B

APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY

THIRD SEMESTER M.TECH DEGREE EXAMINATION

Civil Engineering

(Geomechanics and Structures)

04 CE 7307—Design of Cylindrical Shells and Folded Plates

Max. Marks : 60 Duration: 3 Hours

IS 456:2000 and IS 2210:1988 permitted for use.

PART A
Answer all questions
(All questions carry 3 marks)

1. Explain the stresses acting in a cylindrical shell under vertical loads.
2. What is the relevance of bending theory in the analysis of cylindrical shells?
3. Brief on the nature of stresses in various parts of a conical dome roof.
4. What are shallow and deep hypar shells?
5. Explain the structural behavior of shallow hypar shells with straight edges.
6. What is coefficient of specific distortion?
7. Derive the equation of three shears.
8. List the assumptions in the analysis of hipped plates.

(3 x 8 = 24)

PART B
(All questions carry 6 marks)

Use M25 concrete and Fe 415 steel.
Take self-weight of concrete as 24kN/m^2.

9. A circular cylindrical RC shell spanning 25m, has a radius of 8m, with the central angle being 90 degrees. Thickness of the shell is 70mm. If the weight of water-proofing and occasional live load on the shell is 1.2kN/m^2 of the surface of the shell, design the shell using membrane theory.

OR

10. A RC shell with circular directrix has the following dimensions.

Distance between the traverses = 30m
Radius of the shell = 8m
Thickness of the shell = 60mm
Semi-central angle = 60 degrees
If the water-proofing course and occasional live load is $1kN/m^2$, design the shell using membrane theory.

11. A dome for a water tank is 12.5m in span. Design the dome and the ring beam. Assume thickness of the shell as 150mm and live load on the dome as $1.5kN/m^2$.

OR

12. A circular cylindrical shell with edge beams has the following dimensions.

Span of edge beams = 25m
Radius of the shell = 8m
Chord width = 10m
Thickness of shell = 75mm
Size of the edge beam = 250mm x 1600mm
Reinforcements in the edge beam = 12 bars of 25mm diameter
Effective cover of edge beam reinforcements = 300mm
Analyse the shell for stresses in concrete and steel if the service load on the shell is $1kN/m^2$ and design suitable shear reinforcements in the shell.

13. Design a RC dome resting on a 400mm thick brick water tank, 10m in diameter. Assume the dome is 80mm thick. At the top of the dome, a circular canopy 1.6m in diameter is provided for ventilation and its total weight is assumed to be 15kN. Design the reinforcements for the main dome and the ring beams. Assume a live load on the dome = $1kN/m^2$.

OR

14. A conical dome roof is 10m in diameter, 2.5m in height and its semi-vertical angle = 65 degrees. Design the reinforcements in the shell if the shell thickness is 90mm. Assume live load on the shell to be $0.65kN/m^2$.

15. What are the two types of hypar shells based on the method of generation of the surfaces. Explain with neat figures.

OR

16. How can hypar shells be generated as ruled surfaces?

17. Design a hipped roof on 4 supports to cover an area of 24.4m x 24.4m assuming a thickness of 80mm and live load of $0.75kN/m^2$.

OR

18. A market hall measuring 20m x 30m is to be covered by an inverted umbrella type roof. Design the hypar shell roof assuming shell thickness of 100mm and live load of $0.8kN/m^2$.

19. Explain the distribution of longitudinal, transverse and shear reinforcements in hipped plates using neat figures.

OR

20. Design a folded plate with V-shaped units to cover a store house 9m wide and 30m long. Six plates, each with thickness of 120mm may be used, with the plates inclined at 45 degrees to the horizontal. The vertical and horizontal projections of the plates = 1.5m. Live load = $0.75kN/m^2$. Analyse the roof using equation of 3 shears and design the transverse reinforcements in the plate.

(6 x 6 = 36)