable load. Take $f_y = 235 \text{ N/mm}^2$

Question No. 5 Attempt following Question

An overhead water tank of 70,000 litres capacity is to be erected. Design the flat bottom water tank of required capacity. Need not to design supporting beams. (10)

OR

An overhead water tank of 70,000 litres capacity is to be erected. Design the staging consisting of six columns. The bottom of the tank is 12m above the ground level. Take intensity of wind pressure at 1.50 kN/m^2 . Design of foundation is not required. (10)

An overhead water tank of 70,000 litres capacity is to be erected. Decide the dimensions and design column system required for staging consisting of six columns. The bottom of the tank is 12m above the ground level. Take intensity of wind pressure at 1.50 kN/m^2 . Design of foundation is not required. (6)

OR

An overhead water tank of 70,000 litres capacity is to be erected. Decide the dimensions and design column system required for staging consisting of six columns. The bottom of the tank is 12m above the ground level. Take intensity of wind pressure at 1.50 kN/m^2 . Design of foundation is not required. (6)