

# THE ENGINEERING JUNCTION

TRIBHUWAN UNIVERSITY  
INSTITUTE OF ENGINEERING

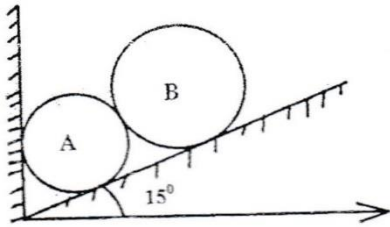
**Examination Control Division**  
2080 Baishakh

Exam	Back		
Level	BE	Full Marks	80
Program	BEL, BEX, BCT, BAM, BIE, BAG, BAR, BAG	Pass Marks	32
Year / Part	I/I	Time	3 hrs.

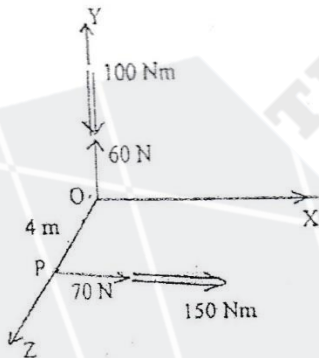
**Subject: - Applied Mechanics (CE 401)**

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

- Define particle and rigid body. Why it is necessary to assume a body as 'perfectly rigid' for your present study? [2+2]
- Explain why free body diagram is used for the analysis of the structure. The roller A and B rest in an inclined surface which makes an angle of  $15^\circ$  with the horizontal as shown in the figure below. Determine the reaction at contact points. Given that, weight of roller A and B = 100 N and 200 N respectively. Radius of roller A and B = 6mm and 9mm respectively. [3+7]

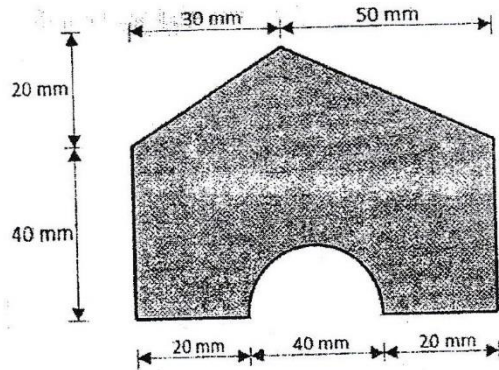


- Prove that couple is a free vector. Two wrenches are shown as in figure, determine the equivalent wrench and indicate its line of action. [3+6]

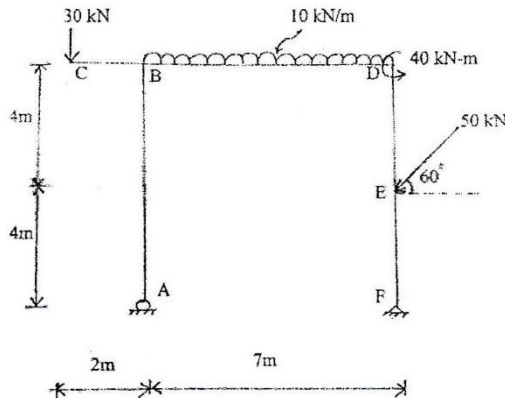


- Define angle of friction and coefficient of friction. Why coefficient of static friction is greater than coefficient of kinetic energy? [2+2]

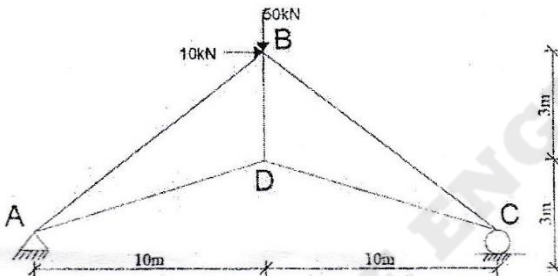
5. Define center of gravity, centroid and axis of symmetry. Calculate polar moment of inertia of the given composite are about its centroidal axis. [3+9]



6. Draw AFD, SFD and BMD for the following frames and mentions its salient features if any. [13]



7. Find the member force of given truss. How can we check the determinacy and stability of truss? [5+3]



8. The position of the particle which moves along a straight line is defined by the relation  $x = t^3 - 6t^2 - 15t + 40$  where  $x$  is expressed in meter and  $t$  in seconds. Determine (i) the time at which the velocity will be zero, (ii) the position and distance traveled by the particle at that time, (iii) the acceleration of the particle at that time, (iv) the distance traveled by the particle from  $t = 4s$  to  $t = 6s$ . What do you mean by dependent motion? Explain with suitable example. [8+2]

9. What is dynamic equilibrium? Two blocks shown in the figure starts from rest. The horizontal plane and the pulley are frictionless, and the pulley is assumed to be of negligible mass. Determine the acceleration of each block and tension in each cord. Take  $\mu_k$  for block A and horizontal plane as 0.3. [2+8]

