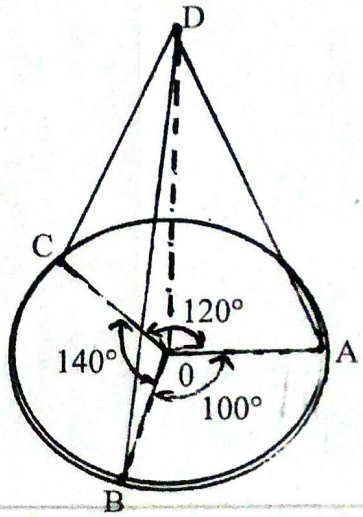
01 TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division
2070 Magh

Exam.	New Back (2066 & Later Batch)		
Level	BE	Full Marks	80
Programme	BCE, BGE, BME	Pass Marks	32
Year / Part	I / II	Time	3 hrs.

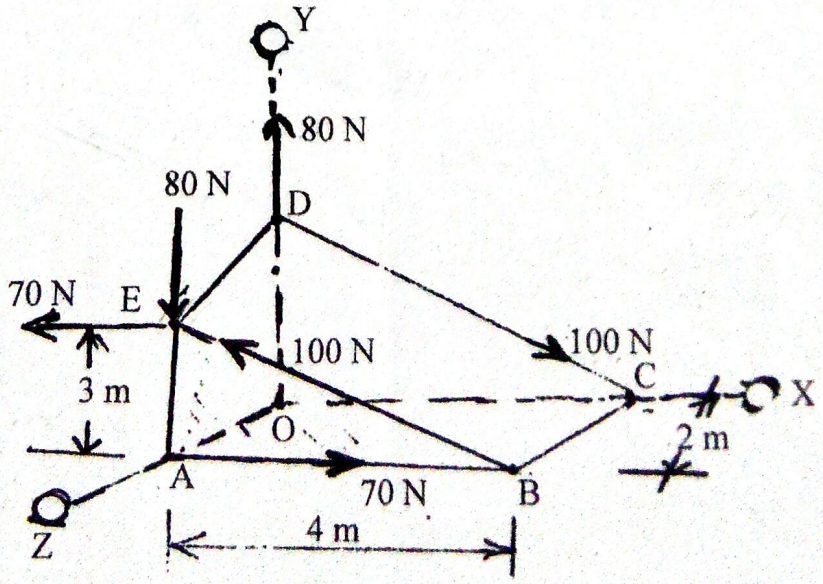
Subject: - Applied Mechanics *(CE451)*

- ✓ 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.*

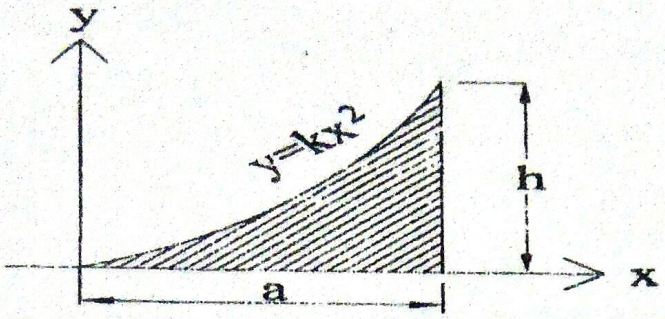
1. Differentiate between rigid body and deformable body. [3]
2. Explain about the physical meaning of equilibrium. Define free body diagram and concept of particle. [3+2+2]
3. A homogeneous circular plate of mass 50 kg is supported by three wires. The angular distance between the points of attachment on the circumference of the plate w.r.t center of the plate makes an angle of 100° while other two angular distances are 120° and 140° as shown in figure below. The three wires are attached to a single point on the ceiling which is 5 m vertically above the centroid of the plate. The plate has diameter of 1 m. Calculate the force developed in each wires. [8]



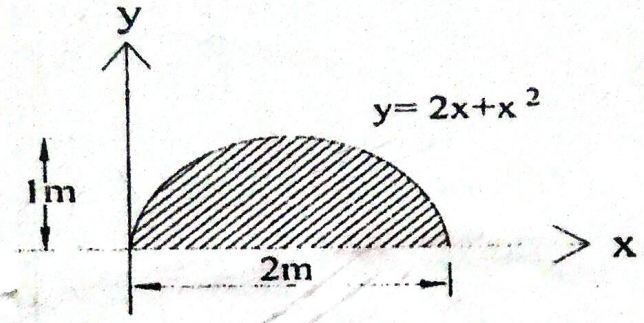
4. Three pairs of couples are acted on the triangular block as shown in figure below. Determine the resultant of them. [4]



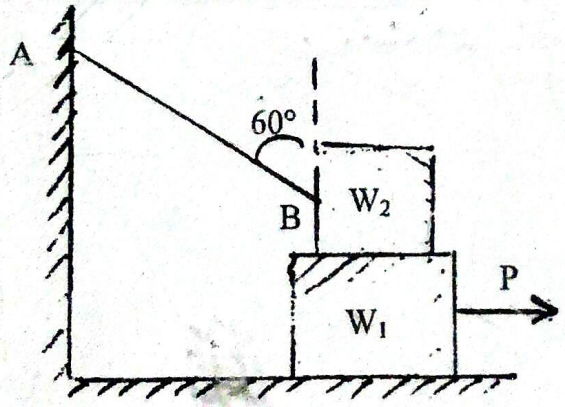
5. Determine the centroidal X and Y coordinate of the shaded area. [6]



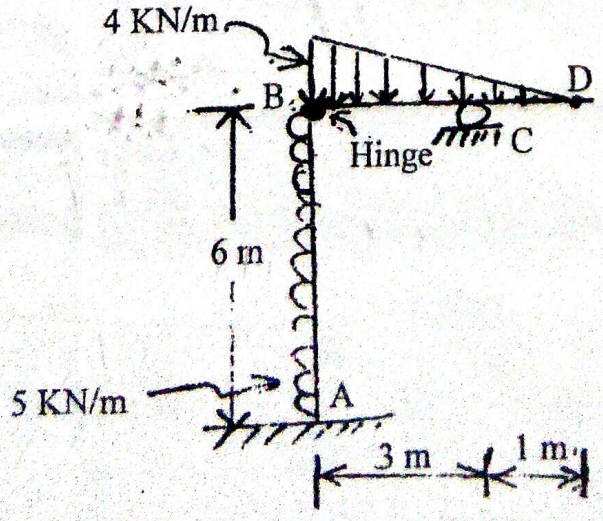
6. Determine the moment of inertia area about X-axis. [5]



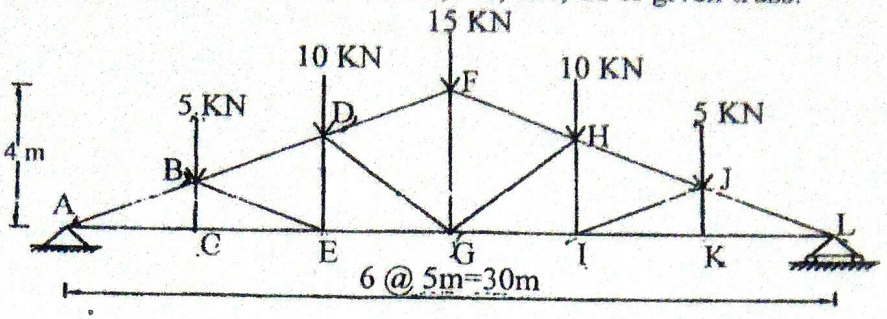
7. A block of weight $W_1 = 1800$ N rests on a horizontal surface and supports on the top of it another block of weight $W_2 = 1000$ N as shown in figure below. The block W_2 is attached to a vertical wall by the inclined string AB. find the magnitude of the horizontal force P, applied to the lower block as shown, that will be necessary to cause sliding to impend. The coefficient of static friction for all contact surfaces is 0.4. [6]



8. Deduce the relationship between load, shear force and bending moment for a beam section loaded uniformly with intensity of load W. Draw AFD, SFD and BMD of the given frame loaded as shown in figure below. Indicate also the salient features if any. [4+9]



9. Determine the member forces in member CE, FH, GH, GI of given truss. [8]



10. Two ships A and B are at a distance of 4800 m apart B being south east of A. Speed of A is 2.6 m/s due east and B is travelling at speed of 4.47 m/s due north. Determine: (a) The relative velocity of B w.r.t A (b) The shortest distance between them (c) Time taken to reach the shortest distance. [10]

11. What do you mean by principle of impulse and momentum? The resultant external force acting on a 30 N particle in space is, $\vec{F} = (12t\,\hat{i} - 24t^2\,\hat{j} + 30t^3\,\hat{K})$ N, where t is the time measured in seconds. Initially, particle is at origin and at rest. Determine Y-component of acceleration, velocity and position at the instant of 5 sec. [3+7]

***