B.E. CIVIL ENGINEERING FOURTH YEAR FIRST SEMESTER EXAM 2019

ref **Ex/CE/T/412/2019**

DESIGN OF STRUCTURES-III

Time 3 hours Full Marks 100

Use separate answer script for each part

Part –I (60 Marks)

Assume reasonable values of any data if required

IS 875 part –III and IRC-6 are allowed in the examination hall

Notations have their usual meaning

Q 1 (a) A G+7 storey RCC office building (24m x 24m in plan) is to be constructed at Digha, West Bengal . Columns are placed 6m c/c along both direction. Floor to floor height is 3.2m except ground floor which is 3.0 m for parking. The service block is separated structurally from the main building by expansion joint. Determine the design wind pressure and forces in the frame. Calculate also the bending moment and shear fore on an internal frame (with diagram) at 4th floor level only using cantilever method of analysis. Take the plinth level is 200 mm above ground level and top of the pile cap is 800mm below the Ground level. 20

Or

Q2. (a) What is shear wall? What are the advantages of using shear wall in the tall building? Why the shear walls are generally provided symmetrically?

(b) What is transfer girder? Where is it used in reinforced concrete structures?

(c) List the load combinations (Limit state Method) for a typical rectangular shaped building under DL, LL and EL (assume WL is not significant).

(d) Draw a neat proportionate sketch of beam – column frame at 4^{th} floor of the building of the Q1 showing the ductile detailing in beams . Assume size of beam =300 x 600 , Size of column 600X600. Reinforcement in beam is 6-25 tor (at top) & 4- 25 tor(at bottom) at support and 4-25 tor(at top and bottom at span. Use stirrups 8 tor @ 75 C/C near support and 150 near span .Draw cross-sections near span and support. 5+4+5+6

Q 3 (a) A simply supported pre-stressed concrete beam of cross section 300 mm x 750 mm deep is loaded with a uniformly distributed live load of 100KN/m on a span of 8 m. Obtain the distribution of stresses at quarter span and at mid span for the initial and final conditions. The beam is post-tensioned by 4 tendons of 250 mm^2 each. The tendons are located at 100 mm from bottom. The Initial pre-stress in the tendons is 1700 MPa. Assume 16% loss of pre-stress.

(b) What are the differences between Pre-tension and post-tension system in Pre-stressed Concrete structures ? What are the different types of losses in prestressing?

15+5

Q4. A RCC tee beam (simply supported) bridge is to be constructed over a river . The following data is given:

- Clear width of roadways = 9.6 m
- Span of the bridge = 20 m
- Average thickness of wearing coat = 80 mm
- Thickness of deck slab = 250 mm
- **Number of main girders = 4**
- Number of cross girders = 6
- Spacing of the main girders = 2.0 m
- Size of kerb = 300mm (depth) X 700 mm (width)

Determine the maximum bending moment for the central girder due to Class 70R track loading only. **20**

Ref. no. :- EX/CE/T/412/2019

BE CIVIL ENGINEERING

4th year-1st semester-2019

Design of Structures III

Time – 3 hour

Full marks – 100

Figures in the margin indicates marks

Part II (40 marks)

IS 456 and SP16 codes are allowed in the examination hall

Assume reasonable values of any data, if required

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1. Check the stability of a RCC Cantilever type retaining wall which will be retaining a cohesionless soil ($\emptyset=30^0$, $\gamma=17$ KN/m^2) of height 6m (bottom of base slab) and a surcharged load of 30 KN/m^2 at top surface level. Base width = 5m, thickness of stem slab = 500mm uniform , width of heel slab from the face of stem slab =3m and remaining 1.5m from the face of the stem slab is toe slab. Thickness of base slab=500mm. μ=0.48. Safe bearing capacity of soil = 225 KN/m^2.

OR

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2. Check the stability of a RCC Cantilever type retaining wall which will be retaining a cohesionless soil ($\emptyset=32^0$, $\gamma=18$ KN/m^2) of height 6.5m (bottom of base slab) and a surcharged load of 20 KN/m^2 at top surface level. Base width = 5.5m, thickness of stem slab = 500mm uniform , width of heel slab from the face of stem slab =3.3m and remaining 1.7m from the face of the stem slab is toe slab. Thickness of base slab=500mm. μ=0.47. Safe bearing capacity of soil = 250 KN/m^2.

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3. Design a RCC Pile cap against a compressive load of 2500KN and biaxial moments M_x=175KN-m & M_y=125KN-m. Pile diameter=500mm and Vertical compressive load carrying capacity of pile =500KN. Grade of concrete M20 and grade of steel Fe415. Apply LSD. γ_L=1.5. Assume column section 600x600.

OR

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4. Design a RCC Pile cap against a compressive load of 3000KN and biaxial moments M_x=200KN-m & M_y=150KN-m. Pile diameter=500mm and Vertical compressive load carrying capacity of pile =600KN. Grade of concrete M20 and grade of steel Fe415. Apply LSD. γ_L=1.5. Assume column section 650x650.