Graphic Era HILL UNIVERSITY
Established by an Act of the State Legislature of Uttarakhand (Adhiniyam Sankhya 12 of 2011)
University under section 2(f) of UGC Act, 1956

Term Evaluation (Odd) Semester Examination September 2025

Roll no.....

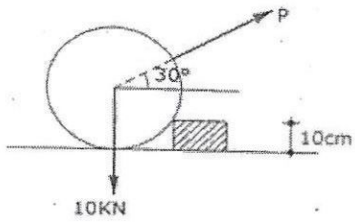
Name of the Course: B. Tech in Mechanical Engineering
Semester: 3rd
Name of the Paper: Engineering Mechanics
Paper Code: TME 306
Time: 1.5 hours **Maximum Marks: 50**

Note:
(i) Answer all the questions by choosing any one of the sub-questions
(ii) Each question carries 10 marks. Assume missing data, if any.

Q1. (10 Marks)
a. Explain the concepts of free-body diagram with examples. **CO1**

OR
b. State Lami's theorem. Write the conditions under which it is applicable. **CO1**

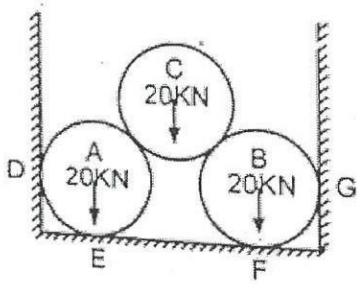
Q2. (10 Marks)
a. A cylindrical roller has a weight of 10 kN and it is being pulled by a force which is inclined at 30° with the horizontal as shown in the figure. While moving it comes across an obstacle 10 cm high. Calculate the force required to cross the obstacle, if the diameter of the roller is 1 m.



OR
b. State and prove Varignon's theorem using the principle of moments. **CO1**

Q3. (10 Marks)
a. State the Parallelogram law of forces. Also, discuss the principle of transmissibility. **CO1**

OR
b. Three smooth pipes, each weighing 20 kN and of diameter 60 cm, are to be placed in a rectangular channel with a horizontal base as shown in the figure. Calculate the reactions at the point of contact between the pipes and between the channel and the pipes. Take the width of the channel as 160 cm. **CO1**



Q4. (10 Marks)
a. A ball of weight 120 N rests in a right-angle groove as shown in the figure. The sides of the groove are

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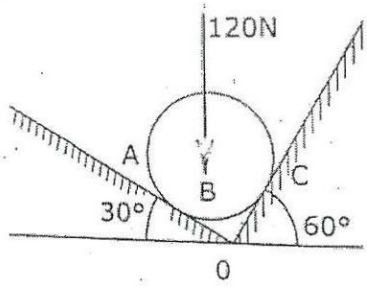
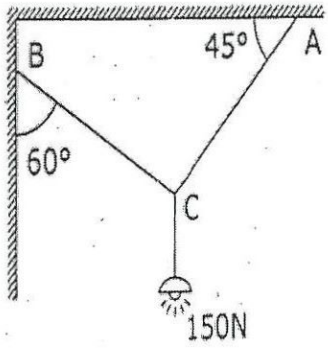
inclined at an angle of 30° and 60° to the horizontal. If all the surfaces are smooth, then determine the reactions RA and RC at the point of contact **CO1**



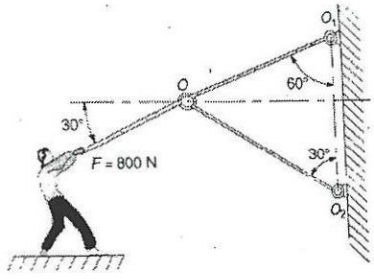
OR

b. A electric light fixture weighing 150 N hangs from a point C, by two strings AC and BC as shown in the figure. Determine the forces in the strings AC and BC. **CO2**



Q5. (10 Marks)

a. Two cables are tied together at the point O and loaded as shown in the figure. Determine the tensions in OO1 and OO2. **CO2**



OR

b. Two cylinders of diameters 100 mm and 50 mm, weighing 200 N and 50 N respectively, are placed in a trough as shown in Fig.. Neglecting friction, find the reactions at contact surfaces 1, 2, 3, and 4. **CO2**