

MANOHARGAD-I (2010 COURSE): WINTER - 2015 |  
SUBJECT: THEORY OF STRUCTURES I AND BUILDING MATERIALS-I

Day: Wednesday  
Date: 02-12-2015

Time: 10.00 A.M. To  
Max Marks: 100

1.00  
P.M.

N.B:

- 1) Answer ANY THREE questions from Section- I.
- 2) Answer ANY FOUR questions from Section -II.
- 3) Answer to the TWO Sections should be written in SEPARATE answer books.
- 4) Neat diagrams must be drawn WHEREVER necessary.
- 5) Figures to the right indicate FULL marks.
- 6) Use of Non- programmable calculator and steel tables is ALLOWED.
- 7) Assume suitable data if NECESSARY.

SECTION-I

- Q.1 Answer any FOUR of the following: (20)
- a) Explain 3 different types of systems of forces, along with illustrative sketches.
  - b) Explain different types of loads acting on beams.
  - c) Explain with illustrative sketch: Point of zero shear and point of contra shear.
  - d) What is moment of inertia? What is radius of gyration?
  - e) Assumptions made for finding out forces in a pin joined perfect truss.
- Q.2 a) Find out centroidal moment of Inertia of a T section (about horizontal axis) through its C.G. The flange of T section is 10cm x 2cm and web is 2cm x 16cm. (10)
- b) A simply supported beam AB 6m long is subjected to 2 point loads of 3t and 5t, at 1m and 4m from the left end respectively. Draw SFD and BMD for this beam showing all the salient points. (10)
- Q.3 a) To move a cart uniformly along a road at a given speed requires a resultant force  $R = 800\text{kg}$ . This is accomplished by two horses pulling with forces P and Q on two ropes (one on either side of R). IF the angles that the two ropes make with the axis of the road are  $\alpha = 35^\circ$  (between P and R) and  $\beta = 25^\circ$  (between Q and R), what are the corresponding tensions in the ropes? (10)
- b) Draw a simply supported, simple, perfect truss with 4 joints and 5 members. Consider a suitable vertical load at one of the joints (apart from the two support joints.) Now find out reactions at supports. Also find out the forces in any two members of the truss and mention the nature of force in those members. (10)
- Q.4 a) A rectangular plane is 3cm wide by 7cm deep. Find out its Area,  $I_{xx}$ ,  $I_{yy}$  (about centroidal axis). (06)
- b) State and explain parallel axis theorem with illustrative sketch. (06)
- c) Find out moment of Inertia for the plane mentioned in Q 4(a) above, about a vertical axis through its leftmost edge. (08)

P.T.O

## SECTION-II

- Q.5** What are the various methods of Damp prevention in a building? Explain each in brief. (10)
- Q.6** Explain the important Technical terms associated with an Arch construction, with the help of a labeled diagram. (10)
- Q.7** What is Plastering and Why is it provided? How is the old & new brick masonry surface prepared for Plastering? (10)
- Q.8** Differentiate between Load Bearing and Framed structures. (10)
- Q.9** Explain the composition and properties of cement used for construction. (10)
- Q.10** Write short notes on: (10)
- a) Advantages of Pointing
  - b) Ashlar masonry

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Day: Friday  
Date: 29-04-2016

Time: 2:00 PM TO 5:00 PM.  
Max. Marks: 100

N.B.:

- 1) Q. No. 1 is **COMPULSORY**. Out of the remaining attempt any **THREE** questions from section -I. All questions in Section -II are **COMPULSORY**.
- 2) Figures to the right indicate **FULL** marks.
- 3) Answers to both the sections should be written in **SEPARATE** answer books.

SECTION-I

Q.1 Answer any **THREE** of following: (15)

- a) What is mean by couple and give its properties of couple?
- b) What is radius of gyration?
- c) Explain different types of supports and different types of beams with sketch.
- d) What is centroid and what is moment of Inertia explain with neat sketch.

Q.2 a) Five forces of magnitude 15N, 20N, are acting at way from point with angle  $30^\circ$ ,  $145^\circ$  in and 45N, 30N, 85N, acting on same point at an angle  $45^\circ$ ,  $135^\circ$ ,  $270^\circ$  respectively. Find their resultant, all angles from positive X axis. (08)

b) What is law of parallelogram? Two forces of 80N and 40N acting at away from point angle between 2 forces is  $45^\circ$  calculate R by using low of parallelogram. (07)

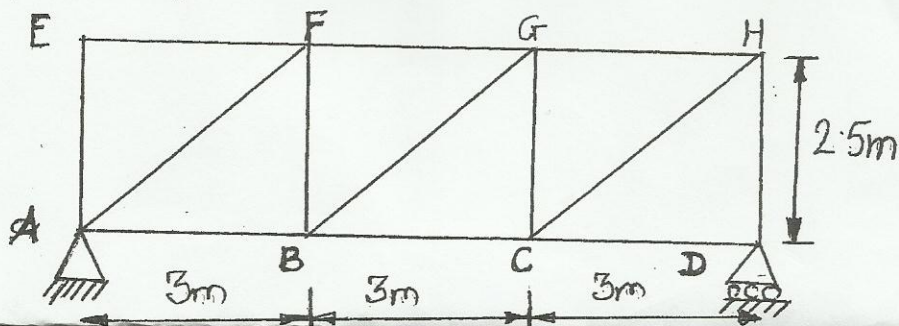
Q.3 a) 3 point load acting on a S.S. beam having magnitude 10N, 20N, and 35N. at a distance 1.5m, 2m and 4m from left support respectively and UDL having magnitude 5kN/ m acting between 2<sup>nd</sup> and 3<sup>rd</sup> force. Calculate reactions of the beam, span of beam 10m. (08)

b) Draw S.F.D and B.M.D of cantilever beam having span 5m. The load on cantilever beam is as follows 20N point load from free need and UDL 5N/m on whole span. Calculate reactions. (07)

Q.4 a) Determine M.I of I section. (08)  
Top Flange = 200 mm X 20 mm  
Web = 20 mm X 400 mm  
Bottom flange = 200 X 15 mm

b) Determine C.G of T section (07)  
Top flange = 200 mm X 15 mm  
Web = 10mm X 400 mm

Q.5 Analyze following truss. (15)



**SECTION-II**

**Q.6** Answer any **ONE** of the following: **(15)**

- a) Explain various Building components in a Structure from foundation to Terrace floor and also give a required Sketch.
- b) Explain the ingredient of good brick and various types of Bonds with sketches.

**Q.7** Write short notes on any **THREE** of the following: **(15)**

- a) Dressing of Stone
- b) Defects in plastering
- c) Bulking of Sand
- d) Types of Cements
- e) What are good qualities of Bricks?
- f) Ingredients of Mortar

**Q.8** Draw/ Sketch and define the following terms any **TWO** of the following: **(10)**

- a) 'Tuck' pointing
- b) Terminology for various parts of a semicircular Arch.
- c) Explain the term 'Frog' in Brick and its advantage.
- d) Lintel

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MANOHARGAD - II (2010 COURSE) : WINTER - 2015  
**SUBJECT : THEORY OF STRUCTURES AND BUILDING MATERIALS - II**

Day : Tuesday  
 Date : 17-11-2015

Time : 2.00 P.M. To 5.00 P.M.  
 Max. Marks : 100

**N. B. ;**

- 1) Q. No. 1, 5 and 6 are **COMPULSORY**. Out of remaining questions attempt **ANY TWO** from Section - I.
- 2) Figures to the right indicate **FULL** marks.
- 3) Answers to both the sections should be written in **SEPARATE** answer books.
- 4) Neat diagrams must be drawn **WHEREVER** necessary.
- 5) Use of non-programmable calculator and steel tables is **ALLOWED**.
- 6) Assume suitable data, if **NECESSARY**.

**SECTION - I**

- Q. 1** Explain **ANY FIVE** of the following with illustrative sketches : (20)
- a) Define shear force and bending moment and draw for S. S. beam.
  - b) Different types of loads acting on structure with examples.
  - c) Slope and deflection of cantilever beam.
  - d) Derive expression for Bending stress for rectangular section.
  - e) Stress strain and modulus of rigidity.
  - f) Statically determinate and indeterminate structures with examples.
- Q. 2** a) A composite section consist of an outer steel tube 125 mm × 100 mm and 15 mm thickness. It encloses an inner copper rod. The length of section is 400 mm. It carries an axial load 5000 kgs. Find force carried by steel and copper. Also find out change in length.  
 $E_s = 2 \times 10^6 \text{ kg/cm}^2$  and  $E_c = 0.9 \times 10^6 \text{ kg/cm}^2$  (10)
- b) A bar 250 mm wide × 200 mm thick and 1000 mm long is subjected to tensile force of 100 KN, 200 KN and 300 KN on faces respectively given above. The change in size 100 mm on each face. Calculate E, G and K. Take  $\mu_k = 0.28$ . (10)
- Q. 3** a) A symmetrical I section with flanges 150 mm × 25 mm and web 25 mm × 220 mm is used as cantilever beam and carries 40 KN/m over a span of 2500 mm. Find maximum bending stress. Draw stress diagram. (10)
- b) A cantilever of 4 m span is loaded with UVL 20 KN/m through out the span. UVL intensity is lowest at support and highest at free end. The c/s of beam having size 230 mm × 450mm. Find out maximum shear stress and shear stress at N.A. (10)
- Q. 4** a) Find maximum bending stress of a T section having flange 15cm × 1.5 cm and web 1.5 cm × 18 cm. Simply Supported beam length 3 m and subjected to 15 KN/m UDL. (10)
- b) Find out maximum slope and deflection for simply supported beam with Central Point Load 50 KN and UDL 5 KN/m. Span of beam is 500cm. The beam is 250 mm wide and 550 mm deep. Take  $E = 25 \times 10^3 \text{ mpa}$ . (10)



**SECTION - II**

- Q. 5** Answer ANY TWO of the following: (20)
- a) Explain how bamboo is used in construction.
  - b) Explain the various roof covering materials for pitched roofs.
  - c) Explain the various factors to be considered while selecting the flooring materials and explain any two types of flooring in detail.

- Q. 6** Write short notes on ANY FOUR of the following: (20)
- a) Defects in Timber
  - b) Glazed panelled wooden door
  - c) Market forms of timber
  - d) Slaking of Lime
  - e) Cement concrete blocks
  - f) Guniting

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Day: Thursday  
Date: 28-04-2016

Time: 10:00AM TO 1:00 PM  
Max. Marks: 100

N.B.:

- 1) Answer ANY THREE Questions from Section-I.
- 2) All questions in Section -II are COMPULSORY.
- 3) Figures to the right indicate FULL marks.
- 4) Answers to both the sections should be written in SEPARATE answer books.

SECTION-I

- Q.1 Explain any FOUR with neat sketches. (20)
- a) Ultimate stress, working stress, factor of safety.
  - b) Lateral strain and Poisson's ratio.
  - c) Shear modulus and bulk modulus.
  - d) Draw shear stress diagram for Z section and H section.
  - e) Assumption in theory of bending.
- Q.2 a) The R.C.C column 300mm x 750 mm in section. The column is provided 8 bars of 20 mm diameter. The column section carries axial load 500kN. Find stresses in material. Take  $E_s = 2 \times 10^5 \text{ N/mm}^2$  and  $E_c = 15 \text{ kN/mm}^2$ . (10)
- b) A composite tube consists of steel tube 14 cm internal diameter and 20 cm external diameter. It is enclosed by an outer brass tube having 20 cm internal diameter, and 2 cm thickness. The length of tube is 50 cm and it carries a load of 2500 kg. Find force shared by each tube. Also find out change in length for steel tube. Take  $E_s = 2 \times 10^5 \text{ N/mm}^2$   $E_B = 1 \times 10^6 \text{ N/mm}^2$ . (10)
- Q.3 a) Find out maximum bending stress for 'C' section having flanges 20cm X 2cm and web 3cm X 30cm. the beam is cantilever, having a span of 2m. it carries 10Kg/m UDL over entire span (10)
- b) Find out maximum slope & deflection for a cantilever beam with UDL 20kN/m over entire span of 2.1m and point load 25KN at free end. (10)  
Take  $E_s = 15 \text{ kN/mm}^2$ ,  $I = 5 \times 10^9 \text{ N/mm}^2$ .
- Q.4 a) Find out maximum shear stress for an I section having flanges 30cm X 5cm and web 3cm x 20cm. take maximum S.F. 120KN. (10)  
Also find out average shear stress
- b) Find out stresses at 4 corners of a column 250mm x 650mm (650mm horizontal) having eccentricity 600mm along both axes. The magnitude of load is 3000Kg. (10)

SECTION-II

- Q.5 Attempt any TWO of the following: (20)
- a) Explain various types of flooring material
  - b) Explain concrete, what is curing of concrete
- Q.6 Answer any TWO of the following: (10)
- a) Slacking of lime
  - b) Defects in Timber
  - c) Use of bamboo in construction.
- Q.7 Write short notes on any TWO: (10)
- a) Lime mortar and its advantage.
  - b) Market forms of timber.