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B.E / B.Tech (Full Time) ARREAR EXAMINATIONS, APRIL / MAY 2013

COMMON TO INDUSTRIAL AND MINING

SECOND SEMESTER

PH9165 – MATERIALS SCIENCE

(Regulation 2008)

Time: 3 Hours

Answer ALL Questions

Max. Marks 100

PART-A (10 x 2 = 20 Marks)

1. What is Hooke's law?
2. What is creep?
3. What is Gibb's phase rule?
4. What is the lever rule?
5. What is Fick's law?
6. What is case hardening?
7. What is stainless steel?
8. Name two applications of titanium alloys.
9. Write the expression for carrier concentration in intrinsic semiconductor.
10. What is ferromagnetism?

Part – B (5 × 16 = 80 Mark)

11. Explain Rockwell and Brinell hardness and Knoop and Vickers micro hardness tests. **(16 marks)**
12. a) Explain binary isomorphous systems. **(16 marks)**

(Or)

(b) Determine the forces in the numbered members shown in Fig.Q12 (b) using method of sections.

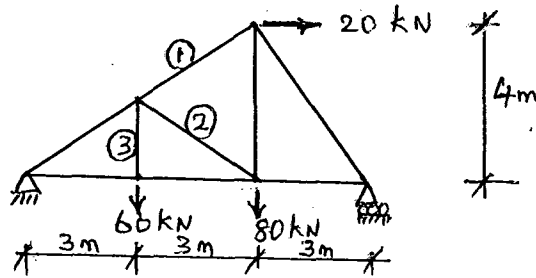


Fig.Q12(b)

13. (a) An overhanging beam ABC is simply supported at A and B over a span of 5 m and BC overhangs by 3 m. Draw the shearing force and bending moment diagrams and determine the point of contra-flexure if it is subjected to a uniformly distributed load of 8 kN/m over the supported span AB and a point load of 10 kN at the free end C.

(Or)

(b) Three beams have the same length, the same allowable stress and the same bending moment. The cross-section of the beams are a square, a rectangle with depth twice the width and a circle. Find the ratios of weights of the circular and the rectangular beams with respect to the square beam.

- 14 (a) A hollow shaft is to transmit a power of 200 kW at 80 rpm. The maximum torque may be 1.25 times the mean torque. If the shear stress is not to exceed 60 MPa, find the diameters of the shaft by taking the internal diameter as 0.6 times the external diameter. Take modulus of rigidity as 80 GPa.

(Or)

(b) For a close-coiled helical spring subjected to an axial load of 300 N having 12 coils of wire diameter 16 mm, and made with coil diameter of 250 mm, find:

(i) Axial deflection;

(ii) Strain energy stored;

(iii) Maximum torsional shear stress in the wire. Take: $G = 80 \text{ GN/m}^2$.

- 15 (a) A cantilever of span 4 m carries two point loads 10 kN and 14 kN at mid span and free end respectively. Determine the slope and deflection of the cantilever at the free end by using conjugate beam method. Take $EI = 6500 \text{ kN-m}^2$.

(Or)

(b) A beam AB of span 6 m is simply supported at its ends A and B. It carries a point load of 10 kN at a distance of 2 m from the end A and a uniformly distributed load of 6 kN/m over the right half span length. Determine using Macaulay's method (i) the maximum deflection in the beam and (ii) slope at the ends. Take $EI = 10\,000 \text{ kN-m}^2$.