

MAHARASHTRA AGRICULTURAL UNIVERSITIES EXAMINATION BOARD, PUNE
SEMESTER END EXAMINATION

B.Tech. (Agril. Engg.)

Semester	: VI (New)	Term	: II	Academic Year	: 2012-13
Course No.	: FS 365	Title	: Design of Structures		
Credits	: 3 (2+1)				
Day & Date	: Friday, 26.04.2013	Time	: 09.00 to 12.00	Total Marks	: 80

- Note :
1. Solve ANY EIGHT questions from SECTION "A".
 2. All questions from SECTION "B" are compulsory.
 3. All questions carry equal marks.
 4. Draw neat diagrams wherever necessary.
 5. Assume necessary data wherever necessary.

SECTION "A"

- Q.1 a) A simply supported beam of 4.5m span carries an uniform distributed load of 30 KN/n inclusive of self weight. The width of the beam is 230mm and is reinforced on tension side only. Design the smallest concrete section. The materials used are M20 grade of concrete and mild steel reinforcement. Assume load factor = 1.5, $f_{ck} = 20 \text{ N/mm}^2$, $f_y = 250 \text{ N/mm}^2$.
- b) Write down the steps to be followed for designing axially loaded compression member.
- Q.2 Write in brief about different structural properties of concrete.
- Q.3 a) Discuss the various loads on roof trusses for design.
b) What are the reasons for providing minimum shear reinforcement?
- Q.4 a) What procedure should be followed to find yield stress of HYSD bar? What are the advantages and disadvantages of using HYSD bars?
b) Calculate the design constants for the following materials considering the balanced design for singly reinforced section. The materials are grade M20 concrete and mild steel reinforcement.
- Q.5 a) Design an I-section purlin for a trussed roof from the following data.
Span of roof = 12m
Spacing of truss = 5m
Spacing of purlins along slope of roof truss = 2m
Slope of roof truss = 1 vertical, 2 horizontal
Wind load on roof surface normal to roof = 1000 N/m^2
Vertical load from roof sheet, etc. = 200 N/m^2
b) What are the factor affecting development lengths?

- Q.6 a) A R.C. beam 300mm wide and 450 mm deep has to resist a design ultimate moment of 140 kN.m at an intermediate support of a continuous beam. The concrete grade M20 and mild steel reinforcement are used. Calculate A_{st} at top of support if 3 Nos. 20 mm diameter bars with effective cover of 35 mm are continued from one span to the other at bottom. Assume effective cover to tension steel equal to 35mm. $f_{ck} = 20 \text{ N/mm}^2$, $f_y = 250 \text{ N/mm}^2$.
- b) Why bond stress in reinforced concrete member are induced.
- Q.7 a) What are the methods used in detailing of slabs?
b) Define column. What are functions served by longitudinal reinforcement?
- Q.8 Calculate the load carrying capacity of a short axially loaded circular column 350 mm diameter reinforced with 6 Nos. of 22 mm diameter bars of grade Fe 415. the helical reinforcement consists of 8 mm bars of Fe 415 grade spaced at 40 mm c/c. Assume clear cover to main steel equal to 40 mm and grade of concrete used is M25. $f_{ck} = 25 \text{ N/mm}^2$, $f_y = 415 \text{ N/mm}^2$ $A_{sc} = 2280 \text{ mm}^2$.
- Q.9 a) Enlist and explain various types of footing used for concrete structure with suitable diagrams.
b) Calculate the strength of ISA 40 x 25, 6mm thick when used as a tension member with its longer leg connected by 14mm diameter rivet.
- Q.10 Design an unequal angle section to act as a tie member 1.56m long in a roof truss if it is to carry an axial load of 120 kN. Use (a) Hand driven rivets at joints, (b) Fillet weld at joints.

SECTION "B"

Q.11 Define the following terms.

- | | |
|----------------------|----------------|
| 1) Durability | 2) Limit State |
| 3) Structural Design | 4) Creep |
| 5) Modular ratio | 6) Bond stress |
| 7) Effective length | 8) Strut |

Q.12 Fill in the blanks.

- 1) Modulus of elasticity of all grades of steel is _____.
- 2) Roof trusses usually require very _____ member.
- 3) Maximum slender ratio for member carrying compression load resulting from dead load and superimposed load is _____.
- 4) For compression member effectively held in position at both ends but not restrained against rotation, value of effective length is _____.
- 5) The direct stress in axial tension on the effective net area should not exceed _____.
- 6) The slope of tangent which gives the rate of change of stress with strain is called _____.
- 7) Beams which are reinforced on tension side only are known as _____ section.
- 8) When the percentage of steel is more than critical percentage, the section is known as _____.

