C14-C-105

4019

BOARD DIPLOMA EXAMINATION, (C-14)
OCTOBER/NOVEMBER-2018
DCE-FIRST YEAR EXAMINATION

ENGINEERING MECHANICS

Time : 3 Hours] [Total Marks: 80

PART-A

4X10=40

Instructions : 1. Answer **All** questions.
2. Each question carries FOUR marks
3. Answer should be brief and straight to the point

1. (a) State Varignon's theorem.
   (b) Define moment.
2. Define the following (a) Statics (b) Dynamics.
3. (a) State the coordinates of centroid for rectangle of width 'b' depth 'h'.
   (b) State the differences between centroid and centre of gravity.
4. (a) Differentiate between coplanar and non coplanar forces.
   (b) Distinguish between scalar and vector quantities.
5. (a) Write any three necessities of finding the centroid.
   (b) State $\overline{X}$, $\overline{Y}$ of semi circle, resting on its diameter.
6. Define (a) Polar moment of inertia (b) Radius of gyration.
7. Calculate the moment of inertia about x-x axis of a
   (a) Rectangular section having dimension 300x600mm.
   (b) Circular section of 400mm dia.
8. (a) Define young's modulus and state its units.
   (b) Define modulus of rigidity.
9. (a) State Hooke's law.
   (b) Define poission's ratio.

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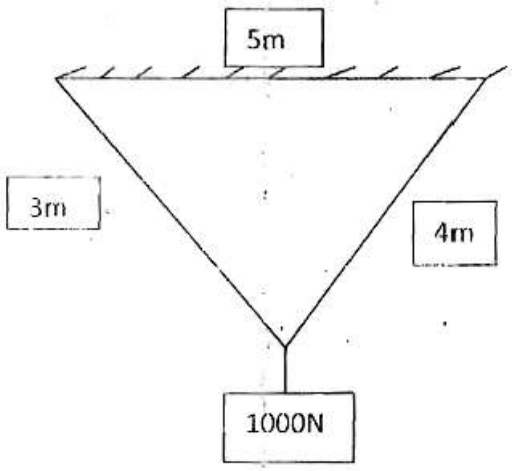
10. Define (a) Bulk Modulus (b)Strain energy.

PART-B

10X4=40

Instructions : 1. Answer any **four** questions. Each question carries **ten** marks.
2. Answer should be comprehensive and the criterion for valuation is the content but not the length of the answer

11. (a) State Lam's theorem and give the expression.
(b) A Body of weight 1000N is suspended by two strings of 4m and 3m lengths attached at the same horizontal level 5m apart as shown in fig. calculate the forces in the strings using Lami's theorem.



12. (a) State polygon law of forces.
(b) Four forces of 100N, 200N, 300N and 400N are acting at a point in the east, 45^0 North East, 45^0 North West and 45^0 South West directions respectively find the resultant and also its direction.
13. (a) Find the centroid of T-section whose flange is 120x20mm and web is 100x20mm.
(b) Find the centroid of I section. Top flange 60x20mm, web 20x100mm and bottom flange 100x20mm.
14. (a) Draw to examples of built up sections.
(b) Find the moment of inertia of a built up section about its centroidal x-x axis, with top flange 60x10mm, bottom flange 120x10mm and web 10x80mm. It has a top cover plate of 100x10mm. centrally placed.

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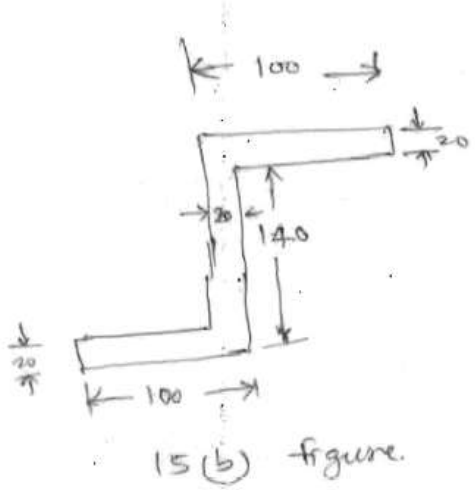
15. (a) Find the least radius of gyration of a channel section of size 100x200mm and thickness of 10mm.

(b) Calculate I_{xx} through the centroid of Z-section shown in figure (given at the end).



15 (b) figure.

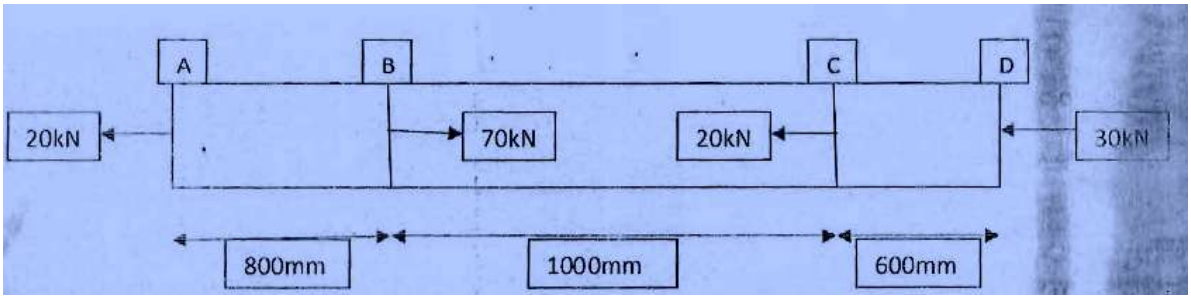
16. (a)A short timber post rectangular cross section is to a compressive force of 10kN and the contraction is found to be 0.1563mm in a length of 1.5m. Determine the cross sectional area of the post if modulus of elasticity of timber is 12Gpa.

(b) A 4m rectangular beam of 230x300mm is subjected to 20kN compressive force. Find contraction of the beam, taking $E=2x10^5 N/mm^2$.

17. (a) State the formula for Temperature stress and hoop stress.

(b) A bar 300mm long is 40 mm diameter in section for first 120mm of its length, 25mm diameter for next 80mm and 40mm diameter for the remaining length. If a tensile force of 100kN is applied to the bar, calculate the maximum and minimum stresses produced in it and the total elongation. Assume uniformly distributed load over the cross Section. E for the material = $2x10^8 kPa$.

18. (a) Calculate the total change in length of the bar 40mm diameter given below. Take the value of young's modulus as $1.05 \times 10^5 N/mm^2$.



(b) Explain any four mechanical properties of the materials.

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