SRI VIDYA COLLEGE OF ENGINEERING & TECHNOLOGY
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CE6505 DESIGN OF REINFORCED CONCRETE ELEMENTS

UNIT – I

METHODS OF DESIGN OF CONCRETE STRUCTURES

QUESTIONS & ANSWERS

PART – A

1. **What is Ultimate Limit State (ULS)**

ULS in concerned with the maximum load – carrying capacity of thestructure within the limits of strength of the materials used.

2. **What is characteristic load?**

Generally, load on any structural members cannot be determined accurately. For most structures, it is uneconomical to design using anticipated maximum load.Therefore, in normal design practice, the load to be used is based on thecharacteristic load. Characteristic load is defined as the minimum load thatstatistically will not exceed during the design life of the structure.

3. **State the 3 types of load.**

a) Dead load b) Imposed loadc) Wind load

4. **State four objectives of the design of reinforced concrete structure.**

Properly designed reinforced concrete structures should:

- Have acceptable probability of performing satisfactorily during their intended life,
- Sustain all loads with limited deformations during construction and use,
- Be durable,
- Adequately resist the effects of misuse and fire.

5. **How to fulfill the three objectives of the design of reinforced concrete structures?**

The three objectives can be fulfilled by:

(i) Understanding the strength and deformation characteristics of concrete and steel,

(ii) Following the clearly defined standards for materials, production, workmanship and maintenance, and use of structures in service,

(iii) Adopting measures needed for durability.

6. What are the three methods of design of reinforced concrete structural elements?

The three methods are:

- Limit state method,
- Working stress method,
- Method based on experimental approach

7. How to estimate the design loads in (i) limit state method, and (ii) working stress method?

(i) In limit state method,

Design loads = Characteristic loads multiplied by the partial safety factor for loads

(ii) In working stress method,

Design loads = Characteristic loads.

PART –B

A doubly reinforced concrete beam is 250mm wide and 510mm depth the center of tensile steel reinforcement. The compression reinforcement consists of 4 Nos. of 18mm dia bars placed at an effective cover of 40mm from the compression edge of the beam. The tensile reinforcement consists of 4Nos. of 20mm diameter bar. If the beam section is subjected to a BM of 85kNm, calculate the stresses in concrete and tension steel

A simply supported RC slab having an overall thickness of 150 mm is reinforced with 12 mm diameter bars at an effective depth of 130 mm. The spacing of the bars is 100 mm. The effective span of the slab is 4 m. If the self weight of slab and finishes is 4.2 kN/m^2. Estimate the maximum permissible live load on the slab. Adopt M-15 grade concrete and MS grade-I steel. Use working stress method.

Design a rectangular RC beam in flexure and shear when it is simply supported on masonry walls 300 mm thick and 5m apart (centre to centre) to support a distributed live load of 8 KN/m and a dead load of $6KN/m$ in addition to its own weight. Materials used are M20 grade of concrete and Fe415 steel bars. Adopt working stress method of design.

Design the roof slab for a Hall of size 4m × 10m by working stress method using M20 concrete and Fe 415 steel. The slab is simply resting on 230 mm thick brick walls all around. Take the live load on the slab as 1.5 kN/m^2 and finish load as 2.25 kN/m^2.

A singly reinforced concrete beam is of width 450mm and effective depth 715mm. It is reinforced with 8Nos.20mm mild steel bars. Assuming M20 concrete, determine its moment of resistance according to the working stress method. Determine also the stress in steel.

Determine the reinforcement for a T beam with flange width = 1500mm, web width = 300mm, thickness of slab = 100mm, effective depth 735mm, to carry a moment of 380kNm due to characteristic loads. Use M25 concrete and Fe 415 steel. Using Working Stress Design.