

**DR. BABASAHEB AMBEDKAR TECHNOLOGICAL UNIVERSITY, LONERE –
RAIGAD – 402 103**

Winter Semester Examination – December – 2019

Branch: B. Tech. (Group A / Group B)

Subject with Subject Code: Engineering Mechanics (ME102/ME202)

Date: 20 / 12 / 2019

Semester: I/II

Marks: 60

Time: 3 Hrs.

Instructions: 1] Attempt any 5 Questions. Each Question Carry 12 Marks.

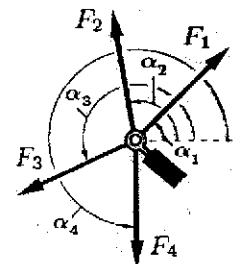
2] Figures to the right indicate full marks.

3] Assume suitable data, if necessary. Neat diagrams must be drawn wherever necessary.

Q. No. 1 Solve any two:

A) Define: Rigid body, Statics, and Line of action of force. (6)

B) An eyebolt is subjected to four forces as shown in figure. $F_1 = 12$ kN, $F_2 = 8$ kN, $F_3 = 18$ kN, $F_4 = 4$ kN that act at angles of $\alpha_1 = 45^\circ$, $\alpha_2 = 45^\circ$, $\alpha_3 = 100^\circ$, $\alpha_4 = 205^\circ$, $\alpha_5 = 270^\circ$. Determine the magnitude and direction of the resultant force (6)

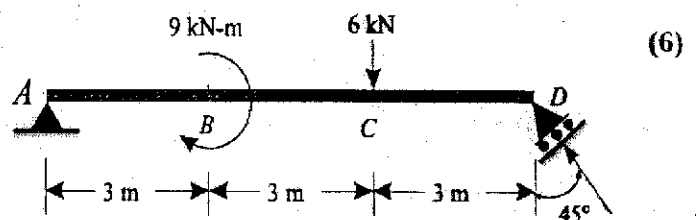


C) State: Parallelogram law of forces. (6)

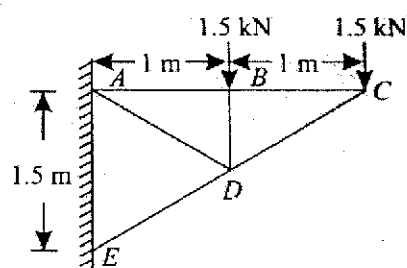
Solve: Two persons are pushing a box so that the net force on the box is 12 N to the east. If one of the person is applying a force 5 N to the north, what is the force applied by the other person.

Q. No. 2 Find the support reactions for a simply

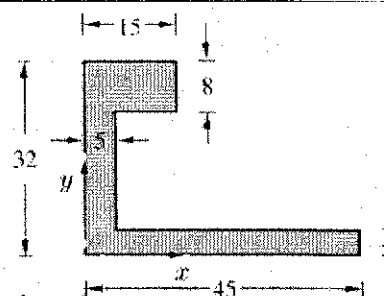
A) supported beam shown in figure. (6)



B) Determine the forces in the various members of a pin-jointed frame as shown in figure. Tabulate the result stating whether they are in tension or compression. (6)

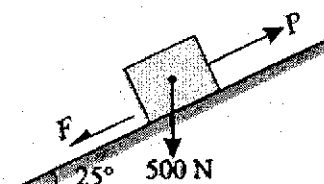


- Q. No. 3** Determine the coordinates x_c and y_c of a plane lamina as shown in figure.



(6)

- B)** A block of weight 500 N is lying on a rough plane inclined at an angle of 25° with the horizontal. It is supported by a pull (P) parallel to the plane as shown in figure. The angle of friction is 20° . Determine the minimum and maximum values of P , for which the equilibrium can exist.



(6)

- Q. No. 4** A ball is projected upwards with a velocity of 60 m/s and reaches a maximum height of 5 metres above ground level. Determine the angle of projection and point where it hits the ground.

- A)** A wheel increases its speed from 45 r.p.m. to 90 r.p.m. in 30 seconds. Find (a) angular acceleration of the wheel, and (b) no. of revolutions made by the wheel in these 30 seconds.

(6)

- Q. No. 5** At a certain instant, a body of mass 10 kg, falling freely under the force of gravity, was found to be falling at the rate of 20 m/s. What force will stop the body in (i) 2 seconds and (ii) 2 metres?

- A)** State and explain in brief D'Alembert's principle.

(6)

- Q. No. 6** A railway engine of mass 20 tonnes is moving on a level track with a constant speed of 45 km.p.h. Find the power of the engine, if the frictional resistance is 80 N/t. Take, efficiency of the engine as 80 %.

- A)** What is meant by Newton's law of collision of elastic bodies? Write its mathematical expression.

(4)

- B)** State: The work-energy principle for a system of particles.

(4)

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