SVKM

D. J. Sanghvi College of Engineering

Programme: B.TECH (AIDS)/B.TECH (AIML)/B.TECH (EXTC)/B.TECH (IOT)/B.TECH (MECH)

Year: I/Semester I (Exam Year: 2023-2024)

Subject: Computational Engineering Mechanics

Date: 13 Jan 2024 **Time:** 02:30 pm - 04:30 pm (02:00 Hrs.)

Max Marks: 60

FINAL EXAMINATION(Acad. Year: **2023-2024**)

Instructions:

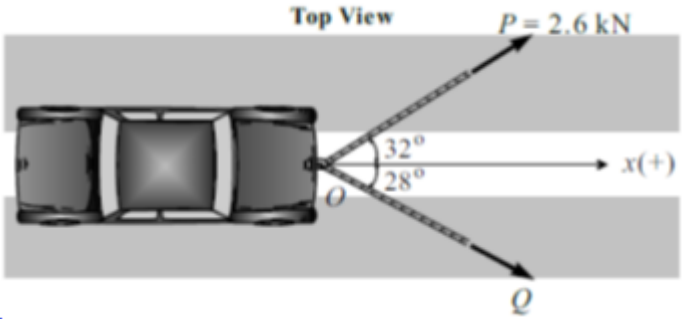
1. This question paper contains 6 pages
2. Candidates should read carefully the instructions printed on the question paper and on the cover page of the Answer Book, which is provided for their use.
3. (1) This question paper contains ___ pages.
4. (2) All Questions are Compulsory.
5. (3) Answer to each new question is to be started on a fresh page.
6. (4) Figures in the brackets on the right indicate full marks.
7. (5) Assume suitable data wherever required, but justify it.
8. (6) Support your answers with neat labelled diagrams, wherever necessary.

---

1. 1 **15**

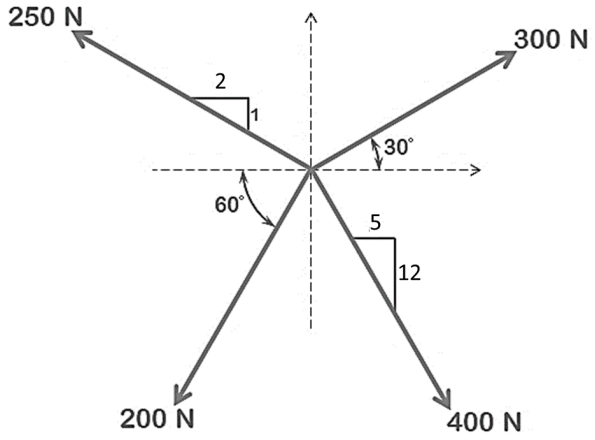
a. **5**

1. A car is pulled by means of two ropes as shown in Fig. The tension in one rope is P = 2.6 kN. If the resultant of two forces applied at O is directed along the x-axis of the car. Find the tension in the other rope and magnitude of the resultant. **5**

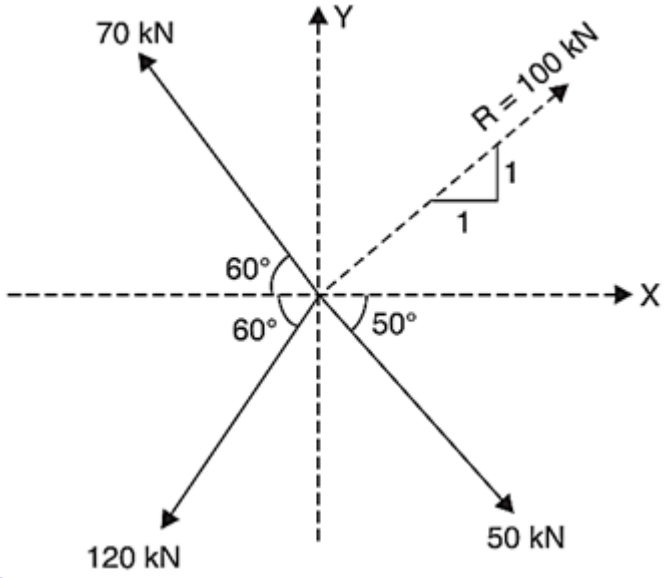


---------- OR ----------

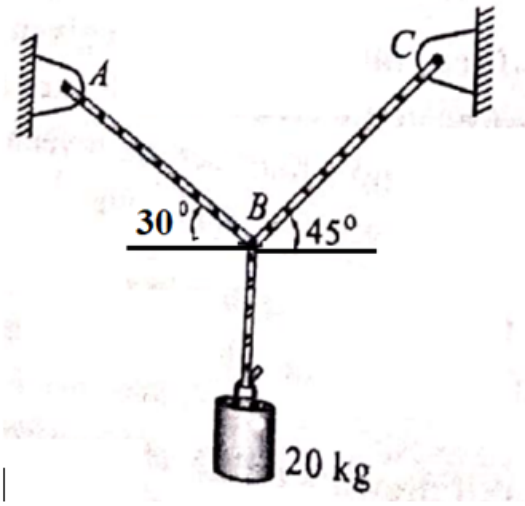
2. Determine the resultant of the forces acting as given in the figure below. Find the angle which the resultant makes with the positive x-axis. **5**



b. The resultant of four forces is 100 KN. Three of these are shown in figure. Determine the fourth force. **5**



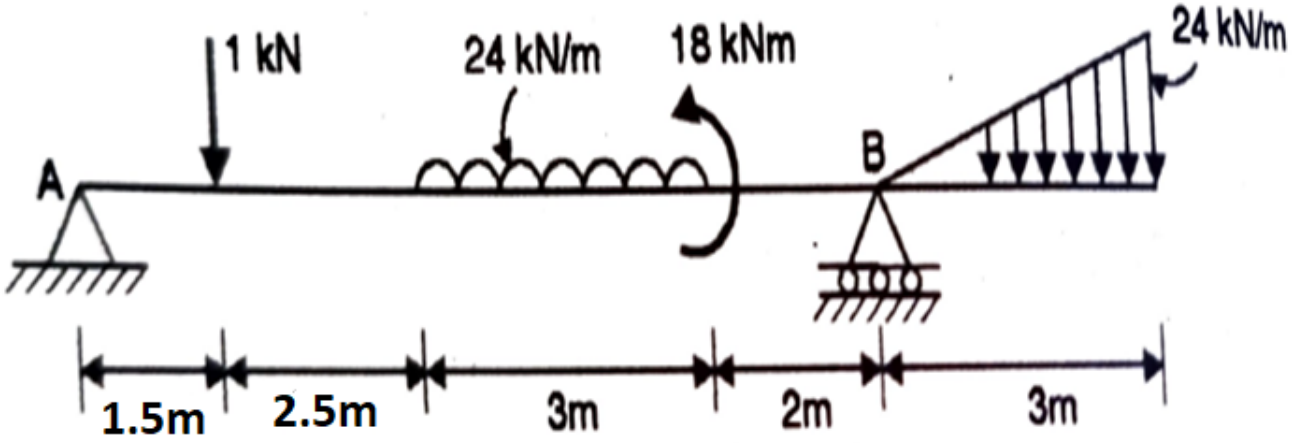
c. Determine the tension in cord AB and BC for equilibrium of 20 Kg block shown in the given figure. **5**



2. 2 **15**

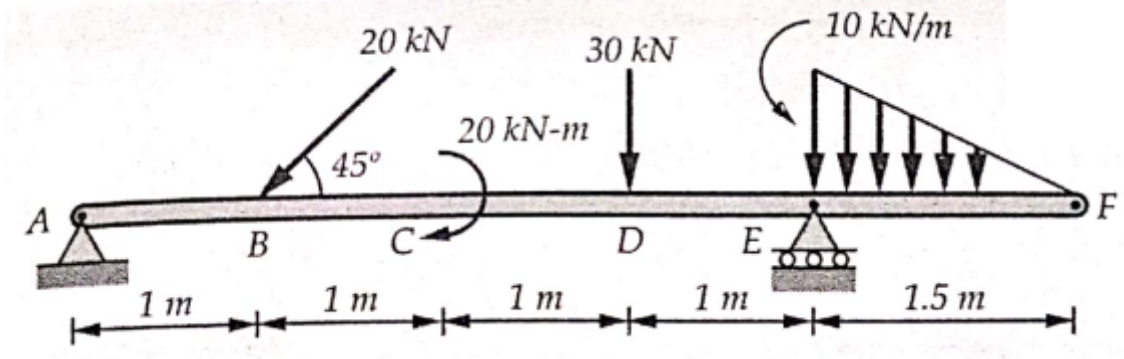
a. **8**

1. Find Support reaction at A and B for the beam as shown in the figure **8**

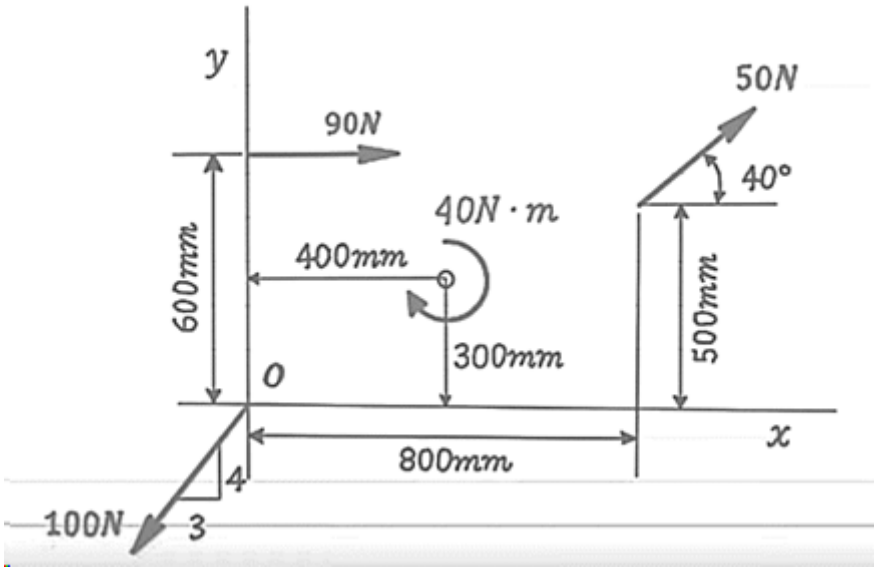


---------- OR ----------

2. A beam ABCDEF is hinged at A and supported on rollers at E and carries loads as shown in Fig. Determine the reactions at supports. **8**



b. Determine the resultant of force system shown. Also find the X – intercept and Y – intercept of the resultant **7**



3. 3 **15**

a. **8**

1. A flat belt drives a pulley at a speed of 1440m/min; μ is 0.3, groove angle 45° and angle of lap is 160°. If the mass of belt is 0.45 kg/m and if permissible pull in the belt is 800N. Calculate the power in kilowatts, considering the centrifugal tension in the belt. **8**

---------- OR ----------

2. In an open-belt drive, the angle of lap on the smaller pulley is 172^0. The smaller pulley has a diameter of 800 mm and rotates at 600 rpm. Consider coefficient of friction between the pulley and belt as 0.3. Neglecting centrifugal tension, find the power that can be transmitted if the initial tension in the belt is 1200 N. **8**

b. **7**

1. A line PQ with end points P (2, 3) and Q (7, 8) is to be rotated about origin by 30° in clockwise direction. Determine the coordinates of the end points for a rotated line. **7**

---------- OR ----------

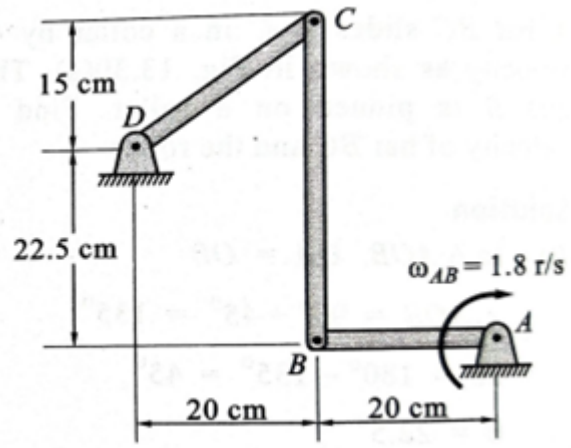
2. A square is formed by four points whose coordinates are: A (0, 0), B (8.66, 5), C (3.66, 13.66), and D (-5, 8.66) with point A is located on the origin with one of the edge at an angle of 30° with **7**

positive X-axis. Determine the new position of square, if it is rotated about -axis by an angle 30° in clockwise direction.

4. 4 **15**

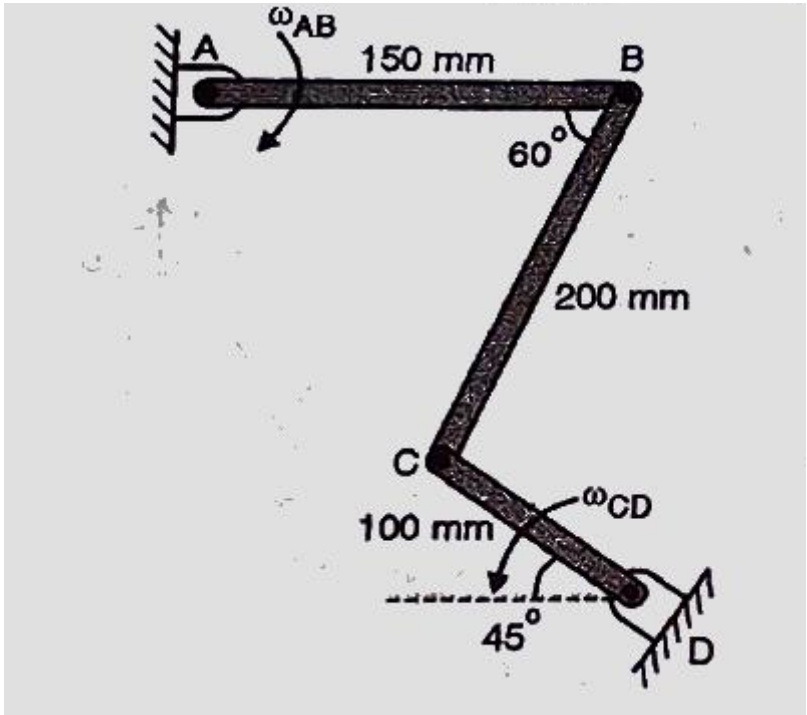
a. **8**

1. In the position shown in fig, rod AB is horizontal and has angular velocity 1.8 rad/sec in clockwise direction. Determine angular velocities of BC and CD? **8**



---------- OR ----------

2. If the link CD is rotating at an angular velocity of 5 rad/s anticlockwise, determine the angular velocity of link AB at the instant shown. **8**



b. Two identical rollers each of mass 50 kg are supported by an inclined plane and a vertical wall at an **7**

angle of 30 degrees as shown in Fig. Assuming smooth surfaces, find the reactions induced at the point of supports A, B and C.