U.S.N.										

B.M.S. College of Engineering, Bengaluru-560019

Autonomous Institute Affiliated to VTU

February / March 2024 Semester End Main Examinations

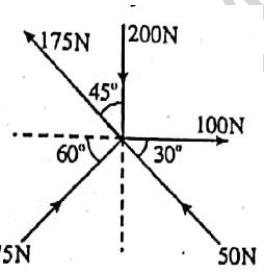
Programme: B.E. **Semester: I / II**
Branch: Common to all Branches **Duration: 3 hrs.**
Course Code: 18CV1ESENM / 18CV2ESENM **Max Marks: 100**
Course: Engineering Mechanics

Instructions: 1. Answer any FIVE full questions, choosing one full question from each unit.
2. Missing data, if any, may be suitably assumed.

Important Note: Completing your answers, compulsorily draw diagonal cross lines on the remaining blank pages. Revealing of identification, appeal to evaluator will be treated as malpractice.

UNIT - I

1 a) Find the resultant and its direction for the system of forces shown in the figure. **10**

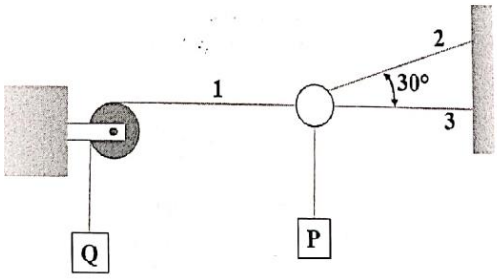


b) Describe i) Characteristics of couple ii) Principle of transmissibility iii)Continoum **10**

OR

2 a) Explain Free body diagram with example. **05**

b) In the figure below weights P = 2225 N and Q = 4450 N are suspended in a vertical plane by strings 1, 2 & 3 as shown. Find the tension induced in each string. **10**

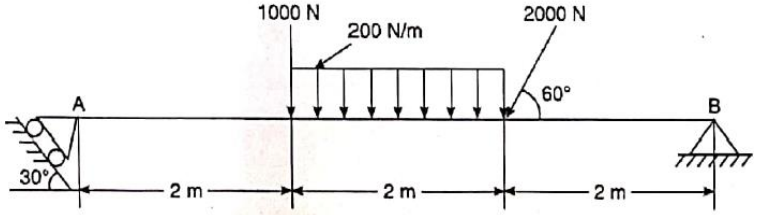


c) State and prove Lami's theorem. **05**

UNIT - II

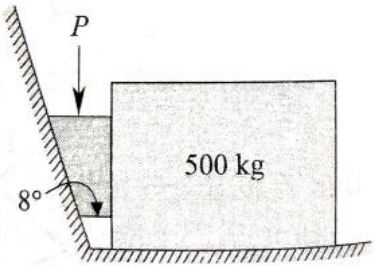
3 a) With reference to determination of support reactions in a beam, explain **10**
i) Types of Supports
ii) Types of Loads.

b) A horizontal beam 6m long is subjected to loads as shown in the figure. find the reactions at the supports. **10**



UNIT - III

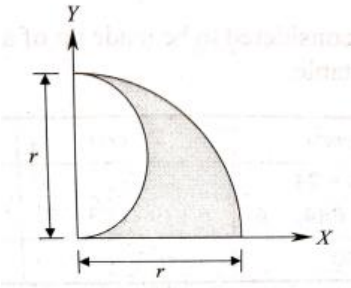
4 a) A heavy block of mass 500kg is to be adjusted horizontally using an 8^o wedge by applying a vertical force P. If the coefficient of static friction for both the contact surfaces of the wedge is 0.25 and that between the block and the horizontal surface is 0.5, determine the least force P required to move the block. **10**



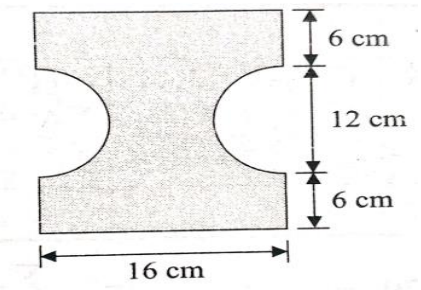
b) An 8 m long uniform ladder weighing 500 N is resting on a rough horizontal floor and inclined at an angle of 30^o with a vertical wall. A man weighing 750 N climbs the ladder. At what position will he induce slipping? The coefficient of friction between the ladder and the wall is 0.3 and that between the ladder and the floor is 0.2. **10**

UNIT - IV

5 a) Determine the centroid of the shaded area formed by removing a semicircle of diameter r from a quarter circle of radius r. **10**



b) For the composite section shown below, find the moments of inertia about the horizontal and vertical centroidal axes. **10**



UNIT - V

6 a) A cricket ball is hit by a batsman at height of 1. 6 m above the ground. The ball is caught by the fielder near the boundary at a height of 0.8 m above the ground exactly after 5 seconds. If the ball is hit with a velocity of 90 kmph. find the angle at which the ball is to be hit by the batsman. Find also the distance between the batsman and the fielder. **10**

b) Explain the terms Range, Time of flight as applied to projectile motion and writhe equations for the same with usual notations. **04**

c) Obtain an expression for path traced by projectile **06**

OR

7 a) State and explain D'Alembert's principle with example. **04**

b) Determine the angle of banking of a highway curve of 100m radius designed to accommodate cars travelling at 160kmph.The coefficient of friction between tyres and road is 0.6. Also find the rated speed of the curve. **06**

c) A bullet of mass of mass 20gms moving at 300m/s pierces a 3cm thick metal plate and emerges with velocity of 200m/s. Determine the average resistance of the plate. Also determine the minimum number of such plates each of 3cm thickness to be placed together to stop the bullet, Assume the same frictional force to be acting. Use work energy principle. **10**

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