S.No. : 99

NME 4101

No. of Printed Pages : 07

Following Paper ID and Roll No. to be filled in your Answer Book.

PAPER ID : 43501 Roll No. 1 2 5 0 4 3 2 1 8 3

B. Tech. Examination, 2025-26

(Odd Semester)

ENGINEERING MECHANICS

Time : Three Hours] *[Maximum Marks : 60*

Note :– Attempt all questions.

SECTION–A

1. Attempt all parts of the following : $8 \times 1 = 8$

   (a) State Lami's theorem.

   (b) Define uniformly varying load (UVL).

   (c) Explain the term force' and list its characteristics.

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(d) Define coefficient of friction and angle of friction.

(e) State work energy theorem.

(f) Explain Hook's law.

(g) Define the term moment of inertia and radius of gyration.

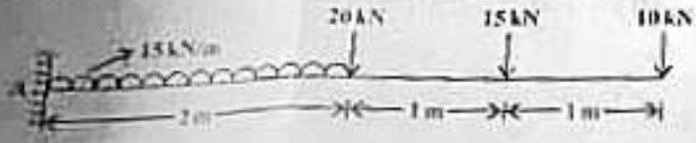
(h) Define Poisson's ratio.

SECTION – B

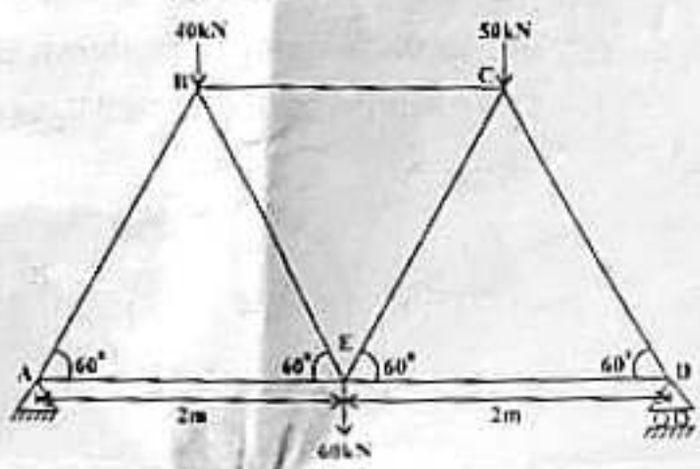
2. Attempt any two parts of the following : 2×6=12

(a) Three forces of 2P, 3P and 4P act along the three sides of an equilateral triangle of side 100 mm taken in order. Find the magnitude and position of the resultant force.

(b) A cantilever beam loaded as shown in figure. Determine the reaction at support A :



(c) Determine the forces in all the members of truss shown in figure :



(d) Draw and explain stress-strain curve for ductile material.

SECTION – C

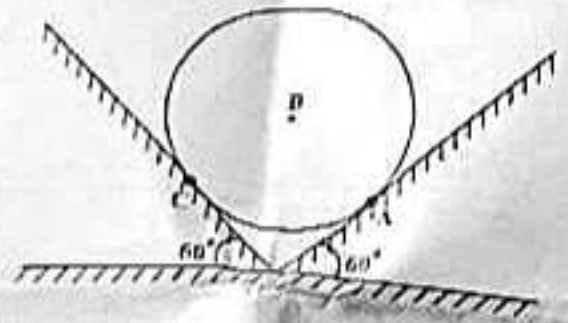
Note :– Attempt all questions. Attempt any two parts from each questions. 8×5=40

3. (a) State and explain the following :

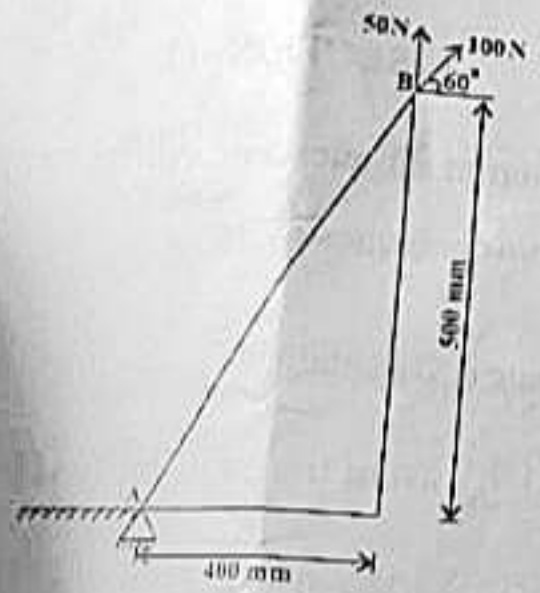
(i) Law of transmissibility of force.

(ii) Varignon's theorem.

(b) A smooth circular cylinder of weight 1000 N and radius 100 mm rests in a right-angled groove whose side are inclined at an angle of 30^0 and 60^0 to the horizontal as shown in figure. Determine the reaction R_A and R_C at the poitns of contact :



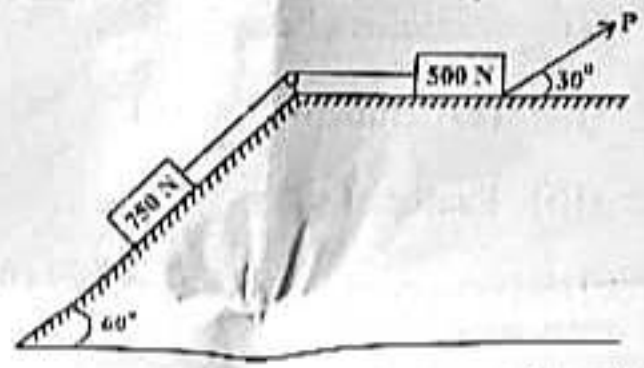
(c) Find the moment of given forces acting at B about point A as shown in figure :



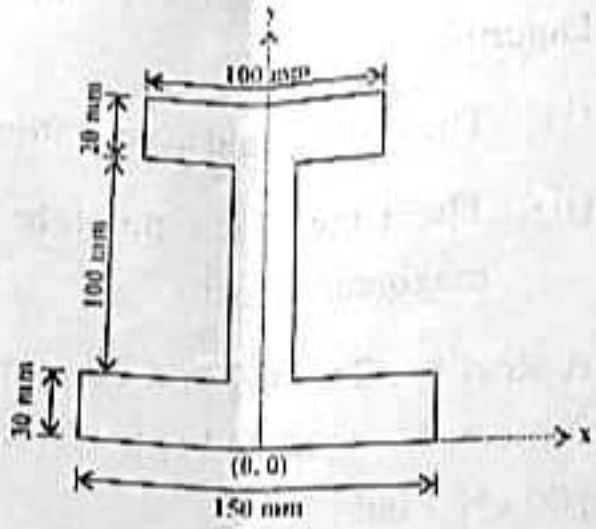
4. (a) What is friction? Derive the relation between tension on tight side and slack side in a rope.

(b) Define beam, types of beam and types of loading.

(c) What is the value of P in the system as shown in figure to cause the motion to impend in right direction. Coefficient of friction between contact surfaces is 0.25



5. (a) Locate the centroid of the I-section shown in figure :



(b) Derive an expression for the moment of inertia of a rectangular section about the base.

(c) What are the assumptions made in the analysis of simple truss? Explain perfect truss also.

6. (a) Define the following :

(i) Modulus of elasticity

(ii) D'Alemberts principal

(iii) Factor of safety

(b) The particle moves along a straight line by given equation :

$$S = 18t + 2t^2 - 2t^3$$

where S = displacement, t = time in second. Determine :

(i) The velocity and acceleration at start.

(ii) The time when particle reaches its maximum velocity.

(c) A steel bar 2m long and 20 mm in diameter, subjected to equal and opposite tensile force of 100 kN. Find :

(i) Stress

(ii) Total elongation

Take $E = 2 \times 10^5$ N/mm^2.

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