Name of Student_____ Sch. No._____

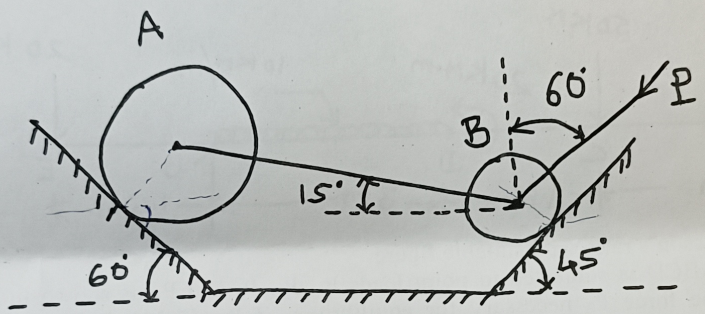
MAULANA AZAD NATIONAL INSTITUTE OF TECHNOLOGY, BHOPAL
DEPARTMENT OF CIVIL ENGINEERING

Examination: - End Term (Theory) *Month & Year*-:- June-July 2022
Course: - B. Tech. *Semester:* - II *Branch:* - All Branches (M. T.)
Subject Name: - Engg. Mechanics *Subject Code:* - CE-109
Time-:- 3 hours *Max. Marks*:- 50

Note: - Answer all questions. Make suitable assumptions if necessary.

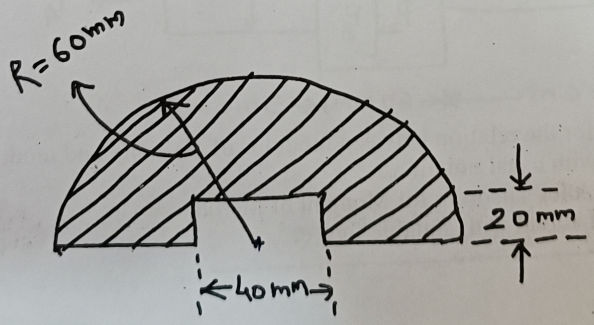
1 a) Explain Free Body Diagram with suitable figure. **(02)**

b) The cylinder A of weight 4000 KN & B of weight 2000 KN resting on smooth inclined planes. They are connected by a bar of negligible weight hinged to each cylinder at their geometric centers by smooth pins. Find the force P, as shown in the figure that keeps the system in equilibrium. **(07)**



2 a) Derive an expression for Moment of Inertia of a circle about its diametral axis. **(02)**

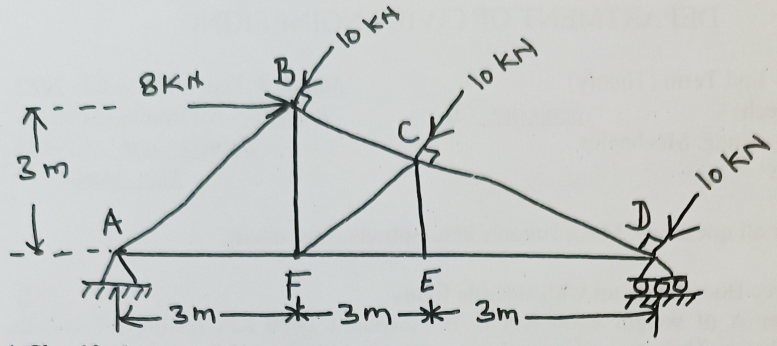
b) Determine the Moment of Inertia of the shaded area as shown in figure about horizontal centroidal axis. **(07)**



P.T.O.....

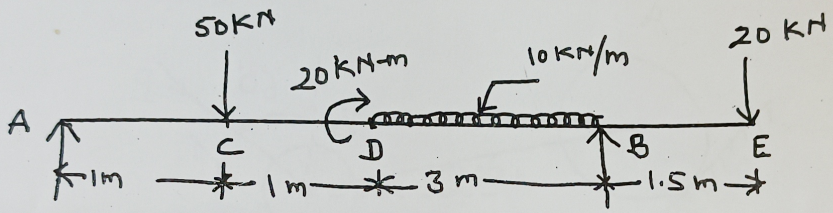
3a) Explain various types of trusses with suitable sketches. **(02)**

b) A truss is loaded as shown in figure. Find out the magnitude & nature of forces in all the members of the truss and tabulate the results. **(07)**



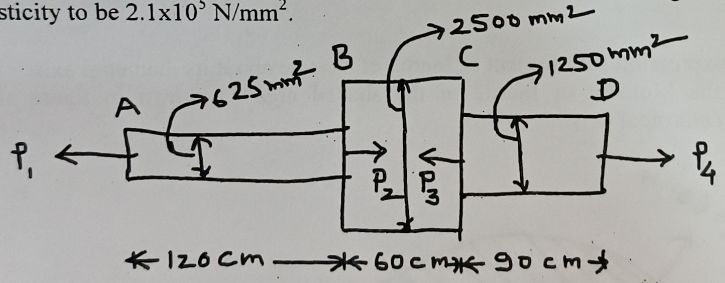
4 a) Classify the types of beams with suitable sketches. **(02)**

b) Draw Shear Force Diagram & Bending Moment Diagram for the beam loaded as shown in figure. Also locate the point of contraflexure if any. **(07)**



5 a) Explain Poisson's ratio with suitable figure. **(02)**

b) A member ABCD is subjected to point loads P_1, P_2, P_3 and P_4 as shown in figure. Calculate the force P_2 necessary for equilibrium, if P_1=45 kN, P_3=450 kN, and P_4=130 kN. Determine the total elongation of the member, assuming the modulus of elasticity to be 2.1×10^5 N/mm^2. **(07)**



6 a) Derive the expression for the relation between modulus of elasticity and modulus of Rigidity, E=2C(1+μ), with usual notations. **(02)**

b) State and prove Parallel Axes Theorem for Moment of Inertia. **(02)**

c) State and prove Lami's theorem with suitable figure. **(01)**
