Seat No: _____ Enrollment No: _____

PARUL UNIVERSITY

FACULTY OF ENGINEERING & TECHNOLOGY

B. Tech Winter 2022 – 23 Examination

Semester: 7 **Date: 03-10-2022**
Subject Code: 03104403 **Time: 10:30am to 01:00pm**
Subject Name: Structural Design III **Total Marks: 60**

Instructions:
1. All questions are compulsory.
2. Figures to the right indicate full marks.
3. Make suitable assumptions wherever necessary.
4. Start new question on new page.

Q.1 Objective Type Questions - All are compulsory (Each of one mark) **(15)**

1. In case of under reinforced concrete beam
a) moment of resistance is less than that of balanced section
b) actual depth of neutral axis is less than the critical depth of neutral axis
c) both (a) and (b)
d) none of these

2. In case of under reinforced beam section, the neutral axis lies
a) Below neutral axis of balanced section
b) Above neutral axis of balanced section
c) On neutral axis of balanced section
d) Independent of neutral axis of balanced section

3.The minimum thickness of the cover at the end of a reinforcing bar should not be less than twice the diameter of the bar subject to a minimum of
a) 10 mm
b) 15 mm
c) 20 mm
d) 25 mm

4.The transverse reinforcements provided at right angles to the main reinforcement
a) Distribute the load
b) Resist the temperature stresses
c) Resist the shrinkage stress
d) All the above

5.If A is the area of the foundation of a retaining wall carrying a load W and retaining earth of weight w per unit volume, the minimum depth (h) of the foundation from the free surface of the earth, is
a) $h = (W/Aw) [(1 - \sin\phi)/ (1+ \sin\phi)]$
b) $h = (W/Aw) [(1 + \sin\phi)/ (1+ \sin\phi)]$
c) $h = (W/Aw) [(1 - \sin\phi)/ (1 + \sin\phi)]^2$
d) $h = \sqrt{(W/Aw) [(1 - \sin\phi)/ (1 + \sin\phi)]}^2$

6. The ratio of tensile strength to the compressive strength of concrete is_____.
7. The minimum number of bars required for circular section is_____.
8. The number given for Indian standard code of practice for design loads (other than earthquake) for buildings and structures is_____.
9. By over-reinforcing a beam, the moment of resistance can be increased not more than_____.
10. The Young's modulus of elasticity of steel, is_____.
11.If W is weight of a retaining wall and P is the horizontal earth pressure, the factor of safety against sliding, is _____.
12. Cantilever retaining walls can safely be used for a height not more than_____.
13. The design of heel slab of a retaining wall is based on the maximum bending moment due to_____.
14. Define epicenter?
15. Give the value of imperfection factor for buckling class A.

Q.2 Answer the following questions. (Attempt any three) **(15)**

A) Discuss the various stability checks employed in design of counterfort retaining walls?

B) Explain the Design Philosophy of RC structures. Also discuss the methods permitted for design as per IS : 456 – 2000.

C) Briefly explain seismic design philosophy.

D) What are the desirable properties of construction materials for earthquake resistance.

Q.3 A) Using IS: 875 (Part 3) provisions, determine wind force on any intermediate frame of a multistorey building. Plot the wind pressure distribution diagram along the height of the building and hence nodal forces at each floor level. Use following data: **(07)**

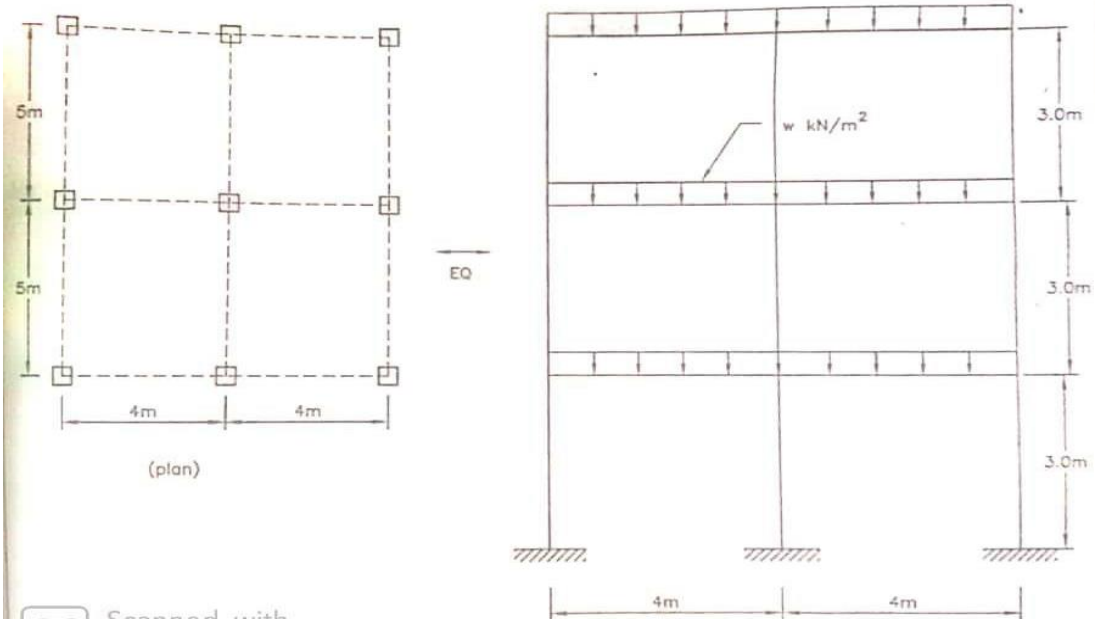
Length of Building = 48 m
Width of building = 40 m
Height of building = 34 m
Storey Height = 3 m
Frame Spacing = 4 m in both directions
Location = Chennai
Terrain Category = 2
Slope of ground = 10º
Height of Hill = 900 m
Location from crest = 200 m (Wind ward)
Design life period = 55 years

B) Design a cantilever retaining wall to retain the earth of height 5.5 m above lower ground level. Fix the basic dimensions and carry out the stability checks of retaining wall. Take SBC of soil = 170 kPa , $\phi = 30^o$, $\mu = 0.5$, Unit weight of soil = 18 kN/m^3. Use M20 grade of concrete and Fe 415 grade of steel. **(08)**

OR

B) Design a rectangular water tank for the following data. Length of tank = 6 m, width of tank = 4 m and depth of water = 3.5 m. The tank rests on ground. Use M30 and Fe 415. **(08)**

Q.4 A) The plan and elevation of a 3 Storey RCC school building is shown in figure below. The intensity of dead load is 12 kN/m^2 (includingcolumns, beams and walls) and floors are to cater an imposed load of 4 kN/m^2. The building is situated in zone IV. The type of soil encountered is medium soil and it is proposed to design the building with a special moment resisting frame. Determine seismic forces and shears at each floor level using static coefficient method. **(07)**



OR

A) Illustrate rigid diaphragm and flexible diaphragm with suitable examples. **(07)**

B) Prepare a typical structural layout for G+3 storey building having 6 bays of 3 m in X-direction and 3 bays of 6 m in Y-direction. Design a two way slab of a typical floor with one short edge discontinuous. Floor height is 3.35 m and live load of 3 KN/m2. Draw sketch of reinforcement detailing. **(08)**