Hall Ticket No ⬚⬚⬚⬚⬚⬚⬚⬚⬚⬚ Question Paper Code: AAEB01

INSTITUTE OF AERONAUTICAL ENGINEERING
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MODEL QUESTION PAPER

First Year B.Tech II Semester End Examinations, May - 2019
Regulations: R18

ENGINEERING MECHANICS

Time: 3 hours   **Max. Marks: 70**

Answer ONE Question from each Unit
All Questions Carry Equal Marks
All parts of the question must be answered in one place only

UNIT – I

1. a) Explain the procedure to find the resultant of several forces acting at a point   **[7M]**

    b) The force of magnitudes 10KN, 20KN, 25KN & 40KN are concurrent in space and are   **[7M]**
        directed through the points A(3,2,5), B(1,7,4), C(4,-2,4) & D(-2,4,-3) respectively.
        Determine the resultant of the force system of forces. Given that system of forces are
        concurrent at the origin.

2. a) Determine the magnitude and the direction of the resultant of two forces 7 N and 8 N
        acting at a point with an included angle of 60o with between them. The force of 7 N
        being horizontal   **[7M]**

    b) A system of connected flexible cables as shown in figure is supporting two vertical
        forces 240 N and 300 N at points B and D. Determine the forces in various segments of
        the cable.   **[7M]**
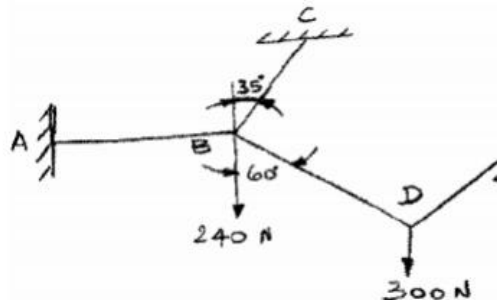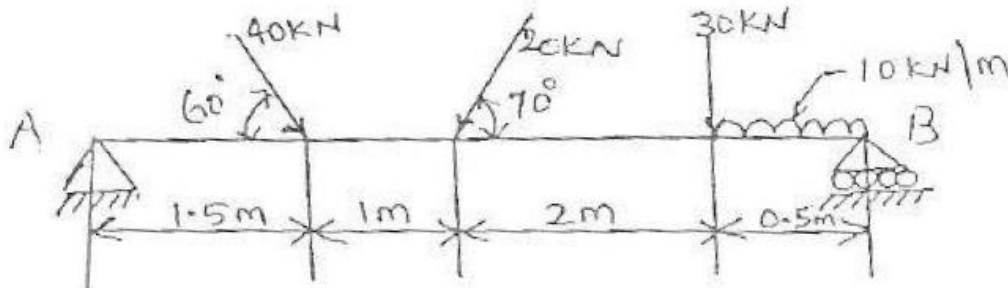
UNIT – II

3. a) Derive an expression for the minimum effort required along the inclined plane to keep a body in equilibrium position when it is at point of sliding downwards on a inclined plane. **[7M]**

b) Find the forc and its nature in member AD and BC for given cantilever truss loaded by 40KN as shown figure **[7M]**
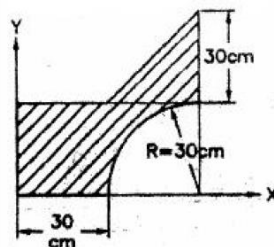

Fig. 7.1(a)   40 kN
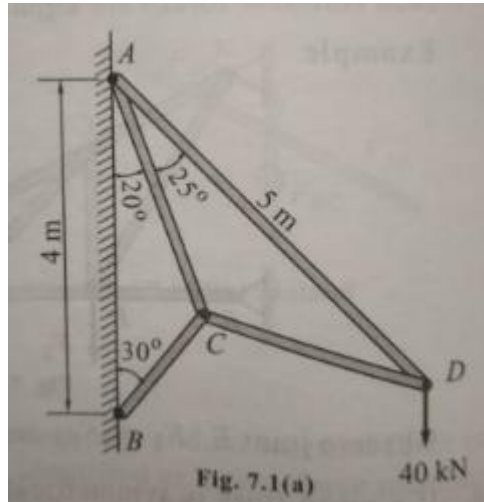
4. a) Solve reactions at points A & B **[7M]**

b) A mean radius of the screw of a square threaded screw jack is 25mm. the pitch of thread is 7.5mm. if the coefficient of the friction is 0.12, what effort applied at the end of the lever 60cm length is needed to raise a weight of 2KN **[7M]**

UNIT – III

5. a) Determine the co-odinates of centroid of the shaded area shown in figure. **[7M]**

b) A pump lifts 40m³ of water to aheight of 50m and delivers it with a velocity of 5m/s. **[7M]** what is the amount of energy spent during the process? If the job is done in half an hour, what is the input power of the pump which has an overall efficiency of 70%

6. a) A block of mass 50 kg slides down a 35° incline and strikes a spring 1.5 m away from it **[7M]** as shown in Fig. The maximum compression of the spring is 300 mm when the block comes to rest. If the spring constant is 1 kN/m, Solve the coefficient of kinetic friction between the block and the plane.
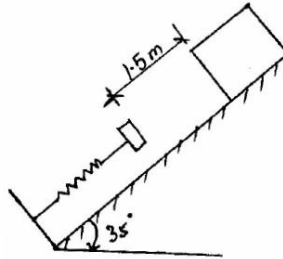

b) Derive an expression for centroid of semi-circle and MI for a rectagle section. **[7M]**

UNIT – IV

7. a) A body A is projected vertically upwards from the top of a tower with a velocity of **[7M]** 40m/s, the tower being 180m high. After t seconds, another body B is allowed to fall from the same point. Both the bodies reach the ground simultaneously. Calculate t and the velocities of A and B on reaching the ground.

b) Determine the tension in the inextensible string of the system shown the figure 4 below while m_1= 200Kg and m_2=100Kg. Consider the pulley as massless and coefficient of friction as 0.2.
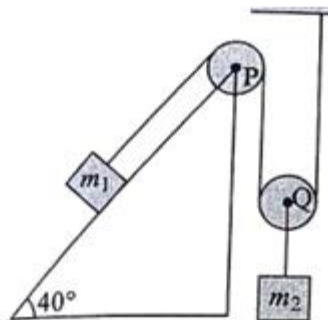

8. a) An elevator weighing 4900N is ascending with an acceleration of 3 m/s2. During the **[7M]** ascent its operator whose weight is 686N is standing on the scales placed on the floor. What is the scale reading? What will be total tension in the cable of the elevator during this motion?

b) Find the velocity of block B shown in figure 2 given below, after 5 seconds starting from **[7M]** rest.
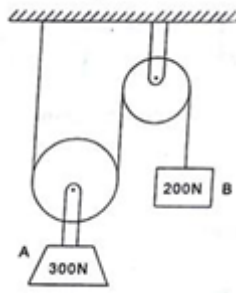
UNIT – V

9. a) Determine the period of vibration of a weight P attached to springs of stiffness k1 and k2 in two different cases as shown in figure 10 given below. **[7M]**

(a)   (b)
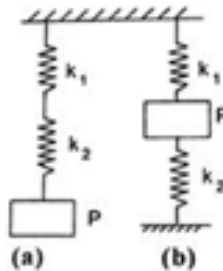
   b) A vertical shaft 5mm in diameter and 1m in length has its upper end fixed to the ceiling. At the lower end it carries a rotor of diameter 200mm and weight 20N. The modulus of rigidity for the rotor is 0.85x105 N/mm2. Calculate the frequency of torsional vibration for the system. **[7M]**

10. a) A body performing simple harmonic motion has a velocity 20m/s when the displacement is 40mm and 3m/s when the displacement is 120mm, the displacement measured from the mid-point. Calculate the frequency and amplitude of the motion. What is the acceleration when displacement is 85mm. **[7M]**

   b) A conical pendulum rotates at 100 rev/min. The cord is 150mm long and the mass of bob1.35Kg. **[7M]**
   Find
   - i. The amount of which the bob rises above its lowest position
   - ii. The period
   - iii. The tension in the cord.