05   TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division
2070 Chitra

| Exam.	Old Back (2065 & Earlier Batch)		
Level	BE	Full Marks	80
Programme	BCE, B.Agri.	Pass Marks	32
Year / Part	I / I	Time	3 hrs.

Subject: - Applied Mechanics I (Statics) (EG441CE)

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

1. a) Define Free Body Diagram with examples. Why it is necessary to assume a solid body as "Perfectly Rigid" for the study of statics? Define also the equation of statics equilibrium. [2+3+3]

   b) Two smooth rollers are supported by an inclined plane and a vertical wall as shown in figure below. Find the reaction at all contact points using the following information: $W_A = 100$ N, $Y_A = 10$ cm $W_B = 140$ N, $Y_B = 14$ cm. [8]
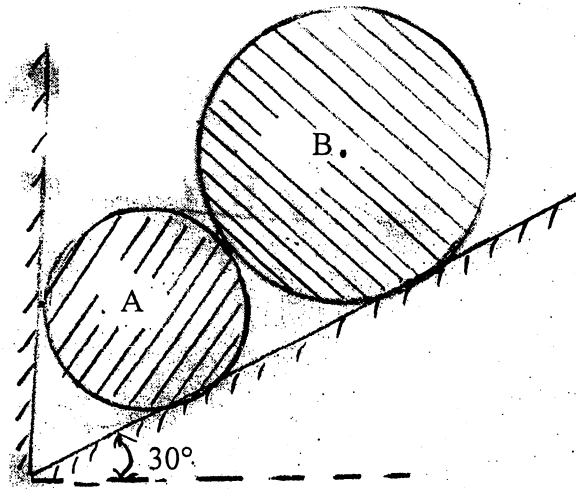

2. a) Define dot and cross product of two vectors. Define also the scalar triple product and show that "scalar triple product represents the volume of the parallelopiped." [2+4]

   b) Two wrenches are shown in figure below, determine the equivalent wrench and also indicate it's line of action. [10]
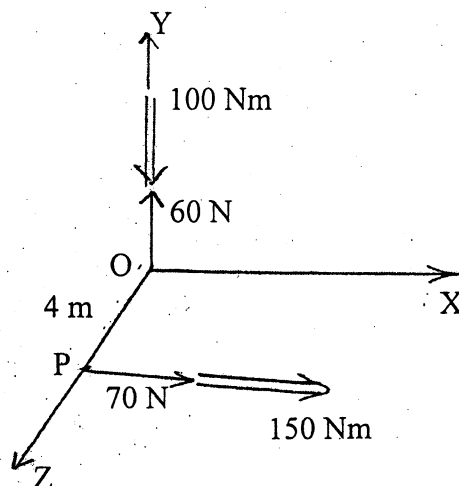

3. a) Define the terms: Centroid, Center of gravity and axis of symmetry. State and prove the parallel axis theorem for moment of inertia. [3+4]

b) Locate the centroid of the shaded area as shown in figure below by the method of integration. [9]
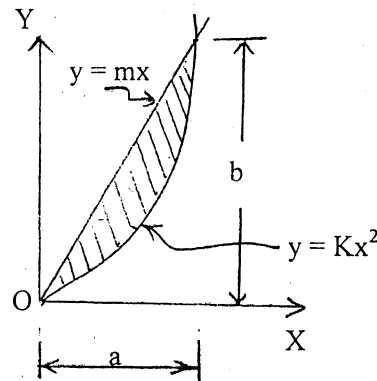

4. a) Obtain the expression for total pressure by the liquid on an inclined immersed surface. [6]

b) How can we assure the condition of sliding and overturning of a block? Explain with suitable example. A block of weight $W_1 = 800$ N rests on a horizontal surface and supports on top of it another block of weight $W_2 = 500$ 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 just sliding. The coefficient of static friction for all contact surfaces is 0.4. [3+7]
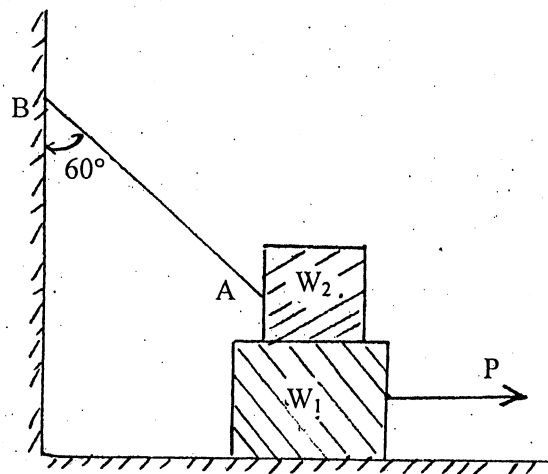
5. a) Define plane and space structures with examples. How can we check the determinacy and stability of the structures (ie beam, frame and truss)? Explain with suitable examples. [2+6]

b) Calculate the force developed in all the members of the truss loaded as shown in figure below. [8]
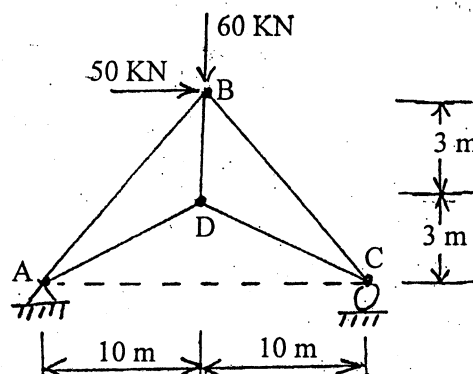
6. a) Obtain the relationship between load, shear force and bending moment for a beam
        section loaded with intensity of load w.   [4]

    b) Draw AFD, SFD and BMD of the given frame loaded as shown in figure below.
        Indicate also the salient features if any.   [12]

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