

**PARUL UNIVERSITY**  
**FACULTY OF ENGINEERING & TECHNOLOGY**  
**B.Tech. Summer 2022-23 Examination**

**Semester: 4**  
**Subject Code: 203115253**  
**Subject Name: Structural Design**

**Date: 24/03/2023**  
**Time: 2.00pm to 4.30pm**  
**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. There is only a \_\_\_\_\_% failure chance of concrete in its characteristic concrete  
A) 2 B) 3 C) 4 D) 5
2. The Concrete Grade can be known by calculating the \_\_\_\_\_ strength of the concrete.  
A) Compressive B) Shear C) Flexural D) All of the above
3. Tensile strength is found out using:  
a) CTM b) Gradual tensile test c) Split tensile test d) Radial tensile test
4. M15 concrete is used for:  
a) Dam b) Foundation c) R.C.C. d) Mass Concrete Work
5. Which of the following size of the bar cannot be used as longitudinal reinforcement of columns?  
a) 25 mm b) 20 mm c) 16 mm d) 10 mm
6. The total area of longitudinal bars in a column section must not be less than \_\_\_\_\_ % of the gross column area.
7. State the parts of the Limit State Method
8. What is the minimum number of longitudinal bars in RC columns?
9. How do you calculate stirrups spacing in RC column?
10. The maximum spacing of spiral tie is \_\_\_\_\_ mm.
11. List out the grade of the reinforcement steel.
12. What are the types of Reinforced Concrete Columns?
13. Write the formula of the maximum depth of the neutral axis for the below-given grade of the steel ( $f_y$ ).  
a. 250 N/mm<sup>2</sup>  
b. 415 N/mm<sup>2</sup>
14. List out the types of transverse bars.
15. What are the Different Shapes of Isolated Footings?

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

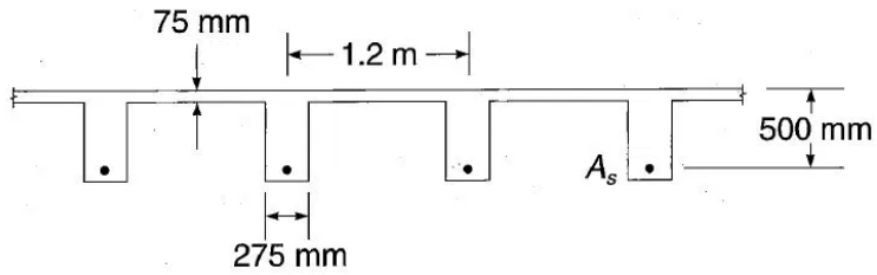
- A) Write down the Reinforcement Detailing of Isolated Footing.
- B) What are the demerits of the Working Stress Method?
- C) What is Isolated Footing?
- D) What are the merits of the Ultimate Load Method?

- Q.3** A) Design a rectangular beam to resist a bending moment equal to 45 kN-m using M20 and Fe415. (07)  
B) Design a doubly reinforced beam of size 280 mm x 500 mm effective is subjected to a factored moment of 225 kN m. Use M20 concrete and Fe 415 steel. Assume  $f_{sc} = 353$  N/mm<sup>2</sup>. (08)

**OR**

- B) Enlist the difference between WSM and LSM. (08)

- Q.4** A) Design the below-given T-beam having a length of 10 m. Find out the tensile steel area required (07)  
at midspan to support a factored moment of 725 kN-m.



**OR**

- A) Classify the types of concrete as per the grade of the concrete. (07)  
B) Find out the area of the isolated footing for the given data. (08)  
Load from the column = 1000 kN  
Size of the column = 350 x 350 mm  
Soil Bearing Capacity = 150 kN/m<sup>2</sup>