01 TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division
2068 Bhadra

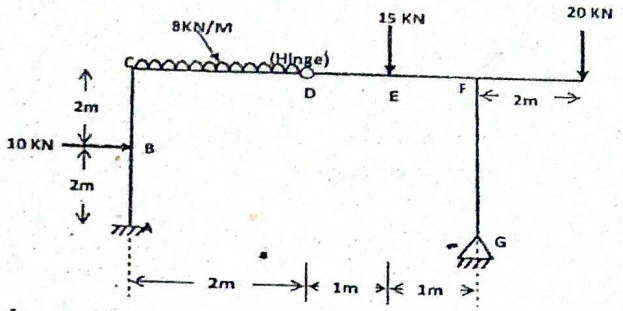
Exam.	Regular		
Level	BE	Full Marks	80
Programme	BCE, BME	Pass Marks	32
Year / Part	I / II	Time	3 hrs.

Subject: - Applied Mechanics

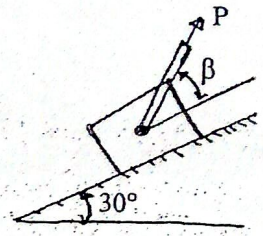
- ✓ Candidates are required to give their answers in their own words as far as practicable.
- ✓ *Attempt All questions.*
- ✓ *The figures in the margin indicate Full Marks.*
- ✓ *Assume suitable data if necessary.*

1. a) Define the fundamental principles on which the study of mechanics rests. [3]

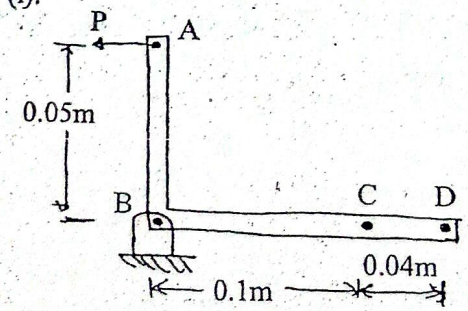
   b) Draw the axial force, shear force and bending moment diagram of the given frame. Also show the salient features. [13]



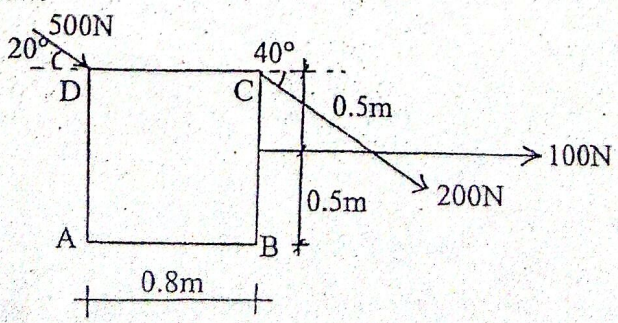
2. a) Knowing that the coeff. of friction between 25 kg block and the incline is $\mu_s = 0.25$. Determine (i) smallest value of P required. to start the block moving up the incline (ii) corresponding value of β. [4]



   b) The 80N horizontal force P act on a bell crank as shown in figure below. (i) Replace P with an equivalent force-couple system. (ii) Find two vertical forces at C and D that are equivalent to the couple formed in (i). [2+3]

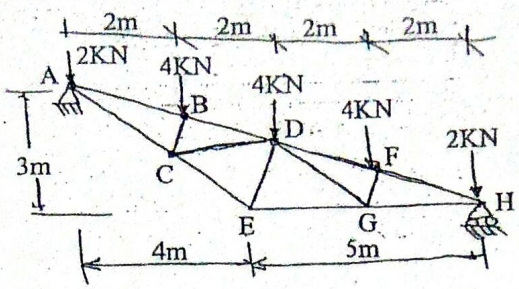


   c) Determine magnitude, direction and position of the resultant of forces acting on a block as shown in figure below. [7]

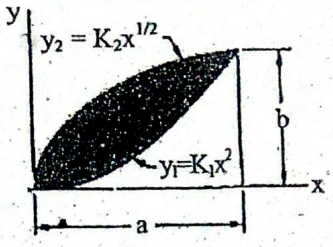


3. a) What is static equilibrium? What are the equations of static equilibrium in two dimension? Describe briefly the importance of them. [2+3+3]

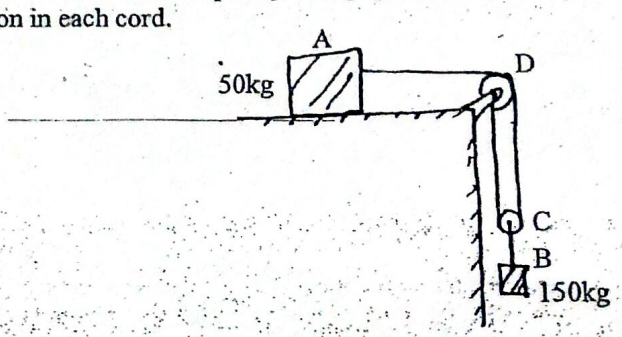
b) Determine the force in members DE, CD and AB for the inverted Howe Roof truss. State whether each member is in tension or compression. [8]



4. a) Determine the centroid of following enclosed (hatched) area with the curves $y_1 = K_1x^2$ and $y_2 = K_2x^{1/2}$, and also given that the extreme values of along X-axis and Y-axis are 'a' and 'b' respectively. Use direct integration method. [6]

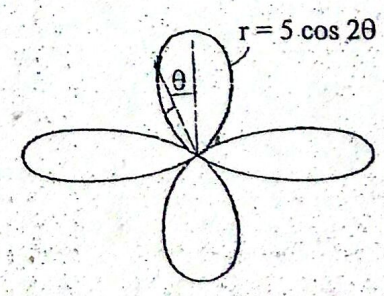


b) The two blocks shown in figure below start from rest. The horizontal plane and the pulley are frictionless and the mass of pulley is negligible. Determine the acceleration of each block and the tension in each cord. [10]

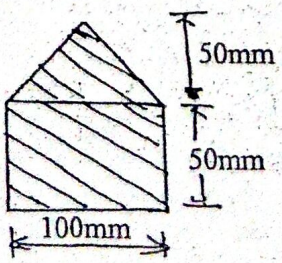


OR

b) The particle, having the position vector of $r = 5\cos(2\theta)$m, is travelled in a curvilinear path as shown in figure below, where $\theta = 3t^2$(rad/s). Find the velocity and acceleration of the motion of the particle at $\theta = 30°$. [10]



5. a) Determine moment of inertia about the centroidal x-axis of the shaded area shown in figure below. [6]



b) A projectile is fired from the edge of a 250m cliff with an initial velocity of 360m/s at an angle of 45° with the horizontal. Neglecting air resistance, find (i) The greatest elevation above the ground reached by the projectile (ii) The horizontal distance from the gun to the point where the projectile strikes the ground. [10]

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