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# 320831(20)

## B. E. (Eighth Semester) Examination, April-May 2021

### (New Scheme)

### (Civil Engg. Branch)

### STRUCTURAL ENGINEERING DESIGN-IV

***Time Allowed : Four hours***

***Maximum Marks : 80***

***Minimum Pass Marks : 28***

***Note :*** *Part (a) is compulsory in each question having 2 marks. Attempt any* ***one*** *part from (b) & (c) for question having 14 marks.*

### Unit-I

1. (a) Define Combined Footing with neat diagram. 2

   (b) Two columns, 3·8 m, apart carrying 600 kN and 800 kN respectively bearing sizes 400 mm × 400 mm and 500 mm × 500 mm respectively. Design a

combined footing for the columns. The safe bearing capacity of the soil is 150 kN/m$^2$, Use M-20 Grade of concrete and Fe415. 14

(c) Design a combined rectangular footing for two columns 600 × 600 mm each and 5 m apart and carrying a load of 1800 kN each. The available width is restricted to 2·4 m. The safe bearing capacity of the soil is 200 kN/m$^2$, Use M-20 Grade of concrete and Fe415. 14

## Unit-II

**2.** (a) What are the different types of retaining walls? 2

(b) Design a counterfort retaining wall to retain earth embankment 6·8 m high above ground level. The foundation is to be taken 1 m deep where the safe bearing capacity of the soil may be taken as 180 kN/m$^2$. The unit weight of earch is 18 kN/m$^3$ and its angle of repose is 30″. The embankment is horizontal at its top. The coefficient of friction between soil and concrete as 0·55, Use M20 concrete and Fe415 steel bars. 14





(c) Design a T-shaped cantilever retaining wall for retaining 5·5 m high above ground level. Consider weight of soil = 15 kN/m$^3$, angle of repose = 30 degree, coefficient of friction 0·55. Bearing pressure 150 kN/m$^2$. Grade M20 and Fe415. 14

## Unit-III

**3.** (a) Write advantages of dome of water tanks. 2

(b) Design circular tank with a dome for capacity of 400 KL. The depth of water is to be 4·3 m including free board. The tank is supported on brick masonry walls all around. Use M 20 concrete and Fe 415 steel. 14

(c) Write the design steps of design of Intze type tank. Write design steps for the following : 14

Design of top dome, Top ring beam, Cylindrical side walls, Bottom ring beam connecting side walls with conical dome and design of conical dome.

## Unit-IV

**4.** (a) Name various types of bridge. 2

(b) Design a solid slab bridge for class A loading for the following data : (i) Clear span 5 m; (ii) Clear width of roadways –7·5 m; (iii) Average thickness of wearing coat = 75 mm Use M 20 concrete. Take unit weight of concrete 24000 N/m$^3$. 14

(c) Design a slab bridge with carriageway of 12 m with kerbs only for an effective span of 6 m for IRC 70 loading. Concrete used M25 and Fe415. 14

## Unit-V

**5.** (a) What do you mean by Post Tensioning? Discuss about classification and types of pre-stressing. 2

(b) List different types of losses induced in pre stress concrete. Explain in brief each. A post tensioning pre stress concrete beam of 30 m span is subjected to transfer pre stress force of 2500 kN at 28 days. The profile of cable is parabolic with maximum eccentricity at 200 mm at mid span. Determine the loss of pre strass and the jacking force required if jacking is done form both end of beam it has a cross section at 500 × 300 mm and is pre stressed





with 9 cables, each cable consisting at 12 wires at 5 mm dia. Take $E_s = 2 \times 10^5$, $Ec = 3{\cdot}5 \times 10^4$. One cable is tensioned at a time. 14

(c) A simply supported pre-stressed concrete beam of rectangular cross section 400 mm × 600 mm is loaded with a total UDL of 256 kN over a span of 6 m. Sketch the distribution of stresses at the mid-span and end sections if the pre-stressing force is 1920 kN and the tendon is : (i) concentric; (ii) eccentric, located at 200 mm above the bottom fibre. 14