R20 Regulation *Subject code: 3E2AD*

TKR COLLEGE OF ENGINEERING AND TECHNOLOGY

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

B.Tech II Semester Regular Examinations, September 2021

ENGINEERING MECHANICS

(Common to CE & ME)

Maximum Marks: 70 Date:17.09.2021 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 Define the term free body diagram with an example.
2 State parallelogram law of forces.
3 Define the terms angle of repose and coefficient of friction.
4 State Pappu's theorem-I.
5 What is the mass moment of inertia of a thin rectangular plate of base (b), height (h) and mass density (ρ).
6 Differentiate between "Area moment of inertia" and "Mass moment of inertia".
7 Write the equation of work-energy for rectilinear motion of a particle.
8 Explain D' Alembert's principle.
9 What are the main causes of vibration?
10 Define the following terms.
a) Simple Harmonic motion b) Degree of freedom

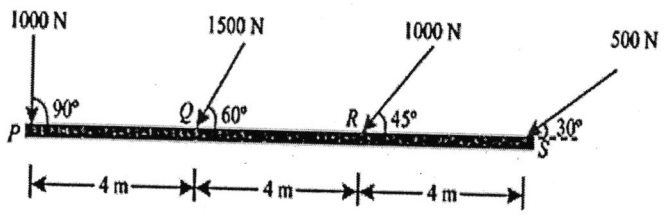
Part-B

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

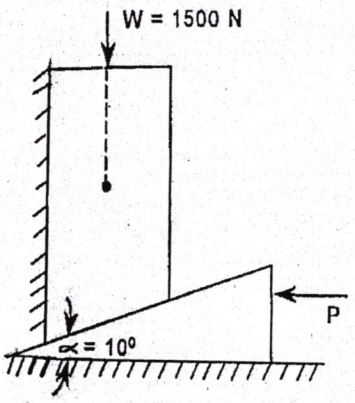
11 a) Explain various system of forces with neat sketches. [5M]
b) Concurrent forces 3P, 7P and 5P act respectively along three directions, which are parallel to the side of an equilateral triangle taken in order. Determine the magnitude and direction of the resultant. [5M]

OR

12 A horizontal line PQRS is 12 m long, where PQ = QR = RS = 4 m. Forces of 1000 N, 1500 N, 1000 N and 500 N act at P, Q, R and S respectively with downward direction. The lines of action of these forces make angles of 90°, 60°, 45° and 30° respectively with PS. Find the magnitude, direction and position of the resultant force. [10M]

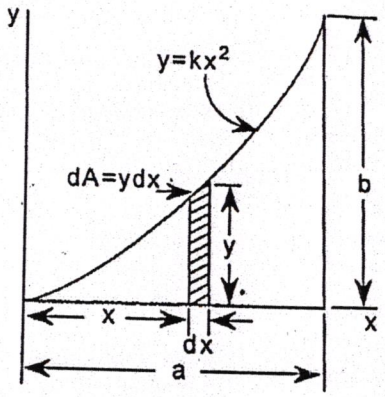


13 A block overlying a 10° wedge on a horizontal floor and leaning against a vertical wall and weighting 1500N is to be raised by applying a horizontal force to the wedge. Assume the coefficient of friction between all the surfaces in contact be 0.3, determine the minimum horizontal force to be applied to raise the block. [10M]



OR

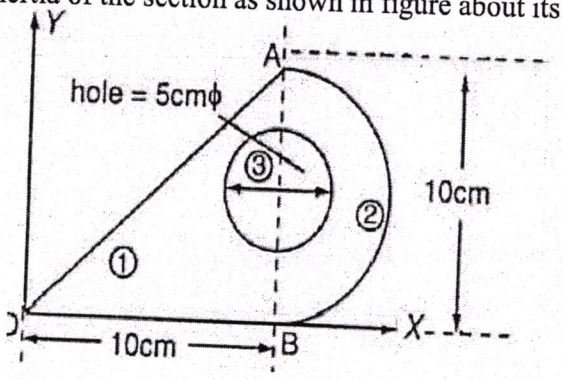
14 Determine the centroid of parabolic spandrel as shown in figure. [10M]



15 Determine the mass moment of inertia of a solid sphere of radius R about its any diametric axis. [10M]

OR

16 Find the moment of inertia of the section as shown in figure about its AB. [10M]



17 A block weighing 2500 N rests on a level horizontal plane for which coefficient of friction of 0.2. This block is pulled by a force of 1000 N acting at an angle of 30^0 to the horizontal. Find the velocity of the block after it moves 30 m starting from rest. If the force of 1000 N is then removed, how much further will it move? Use work energy method. [10M]

OR

18 a) Derive the equation of motion for a rectilinear motion of a particle as stated by D' Alembert Principle. [4M]

b) Explain the Work – Energy Applications to particle motion in Connected Systems [6M]

19 What is virtual work, principle of virtual work and its applications? [10M]

OR

20 A particle moving with simple harmonic motion has velocities of 8 m/s and 4 m/s at the distance of 1 m and 2 m from the mean position. Determine (a) amplitude (b) time period (c) maximum velocity and (d) maximum acceleration of the particle. [10M]