R17 Regulation *Subject code:1E1AE*

TKR COLLEGE OF ENGINEERING AND TECHNOLOGY

(Autonomous, Accredited by NAAC with 'A' Grade)

B.Tech I Semester Supplementary Examinations, September 2023

Engineering Mechanics

(Common to CE,EEE,ME,ECE,CSE & IT)

Maximum Marks: 70 *Date:05.10.2023* Duration: 3 hours

Note:
1. **This question paper contains two parts A and B.**
2. **Part A is compulsory which carries 20 marks. Answer all questions in Part-A.**
3. **Part B consists of 5 Units. Answer any one full question from each unit.**
4. **Each question carries 10 marks and may have a, b, c, d as sub questions.**

Part-A

All the following questions carry equal marks (2M X 10 = 20Marks)

1 State the Lami's theorem.

2 State the parallelogram law of forces.

3 State the Laws of friction.

4 Define Angle of Friction.

5 State perpendicular axis theorem.

6 Define centroid.

7 State D'Alembert principle giving equations

8 Write about Polar mass moment of inertia.

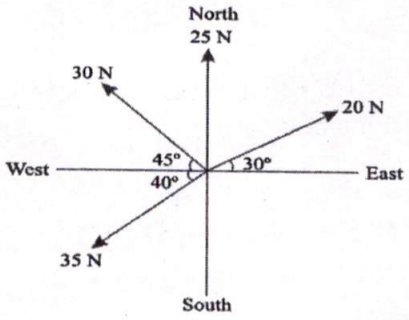
9 What is mean by virtual work?

10 Write about mechanical vibration.

Part-B

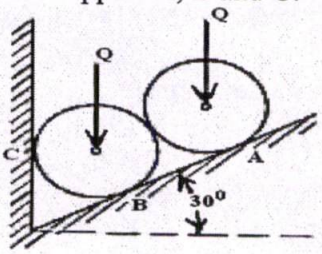
Answer All the following questions. (10M X5=50Marks)

11 The following forces act at a point: (i) 20 N inclined at 30° towards North of East, (ii) 25 N towards North, (iii) 30 N towards North West, and (iv) 35 N inclined at 40° towards South of West. Find the magnitude and direction of the resultant force. 10 M



OR

12 Two identical rollers, each of weight 100 N, are supported by an inclined plane and a vertical wall as shown in the following figure. Assuming smooth surfaces, find the reactions induced at the points of support A, B and C. 10M

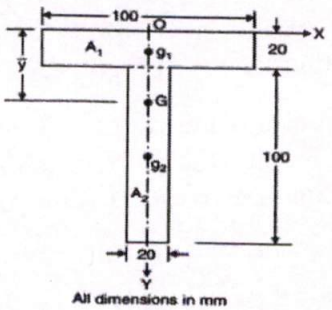


13 A ladder 5 m long rests on a horizontal ground and leans against a smooth vertical wall at an angle of 70^0 with the horizontal. The weight of the ladder is 300 N. The ladder is on the verge of sliding when a man weighing 750 N stands on a rung 1.5 m along the ladder. Calculate the coefficient of friction between the ladder and the floor. 10M

OR

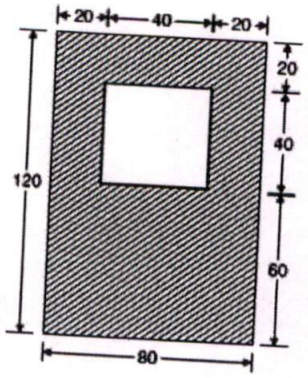
14 Derive the centroid of the triangular area? 10M

15 Find the centroid of the T-section as show in figure. 10M

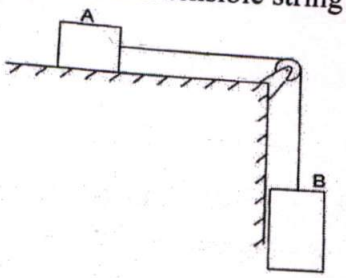


OR

16 For the shaded area as shown in the following figure, determine the Moment of Inertia of an area of plane figure about their centroidal axes. All units are in centimeters. 10M



17 Two blocks A and B connected with in extensible string as shown in fig. 10M



If the system is released from rest, determine the velocity of the block A after it has moved 1.5m. Assume the coefficient of friction between block A and plane is 0.25. Masses of block A and B are 200Kg and 300Kg respectively.

OR

18 a) Calculate the moment of inertia and radius of gyration of grinding stone 90cm in diameter and 10cm thickness with respect to its axis of rotation. Stone density is $0.0026Kg/cm^3$. 5M

b) A cylinder of diameter 600mm and height 1200mm has a mass density of $800Kg/cm^3$. Find mass moment of inertia of cylinder 5M
i. with respect to the axis of cylinder
ii. about a line, through center and perpendicular to axis/length.

19 Explain about virtual work? What is the principle of virtual work and mention applications of virtual work? 10M

OR

20 A body performing SHM has a velocity14m/s when the displacement is 60mm and 4m/s when the displacement is 100mm, the displacement being measured from the mid-point. Calculate the frequency and amplitude of the motion. What is the acceleration when the displacement is 75cm? 10M