R20 Regulation *Subject code:* **3E2AD**

TKR COLLEGE OF ENGINEERING AND TECHNOLOGY

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

B.Tech II Semester Regular/Supplementary Examinations, October 2022

ENGINEERING MECHANICS

(Common to CE & ME)

Maximum Marks: 70 Date:20.10.2022 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 (10x2M=20 Marks)

1 A force of 100N is acting at a point making an angle of 30° with the horizontal. Determine the components of this force along x and y directions.
2 State Lami's theorem.
3 Define (i) Coefficient of Friction (ii) Angle of Friction
4 Differentiate between Centroid and Centre of gravity
5 Define radius of gyration
6 Define mass moment of Inertia
7 State D'Alemberts principle
8 What is Instantaneous centre of rotation
9 Define simple harmonic motion
10 State the principle of virtual work. State its applications.

Part-B

Answer All the following questions. (5X10M=50Marks)

11 The resultant of two forces acting at an angle of 60^0 is $\sqrt{49}$. If they act at right angle their resultant would be $\sqrt{34}$. Find the magnitude of the forces. (10M)

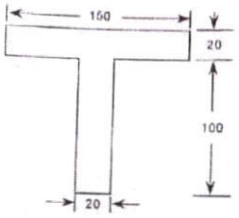
OR

12 A lamp weighing 5N is suspended from the ceiling by means of a wire. It is pulled to one side by a horizontal cord, until the wire makes an angle of 60° with the ceiling. Find the tension in the wire and cord. (10M)

13 Explain the principle of screw jack. Derive an expression for an effort required to lift the load. (10M)

OR

14 Find the centre of gravity of the Lamina shown in the figure. All dimensions are in mm. (10M)

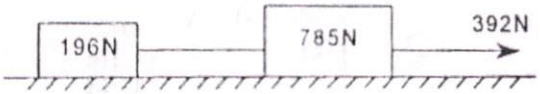


15 Find the moment of inertia of rectangular lamina of 30mm wide and 70mm deep about its centre of gravity and least radius of gyration. (10M)

OR

16 A cylinder of diameter 500mm and height 1200mm has mass density of 8000kg/m^3. Find out the mass moment of inertia of the cylinder (a) with respect to the axis of the cylinder and (b) about a line, through center, and perpendicular to longitudinal axis. (10M)

17 Two weights 785N and 196N are connected by a thread and move along a rough horizontal plane under the action of a force 392N applied to the first weight of 785N as shown in the figure. The coefficient of friction between the sliding surfaces of the weights and the plane is 0.3. Determine the acceleration of weights and tension in the thread using D'Alemberts principle. (10M)



OR

18 An engine and a train having a load of 300 tones are moving on a straight horizontal track with uniform speed of 48kmph. If the frictional resistance is 68N per ton, calculate the power exerted by the engine. If the train moves up a gradient of 1 in 200, what additional power is required to maintain the speed. (10M)

19 A body performing simple harmonic motion has a velocity of 12 m/s when the displacement is 50mm and 3m/s when the displacement is 100mm, the displacement being measured from the midpoint. Calculate the frequency and amplitude of the motion. What is the acceleration when the displacement is 75mm. (10M)

OR

20 A uniform ladder of weight 300N rests against a smooth vertical wall and rough horizontal floor making an angle of 60° with the horizontal. Find the force of friction at the floor using the method of virtual work. (10M)