

Code : 011726

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B.Tech 7th Semester Exam., 2018

DESIGN OF CONCRETE STRUCTURES—II

Time : 3 hours

Full Marks : 70

Instructions :

- (i) All questions carry equal marks.
- (ii) There are **NINE** questions in this paper.
- (iii) Attempt **FIVE** questions in all.
- (iv) Question No. 1 is compulsory.

1. Choose the correct answer (any seven) :

- (a) The factors that must be considered while designing an RCC tank are
 - I. Strength
 - II. Water tightness
 - III. Overall stability

Choose the correct answer :

- (i) I and II
- (ii) II and III
- (iii) only II
- (iv) I, II and III

(b) Which of the following theory is applicable for design of silo walls?

- (i) Janssen's theory
- (ii) Rankine's theory
- (iii) Euler's theory
- (iv) Coulomb's theory

(c) The bending moment at mid-span of a square vertical bunker due to a lateral pressure per unit area is

- (i) $pl^2 / 12$
- (ii) $pl^2 / 16$
- (iii) $pl^2 / 24$
- (iv) $pl^2 / 32$

(d) A bridge or viaduct carrying a waterway over a valley or other gap is called

- (i) aqueduct
- (ii) causeway
- (iii) hydropath
- (iv) None of the above

(e) Triangulated structure is used for

- (i) wall
- (ii) bridges
- (iii) arch
- (iv) high-rise buildings

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(f) Diaphragms are adopted in concrete box girder bridges to

- transfer loads from bridge decks to bearings
- (ii) contribute to the provision of torsional restraint
- (iii) increase axial capacity of deck
- (iv) increase flexural capacity of bridge

(g) Vault is an architectural term for

- (i) cable
- (ii) bridges
- arch
- (iv) dam

(h) Reinforced concrete shells are ideally suited to cover floor spaces of up to

- (i) 15 m
- (ii) 25 m
- 30 m
- (iv) 40 m

(i) IS 1893-2002 gives details on

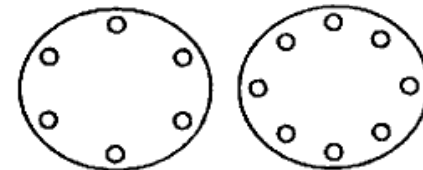
- seismic strengthening
- (ii) improving earthquake resistance
- (iii) earthquake resistance structures
- earthquake resistance design

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(i) The small circular pattern in the plan represents



- (i) hole
- (ii) beam
- column
- (iv) design

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2. Design the staging (column and braces) with the following data :

- Size of bottom ring beam—450 mm × 700 mm
- Diameter of staging—6 m
- No. of supports—4
- Staging height—16 m
- Take suitable sizes of column braces and foundation ring beam <http://www.akubihar.com>
- Weight up to bottom of bottom ring beam—1610 kN
- Depth of foundation—2.5 m
- BC of soil—80 kN/m²
- Location—Patna
- Exposed surface area of container—34.38 m², its CG lies at 2.78 m above bottom of bottom ring beam
- CG of filled container—2.73 m above bottom of bottom ring beam
- Use M-25 concrete and TMT Fe-500 bars

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3. Design the raft foundation and beam supporting raft with the following details :

Load at column base—4730 kN

Diameter of staging—6.6 m

BC of soil—100 kN/m²

Size of foundation ring beam—500 mm × 750 mm

No. of columns—6

Diameter of column—400 mm

Negative BM—0.057 wr^2 (2x)

Positive BM—0.045 wr^2 (2x)

Torsional moment—0.009 wr^2 (2x)

Use M-25 concrete and HYSD Fe-500 bars

Show details of reinforcements.

4. A cylindrical silo has an internal diameter of 6 m and 20 m deep (cylindrical portion) with a conical hopper bottom. The material stored is wheat with a density of 8 kN/m³. The coefficient of friction between wall and material is 0.444. The ratio of horizontal to vertical pressure is 0.40. Angle of repose is 25 degree. Design the reinforcement in the silo walls and hopper bottom. Use M-25 concrete and Fe-500 TMT bars. Show details of reinforcement.
5. Design the sidewalls and hopper bottom of a 3 m × 3 m square bunker to store 25 tonnes of coal. Density of coal is 9 kN/m³. Angle of repose is 30 degree. Use M-25 concrete and HYSD Fe-500 bars. Show the reinforcement details of bunker.

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6. Design the RC slab culvert for Class AA/70 R loading as per provisions of latest IRC-6.

Given data :

Width of bridge—10.5 m

No footpath provided

Condition of exposure—Moderate

Materials—Concrete grade M-25

Steel—Deformed bars to IS : 1786 (grade S-415)

Clear span—5 m

Height of vent—3 m

Depth of foundation—1.35

Wearing course—75 mm thick asphaltic concrete

7. A three-storied building frame has three equal bays of 5 m each and the height between floors is 4 m. The wind load acting at roof level and various floor levels are $H_1 = 6$ kN, $H_2 = 12$ kN and $H_3 = 12$ kN. The columns have the same cross-section. Estimate the moments in columns and beams using cantilever method.
8. An intermediate shell of a multiple cylindrical shell roof of span 25 m is to be built. Each shell unit has a chord width of 10 m. Fix up overall size of the unit and check whether beam theory can be applied. If it can be applied, then design longitudinal and shear reinforcement. Explain how analysis for arch action will be carried out and give typical reinforcement.

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9. A reinforced concrete shell with circular directrix has the following dimensions :

Radius, $R = 6$ m

Span = $2L = 24$ m

Self-weight, $g = (0.05 \times 25) = 1.25$ kN/m²

Thickness, $t = 50$ mm

Semi-central angle, $\epsilon = 60^\circ$

The shell is subjected to the action of snow load only of intensity 1 kN/m² per unit length of curved surface of shell.

Calculate maximum stress in the shell and the maximum bending moment and tension developed in the edge beams.
