

Code No: 111AC

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

B.Tech I Year Examinations, July - 2021

ENGINEERING MECHANICS

(Common to CE, ME, MMT, AE, AME, MIE, PTM, AGE)

Time: 3 hours

Max. Marks: 75

Answer any five questions

All questions carry equal marks

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Note: Illustrate your answers with NEAT sketches wherever necessary.

- 1.a) A system of five forces of magnitudes 4 kN, 5 kN, 6 kN, 7 kN, and 8 kN act at one of the vertices of a regular hexagon as shown in figure 1. And the forces pass through the other vertices as indicated. Find the magnitude and direction of the resultant of the system of forces.

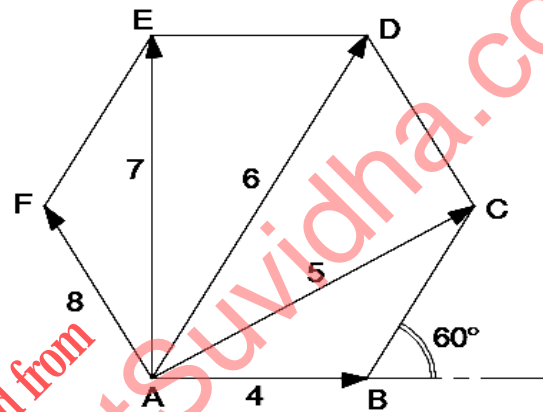


Figure: 1

- b) Differentiate between active and reactive forces. [9+6]
- 2.a) Four forces, each of 32 kN, 24 kN, 24 kN and 120 kN are concurrent at the origin, and are respectively directed through the points whose coordinates are: A(2, 1, 6), B(4, -2, 5), C(-3, -2, 1) and D(0, 1, -2). Find the magnitude and direction of the resultant of the system of forces.
- b) What are the steps to be followed while drawing free body diagrams? [9+6]
- 3.a) Derive an expression for the Angle of Contact in the case of Cross belt drive.
- b) The distance between adjacent threads of a double – threaded screw jack is 10mm; mean radius is 60 mm; coefficient of friction is 0.10; what load can be raised by exerting a moment of 100 N-m? [8+7]
4. A belt transmitting power weighs 23.54 N/m, and the maximum permissible tension for the belt is 5395 N. The angle of lap is  $200^\circ$ , and the coefficient of friction is 0.28. If the belt runs under maximum power conditions, determine the maximum power transmitted (considering the effect of centrifugal tension). [15]

5. Find the moment of inertia of the shaded area shown in figure 2 with respect to the x axis. All dimensions are in mm. [15]

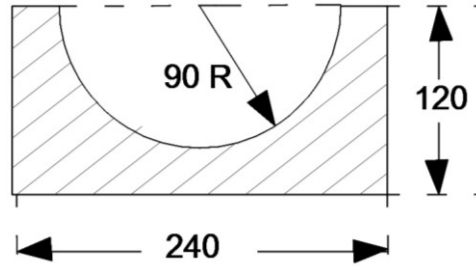


Figure: 2

6. Determine the C.G. of the plane figure shown in figure 3. [15]

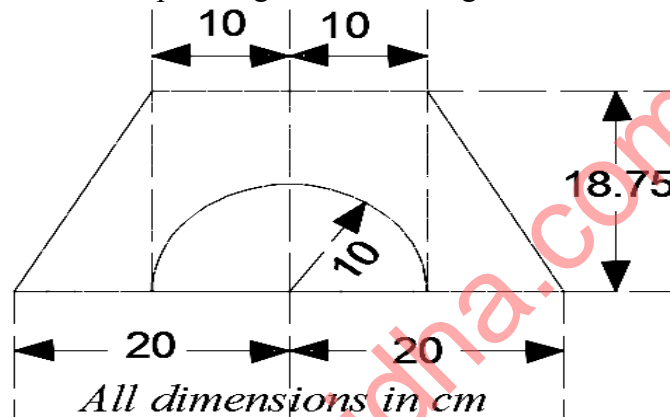


Figure: 3

7. Two vehicles travel between two stations 50 km apart. Both vehicles start at the same time from the same station. The first vehicle travels at 50 km per hour while the second vehicle travels at 30 km per hour. If the first vehicle halts in the second station and then returns with the same speed, find where the two vehicles will meet. [15]
- 8.a) Express the K.E. of a rigid body as the sum of translational motion of its centre of mass and kinetic energy of rotation about its centre of mass.
- b) A compound pendulum consists of a circular metallic plate suspended by a thin metallic strip, as shown in figure 4. If their respective masses are 0.4 kg and 0.2 kg, determine the angular acceleration of the pendulum at the instant it is released from the position shown. [6+9]

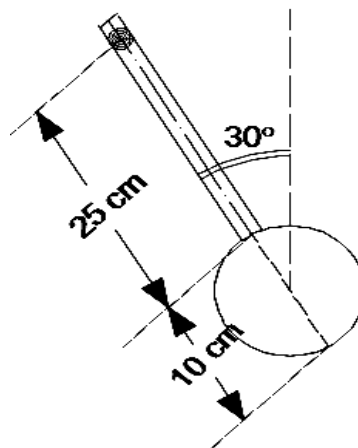


Figure: 4

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