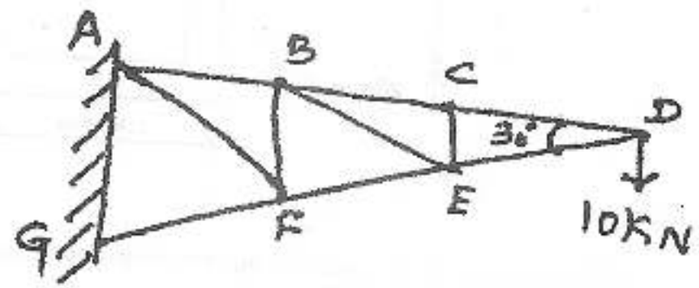
20. (a) (i) A rectangular beam 60mm wide and 150mm deep is simply supported over a span of 6m. If the beam is subjected to central point load of 12kN, find the maximum bending stress induced in the beam section.

(ii) A rectangular beam 300mm deep is simply supported over a span of 4 meters. What uniformly distributed load the beam can carry, if the bending stress is not to exceed 120 MPa ? Take $I = 225 \times 10^6\ mm^4$.

(Or)

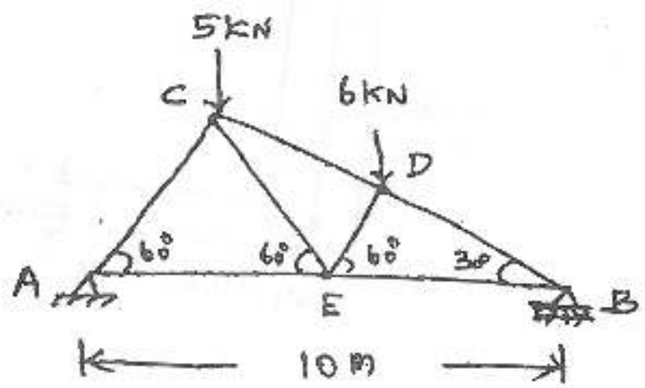
(b) Find the diameter of the shaft required to transmit 60kW at 150rpm, if the maximum torque is likely to exceed the mean torque by 25% for a maximum permissible shear stress of 60N/mm². Find also the angle of twist for a length of 2.5 metres.

21. (a) Determine the forces in all the members of a cantilever truss by method of joints as shown in fig.



(Or)

(b) A simply supported truss is loaded as shown in fig. Find the reactions and forces in all the members of the truss by graphical method and indicate whether forces are in tension or compression.



403 Register No.:

April 2019

Time – Three hours
(Maximum Marks: 75)

(N.B: (1) Q.No. 8 in PART – A and Q.No. 16 in PART – B are compulsory. Answer any FOUR questions from the remaining in each PART – A and PART – B

(2) Answer division (a) or division (b) of each question in PART – C.

(3) Each question carries 2 marks in PART – A, 3 marks in Part – B and 10 marks in PART – C.)

PART – A

1. Define shear modulus and bulk modulus.
2. Mention any two examples of composite sections.
3. What is indeterminate beams?
4. Locate the centroid of quadrant sections.
5. Write down the equation for pure bending and name the variables.
6. What is torsional rigidity?
7. What is the value of radius of gyration, if the beam section has an area of 100mm² and the moment of inertia of $200 \times 10^4\ mm^4$?
8. What are deficient and redundant frames?

PART – B

9. An alloy specimen has a modulus of elasticity of 120GPa and modulus of rigidity of 45GPa. Determine the Poisson's ratio of the material.
10. Draw the stress-strain curve of a ductile material and mark the elastic, yield and ultimate points on the curve.
11. What will be maximum UDL, the beam can carry for a simply supported beam subjected to an UDL over a span of 6m if the maximum bending moment is 100kNm.
12. State parallel axis theorem. Write down its expression.
13. Determine the strength of a rectangular beam of size 200mm wide and 300mm deep, if the bending stress is not to exceed 50MPa.

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14. A circular shaft of 60mm diameter is running at 150rpm. If the shear stress is not to exceed 60MPa, find the power which can be transmitted by the shaft.

15. Write down the steps required to obtain a graphical solution of a perfect frame.

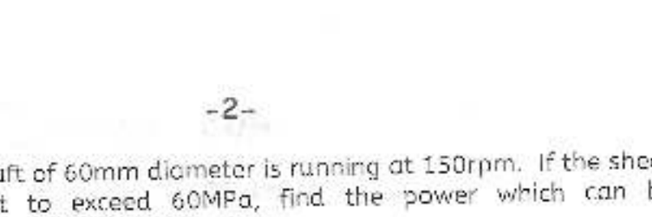
16. Find the MI of a triangular section having 50mm base and 60mm height about an axis through its centre of gravity and through its base.

PART – C

17. (a) A bar of 30mm diameter is subjected to a pull of 60kN. The measured extension on gauge length of 200mm is 0.09mm and the change in diameter is 0.0039mm. Calculate the Poisson's ratio and the values of the three elastic constants.

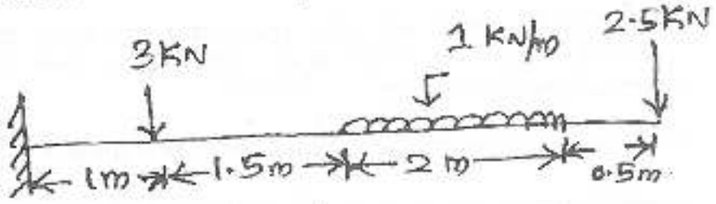
(Or)

(b) (i) A bar of different cross-sections is subjected to a tensile force of 50kN as shown in fig. Find the stresses in different sections and the total elongation produced in the bar. Take $E=200\times10^3$ N/mm^2.



(ii) Explain the principles of analysis of composite sections.

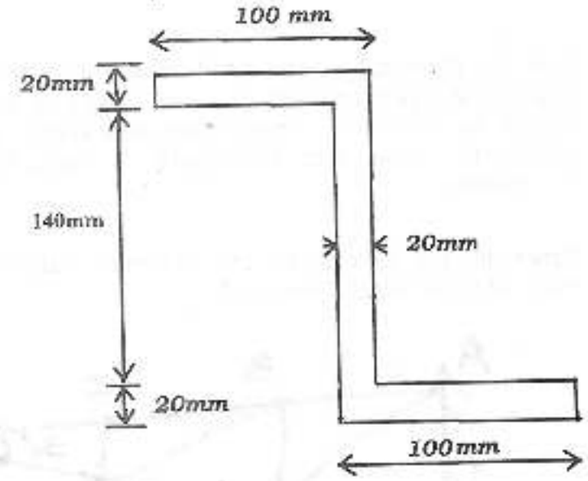
18. (a) Draw shear force and bending moment diagrams for the cantilever beam shown in fig.



(Or)

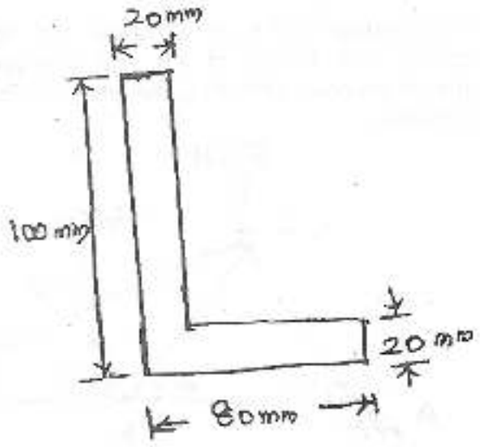
(b) A simply supported beam 10 meters long carries a point load of 5kN at 3 metres from left support A and a point load of 5kN at 7 meters from A. Also, it carries a uniformly distributed load of 1kN per metre between the point loads. Draw SF and BM diagrams. Also, find the maximum bending moment.

19. (a) Determine the centroid of the Z-section shown in fig.



(Or)

(b) Find the moment of inertia about the centroidal axis XX and YY of the section shown in fig.



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