Hall Ticket No | | | | | | | | | | | Question Paper Code: AMEC01

INSTITUTE OF AERONAUTICAL ENGINEERING

(Autonomous)

B.TECH II Semester End Examinations (Regular) AUGUST- 2021

Regulation:UG20

ENGINEERING MECHANICS

Time: 3 Hours **(AE|ME|CE)** **Max Marks: 70**

Answer all questions in Modules I and II
Answer ONE out of two questions from Modules III, IV and V
(NOTE: Provision is given to answer TWO questions from among one of the Modules III / IV / V)
All Questions Carry Equal Marks
All parts of the question must be answered in one place only

MODULE – I

1. (a) What is resolution of forces? Distinguish clearly between resolution of forces and composition of forces. **[7M]**

   (b) Determine the resultant of the four forces acting on the rod as shown in the Figure 1. **[7M]**

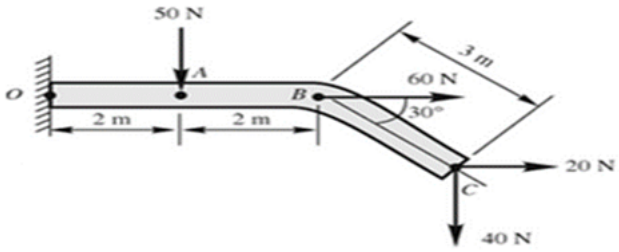

Figure 1

MODULE – II

2. (a) Write short notes on the following terms:
   i) Limiting friction ii) Angle of friction iii) Angle of repose iv) Cone of friction. **[7M]**

   (b) A ladder 5m long and 250N weight is placed against a vertical wall in a position where its inclination to the vertical is 30^0. A man weighing 800N climbs the ladder. At what position will he induce slipping of the ladder? The coefficient of friction for both the contact surfaces of the ladder i.e., with the wall and the floor is 0.2. **[7M]**

MODULE – III

3. (a) State and explain parallel axis theorem with a suitable figure. **[7M]**

   (b) Locate the centroid of the shaded three-quarters of the area of a square of dimension 'a' as shown in the Figure 2. **[7M]**

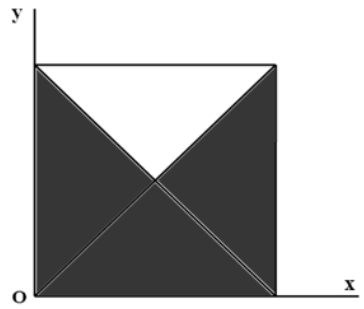

Figure 2

4. (a) Determine the centroid of a triangle with base 'b' and height 'h' using integration method. **[7M]**

   (b) Compute the moment of inertia of the composite area about the x- axis for the Figure 3 shown. **[7M]**

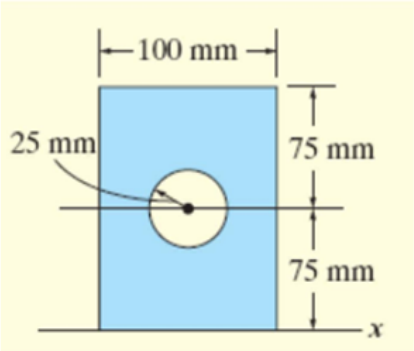

Figure 3

MODULE – IV

5. (a) Write about the concept of work. What is the unit of work? State and prove work energy principle. **[7M]**

   (b) Weights W and 2W are supported in a vertical plane by a string and pulleys arranged as shown in Figure 4. Find the magnitude of an additional weight Q applied on the left which will give a download acceleration a=0.1g to the weight W. Neglect friction and inertia of pulleys. **[7M]**

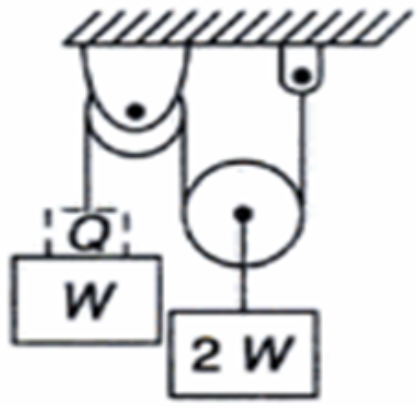

Figure 4

6. (a) Explain the following terms:
i) Work done by weight force ii) Work done by friction force iii) Work done by spring force **[7M]**

(b) The driver of an automobile, travelling along a straight level highway, suddenly applies the brakes so that the car slides for 2 s, covering a distance 9.66 m, before coming to a stop. Assuming that during this time the car moved with constant deceleration; find the coefficient of friction between the tyres and pavement. **[7M]**

MODULE – V

7. (a) Define simple harmonic motion (SHM). Derive displacement, velocity and acceleration equations of simple harmonic motion. **[7M]**

(b) A helical spring, of negligible mass, and which is found to extend 0.25 mm under a mass of 1.5 kg, is made to support a mass of 60 kg. The spring and the mass system is displaced vertically through 12.5 mm and released. Determine the frequency of natural vibration of the system. Find also the velocity of the mass, when it is 5 mm below its rest position. **[7M]**

8. (a) List the different types of vibrations. Derive an expression for the time period for a spring mass system subjected to free vibration. **[7M]**

(b) A ball of mass 110 gm is moving towards a batsman with a velocity of 24 m/s as shown in Figure 5. The batsman hits the ball by the bat, the ball attains a velocity of 36 m/s. If ball and bat are in contact for a period of 0.015 sec, determine the average impulsive force exerted on the ball during the impact. **[7M]**

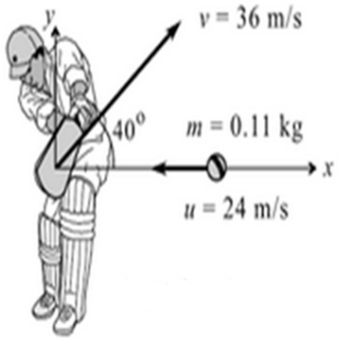

Figure 5

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