Total No. of printed pages = 3

CE 1818 PE 31

Roll No. of candidate

16/6/22

2022

B.Tech. 8th Semester End-Term Examination

CE

ADVANCED STRUCTURAL DESIGN

(New Regulation 2017-18)

(New Syllabus 2018-19)

Full Marks – 70   Time – Three hours

The figures in the margin indicate full marks for the questions.

Relevant IS codes are allowed.

Assume any missing data suitably.

Answer question No. 1 and any *four* from the rest.

1. Answer the following (MCQ/ Fill in the blanks) :   (10 × 1 = 10)

   (i) Prestressed structure is a composite structure. (Yes/No)

   (ii) Walls of a cylindrical water tank with flexible base is designed for ————————— (hoop tension/bending moment)

   (iii) Safety against sliding of retaining wall can be improved by use of ——————.

   (a) Counter forts   (b) Removing surcharge

   (c) Avoiding inclined backfill   (d) Shear key

   (iv) Grid slabs are also known as ——————

   (a) Flat slab   (b) One-way slab

   (c) Two-way slab   (d) Coffer slab

   (v) For grid-slabs with length more than twice the width, the longitudinal grid-beams ——————.

   (a) play major part

   (b) play no part apart from adding dead load

   (c) helps resisting bending moment

   (d) help resisting shear force

[Turn over

(vi) The web-plate of plate girder is designed to take ——————.

(a) Bending moment   (b) Shear Force

(c) Torsion   (d) Axial tension

(vii) The flange plates of a plate girder is designed to take ——————

(a) Bending moment   (b) Shear force

(c) Torsion   (d) Axial tension

(viii) Web-stiffeners of a plate girder is used to prevent ——————.

(a) Web-crippling   (b) Web-buckling

(c) Shear failure   (d) Bending failure

(ix) Gantry girder is a

(a) Rolled-steel section   (b) Built-up section

(c) ISHB   (d) ISMB

(x) The magnitude of pressure or suction caused by wind at a point of a structure <u>depends on/does does not depend</u> on overall stiffness of the structure.

(Choose the correct option from the underlined words)

2. (a) Name the tosses in prestress. Explain how to reduce each of these. (2+3 = 5)

(b) A rectangular prestressed beam 200 mm wide and 400 mm deep is prestressed by 4 number of 16 mm diameter high tensile bar located at an eccentricity of 100 mm. Calculate the maximum Imposed load udl over an effective span of 8 mts so as not to induce tension at the soffit of the beam.

(10)

3. (a) Explain the reason why there should be special permissible stresses for steel and concrete for design of an RCC watertank. (3)

(b) Design the wall of a circular water lank with a flexible base. The internal diameter of the tank is 15 mts. The water depth is 4 mts. Assume Fe 500 grade steel and M 25 grade concrete. Sketch the reinforcement details.

(9+3 = 12)

4. (a) What are the different types of retaining wall? Mention the recommended heights of backfill retention against each type. (1.5 × 2 = 3)

(b) Design the stem of a cantilever type retaining wall for an earth embankment of soil of unit weight 18 kN/m³ and angle of repose of 30°. The height of stem is 4 mts. The top of the embankment is horizontal. Safe bearing capacity of the soil is 230 kN/m². Adopt M 25 grade of concrete and Fe 500 grade of steel. Assume the top width of the stem as 200 mm. Sketch the reinforcement details. (9+3 = 12)

5. (a) State the benefits of a Flat Slab? Describe its performance during an earthquake. $(2+1 = 3)$

 (b) Design the flexural reinforcements of 6 m × 6 m interior panel of a flat slab. The supporting columns are of circular shape with a diameter of 600 mm. The slab may be considered without drop and column without column-head. Imposed load is 5 kN/m². The material may be taken as M 20 grade of concrete and Fe 500 grade of steel. Sketch the reinforcement details.

$(9+3 = 12)$

6. (a) What are the different Components of a plate-girder? (3)

 (b) Determine the depth of the web-plate of a plate girder of effective span 20 mts to take a Total load including self weight is 30 kN/m. Assume thickness of web plate as 12 mm and flange plates with size 500 mm × 16 mm for each tension and compression flange. Draw the cross-section of the plate girder. Under what circumstance would you use web-stiffners?

$(7+3+2 = 12)$

7. (a) What is the role of a Gantry Girder in an industrial building? (3)

 (b) Determine the wind pressure load on a roof truss for pitched industrial building located in Jorhat, with total height of 11 mts and length 50 mts. The building is to be constructed in a place with numerous closely spaced obstructions having a size of building structure upto 10 m height with or without a few isolated tall structures. (3)

 (c) Determine the moment and forces due to the vertical and horizontl loads acting on a simply-supported gantry girder given the following data:

   (i) Simply—supported Span = 8 m

   (ii) Wheel distance of crane = 3.3 mts

   (iii) Assume Self weight of girder = 1.8 kN/m

   (iv) Maximum crane wheel load(static) = 200 kN

   (v) Weight of crab/trolley = 50 kN

   (vi) Maximum hook load = 150 kN $(6+3 = 9)$