K. K. Wagh Institute of Engineering Education & Research, Nashik

(An Autonomous Institute From A.Y. 2022-23)

WINTER-2025	
Exam Seat No.:	
Academic Year:2025-2026	Semester:I
Class:PG-I	Program:M.Tech
Branch Code:CIV	Pattern:2024
Name of Course:Advanced Design of Steel Structures	Course Code:2404504(A)
Max. Marks:60	Duration:2.30 Hrs.

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.

1. This question paper contains three 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 of the Question/sub-question.

		Marks	**CO**
Question No. 1			
1a)	What are castellated beams? Mention advantages of castellated beams	(6)	CO1
Question No. 2			
2a)	Explain with neat sketches any six types of bracings used for microwave towers.	(6)	CO2
Question No. 3			
3a)	A steel tower is to be erected for a transmission line of a single circuit three phase, 60 cycles/ sec, to transmit 65MW at 0.85 power factor for 259 km for the following data-	(8)	CO3

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- 0.85×10^5 N/mm^2

e. Coefficient of thermal expansion- 0.00001992°/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

Determine the maximum sag of the conductor at the mid span.

OR

3b) A steel tower is to be erected for a transmission line of a single circuit three phase, 60 cycles/ sec, to transmit 55MW at 0.75 power factor for 269 km for the following data- (8) CO3

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- 0.85×10^5 N/mm^2

e. Coefficient of thermal expansion- 0.00001992°/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

3c) Explain the following terms along with a neat and suitable sketch (8) CO3

i. Normal span

ii. Wind span

iii. Weight span

iv. Maximum sag of the conductor

OR

3d) State the different loads acting on transmission line towers and state broken wire conditions assumed for single circuit tower design. (8) CO3

Question No. 4

4a) Design member AB and joint A of a roof truss, as shown in the fig. 4(a) for the following data (8) CO4

Member	Length	Compressive force	Tensile force
AB	3.5m	85 kN	48 kN

Use tubes of grade Yst 210

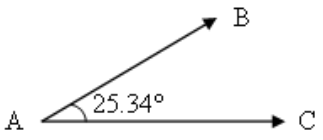

Fig. 4(a)

OR

4b) Two channels 200mm x 80mm with bent lips are connected back to back with webs to act as a column. The thickness of the plate is 4 mm and the depth of the lips is 25mm. Determine the safe (8) CO4

load-carrying capacity if the effective length of the column is 6m. Take $f_y = 235$ N/mm^2 .

4c) Define stiffened element, unstiffened element, flat-width ratio and effective design width for cold formed light gauged section along with suitable sketches. (8) CO4

OR

4d) What are the important advantages of tubular structures? (8) CO4

Question No. 5

5a) The flat bottom overhead water tank of 80,000 litres capacity is to be erected. Design dimensions of tank, bottom plates and T-covers. (8) CO5

OR

5b) Design staging for overhead water tank with the overall size of tank 7.0m x 5.6m x 2.5m and height of staging is 12m. the staging consists 6 columns with corner column c/c spacing 6.0m x 4.8m, maximum superimposed axial load on column is 250kN. The staging is converted into 3 panels of height 4m each. Consider depth of upper and lower tie beams as 0.3m and 0.5m respectively. Calculate wind pressure on staging, design column, horizontal bracing and base plate for foundation. Take intensity of wind pressure at 1.50 kN/m^2 (8) CO5

5c) Explain (8) CO5

i. Different design loads to be considered for the design of steel water tanks and supporting structures

ii. Different types of water tanks with suitable sketches.

OR

5d) Explain the codal provisions governing the use of steel in flat bottom gravity water tanks as per relevant Indian Standards (8) CO5

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