R18 Regulation *Subject code: 2E2AD*

TKR COLLEGE OF ENGINEERING AND TECHNOLOGY

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

B.Tech II Semester Supplementary Examinations, October 2022

ENGINEERING MECHANICS

(Common to CE & ME)

Maximum Marks: 70 Date:18.10.2022 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

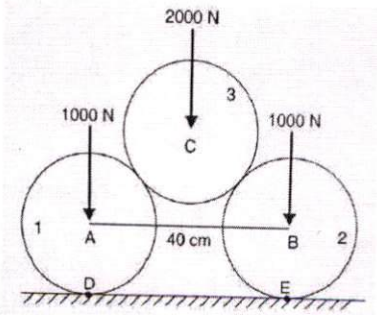
All the following questions carry equal marks (10x2M=20 Marks)

1 What are coulomb's laws of dry friction?
2 State parallelogram law of forces.
3 Define the terms angle of repose and coefficient of friction.
4 What is the concept of limiting friction?
5 Define the theorem of Pappus.
6 Define Centroid.
7 Write the equation of work-energy for rectilinear motion of a particle.
8 State the D' Alembert principle.
9 What are the main causes of vibration?
10 Write the Work energy equation for Translation motion.

Part-B

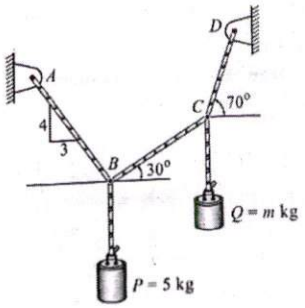
Answer All the following questions. (5X10M=50Marks)

11 Two smooth circular cylinders, each of weight W = 1000 N and radius 15 cm, are connected at their centers by a string AB of length = 40 cm and rest upon a horizontal plane, supporting above them a third cylinder of weight = 2000 N and radius 15 cm as shown in the following figure. Find the force S in the string AB and the pressure produced on the floor at the points of contact D and E. [10M]



OR

12 A block P is 5kg and block Q of mass m kg are suspended through the cord which is in the equilibrium position, as shown in below fig. determine the mass of Q? [10M]



13 Derive the Centroid of regular rectangular and circular sections. [10M]

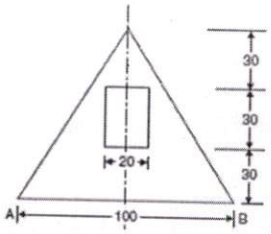
OR

14 A body of weight 300 N is lying on a rough horizontal plane having a coefficient of friction as 0.3. Find the magnitude of the force which can move the body, while acting at an angle of 25° with the horizontal. [10M]

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

OR

16 Determine the moment of inertia an area of a triangle with a rectangular cut as shown in the following figure, about the base *A-B* and the centroidal axis parallel to *AB*. (All dimensions are in Centimeters). [10M]



17 The acceleration of a particle is defined by the relation $a= 25-3x^2$ mm/s^2. The particle starts with no initial velocity at the position x=0, determine: [10M]
i) The velocity when x=2mm, ii) The position when velocity is again zero and
iii) The position where the velocity is maximum and the corresponding maximum velocity.

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 In a spring -mass vibrating system, the natural frequency of vibration is reduced to half the value when a second spring is added to the first spring in series. Determine the stiffness of a second spring in terms of that of the first spring. [10M]