3016

BOARD DIPLOMA EXAMINATION, (C-09)
OCTOBER/NOVEMBER-2018
DCE- FIRST YEAR EXAMINATION

ENGINEERING MECHANICS

Time : 3 Hours] [Total Marks: 80

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PART-A

3X10=30

Instructions   :   1. Answer **All** questions.

2. Each question carries **Three** marks.

3. Answer should be brief and straight to the point and shall not exceed

   five simple sentences.

1. Define the terms (a) Force (b) Scalar Quantity (c) Vector Quantity.
2. List any three properties of a couple.
3. Give the position of Centroid of the following sections.
    - i.   Square
    - ii. Rhombus
    - iii. Semicircle
4. Write the formulae for radius of gyration of semi-circular section and hollow circular section.
5. A bar of 100 sq.mm in area is 2000 mm long. If a load of 75 kN is applied suddenly, what is the maximum instantaneous stress produced? Express its value in MPa.
6. A material has Young's modulus of 1.25×10^5 N/mm^2 and Poisson's ration of 0.25. Calculate the modulus of rigidity and bulk modulus.
7. A steel rod 20 mm diameter and 2500 mm long is subjected to an axial pull of 50KN. If E for steel is 2×10^5 N/mm^2, calculate the stress and elongation of the bar.
8. Define
    - i.   Shear force
    - ii. Bending Moment
    - iii. Point of contra flexure
9. A simply supported beam of span 6 m carries a central point load of 20 kN in addition to the UDL of 5kN/m over its entire span. Draw the SF diagram.
10. Draw the sketches of a cantilever beam of 4m length with a central point load of 9kN and UDL of 5kN/m over its entire span. Draw the SF diagram.

PART-B

Instructions : 1. Answer any **Five** questions

2. Each question carries **ten** marks.

3. Answer should be comprehensive and the criterion for valuation is the content but not the length of the answer.

11. (a) With the help of a sketch state the Lami's theorem.

(b) In a jib crane, the jib and the tie rod are 5m and 4m long respectively. The height of crane post is 3m and the tie rod remains horizontal. Determine the forces produced in the jib and tie rod when a load of 2KN is suspended at the crane head.
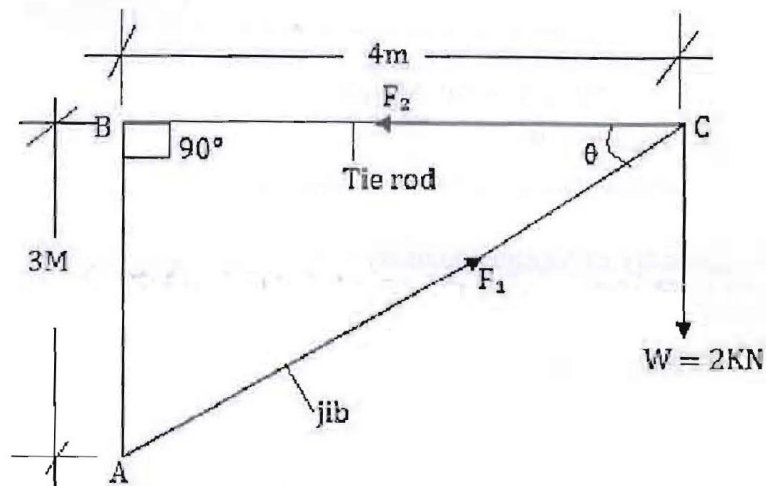
12. Find the position of centroid of a channel from base left edge.

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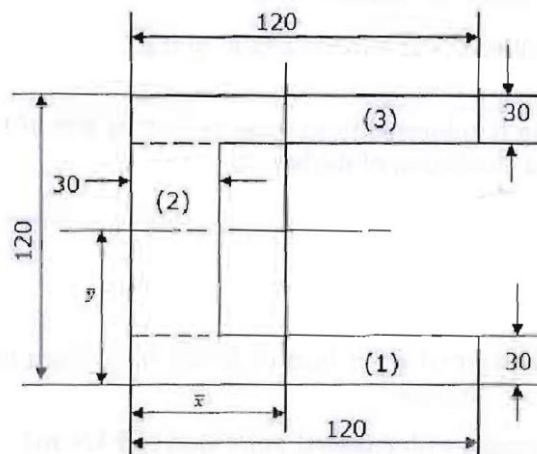
13. (a) What do you mean by Polar moment of inertia of a section?

(b) Determine the moment of inertia of a semi-circular section of 100mm diameter about its centroidal axes by using parallel axes theorem.

14. A steel bar 50mm diameter is completely encased in a brass tube of 80m outside diameter. The length of the composite bar is 400mm. if this assembly is subjected to a compressive force of 80kN, Determine.

   i.   Stresses in steel bar and brass tube

   ii.   Change in length of the assembly

        Given E for steel = 208 kN/mm^2 and E for brass= 104 kN/mm^2. Also find the load shared by each material

15. The following data refer to a tensile test conducted on a mild steel bar.

   i.   Diameter of bar = 20mm

   ii.   Gauge length = 300mm

   iii.   Extension at a load of 30kN= 0.1mm

   iv.   Yield point = 80kN

   v.   Ultimate load=130kN

   vi.   Total extension = 50mm

   vii.   Diameter of the rod at failure=14.1mm

        Calculate

   i.   The Young's modulus

   ii.   Yield stress

   iii.   Ultimate stress

   iv.   Percentage of elongation

   v.   Percentage of reduction in area

16. A cantilever 6m long subjected to a UDL of 3kN/m over a length of 2m form the free end and another UDL of 2kN/m over a length of 3 m from fixed end. Draw the S.F and B.M diagrams.

17. Write the relationship between the rate of loading, shear force and Bending Moment giving a neat sketch

18. (a) Determine the position of centroid of a T-section of flange 120 x120 and web 160x20.

(b) find the moment of inertia of a T-Section having flange and web both 120mmx30mm about its centroidal y-y axis.

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