U.S.N.										

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

Autonomous Institute Affiliated to VTU

May 2023 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 **Date: 16.05.2023**

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

UNIT - I

1 a) Determine the magnitude and direction of the resultant of the system of forces shown in Fig.1. **05**

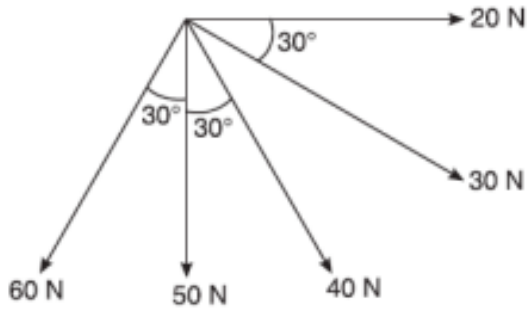

Fig-1

b) State and explain the principle of transmissibility of a force and principle of superposition of forces. **05**

c) Two identical rollers each of weight 700 N are supported by an inclined plane and vertical wall as shown in Fig.2. Find the reaction exerted by the wall and the inclined plane at C, D. **10**

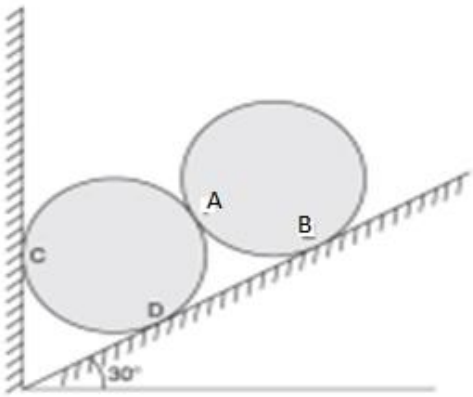

Fig 2

OR

2 a) A particle is acted upon by the following forces. 'P' N30^0 W and 'Q' S45 ^{0} E. If the resultant of P and Q is a force of magnitude 50kN acting N75^0 E, calculate the forces 'P' and 'Q'. **06**

b) State and prove Varignon's theorem. **04**

c) Determine the resultant with respect to point O of the force system shown in Fig.3. **10**

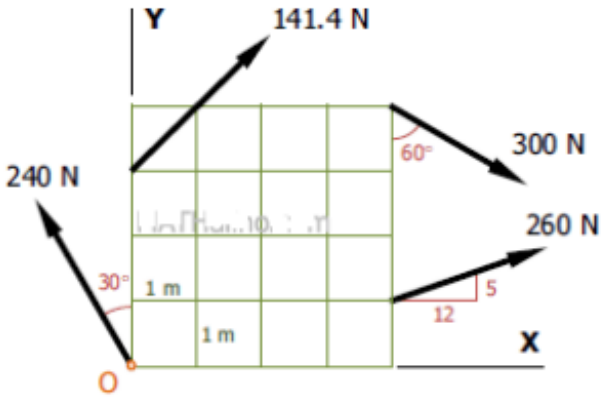

Fig 3

UNIT - II

3 a) Determine the support reactions for the overhanging beam shown in Fig.4. **10**

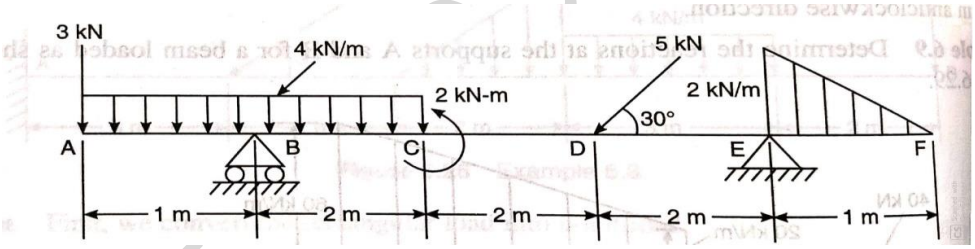

Fig 4

b) Determine the forces in all the members of the truss shown in Fig.5 below and indicate the magnitude and nature of the forces on the diagram of the truss. All inclined members are at 60^0 to horizontal and length of each member is 1.5m. **10**

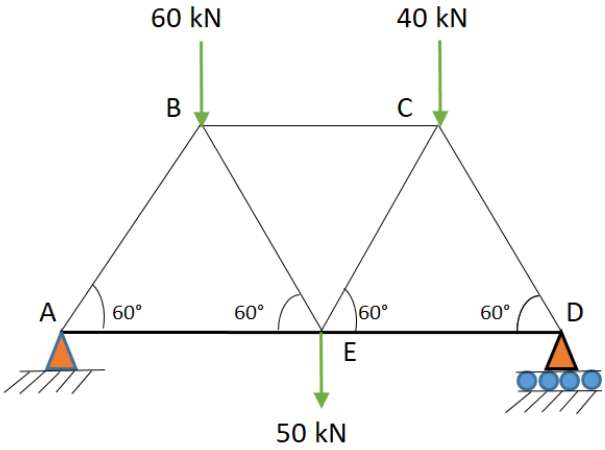

Fig 5

UNIT - III

4 a) State the coulombs laws of dry friction. **04**

b) Determine the least force P required for moving the block shown in Fig.6 below. The weight of the wedge may be neglected. The weight of the block is 100 kN. The angle of limiting friction for all contact surfaces may be taken as 15°. **08**

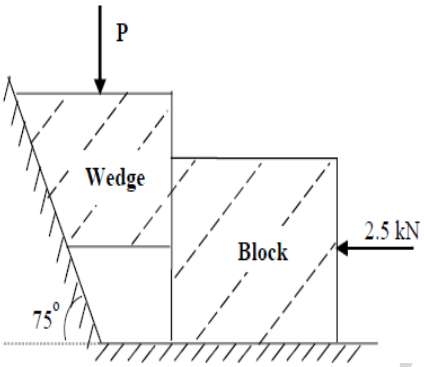

Fig.6

c) Find the minimum horizontal force 'P' required to stop the ladder shown in fig 7, when a man weighing 700N moves up the ladder for a distance of 1.5m along the ladder. Coefficient of friction between the floor and ladder is 0.2 and between the wall and ladder is 0.25. Assume weight of ladder as 200N. **08**

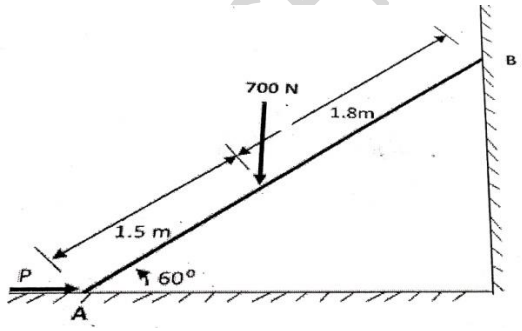

Fig 7

UNIT - IV

5 a) Develop an expression for centroid of right angled triangle by method of integration. **08**

b) Find the radius of gyration of the area shown in fig 8, about the horizontal and vertical centroidal axes. **12**

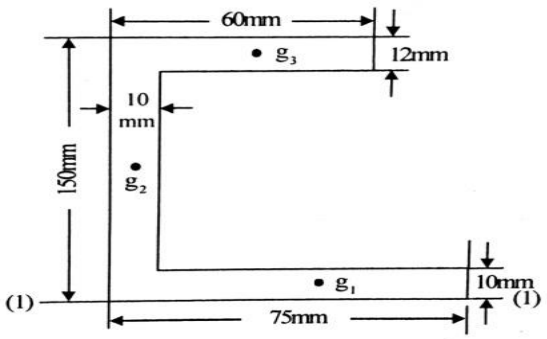

Fig 8

UNIT - V

6	a)	A cricket ball hit by a batsman at a height of 1.6m above the ground. The ball is caught by the fielder near the boundary at a height of 0.6m above ground exactly after 5 seconds. If the ball is hit with a velocity of 90kmph. 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)	State and explain D Alembert's principle.	**04**
	c)	Derive the equation for the path of a projectile.	**06**

OR

7	a)	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.	**08**
	b)	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.	**06**
	c)	Explain the principle of Impulse Momentum.	**06**

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