

Reg. No. \_\_\_\_\_ Name: \_\_\_\_\_

**APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY**  
FIRST SEMESTER B.TECH DEGREE EXAMINATION, JANUARY 2017  
(Regular & Supplementary)

Course Code: **BE100**Course Name: **ENGINEERING MECHANICS**

Max. Marks: 100

Duration: 3 Hours

**PART A**

*Answer all questions. Each question carries 5 marks*

1. The greatest and least resultants of two forces  $F_1$  and  $F_2$  are 17N and 3N respectively. Determine the angle between them when their resultant is  $\sqrt{149}$  N.
2. A simply supported beam AB of span 4m is carrying point loads 5kN, 2kN, and 3kN at 1m, 2m, and 3m respectively from the support A. Calculate the support reactions at A and B.
3. State and explain parallel axis theorem.
4. Distinguish static friction and dynamic friction.
5. In an office, a lift is moving upwards with an acceleration of  $1.5\text{m/s}^2$ . Find the force exerted by a body of mass 30kg on the floor of the lift?
6. Explain the concept of instantaneous centre? How can you locate it?
7. Distinguish between free vibration and forced vibration.
8. What are the general conditions of simple harmonic motion?

**PART B**

*Answer TWO questions from each SET*

**SET 1**

*Each question carries 10 marks*

9. ABCD is a square, each side being 20cm and E is the middle point of AB. Forces of magnitude 7,8,12,5,9 and 6 kN act on lines of directions AB, EC, BC, BD, CA and DE respectively. Find the magnitude and direction of resultant force.
10. Three cylinders weighing 100N each and 80mm diameter are placed in a channel of width 180mm as in Figure 1. Determine the force exerted by (a) the cylinder A on B

at the point of contact (b) the cylinder B on the base and (c) the cylinder B on the wall.

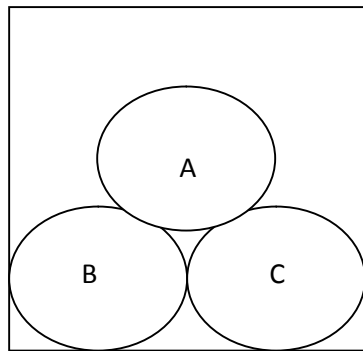


Fig.1

11. Determine the support reactions at A & B for the beam shown in Fig.2

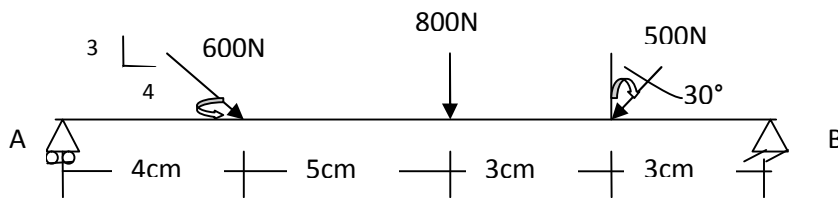


Fig.2

**SET 2**

*Each question carries 10 marks*

12. Locate the centroid of the shaded area given in figure 3.

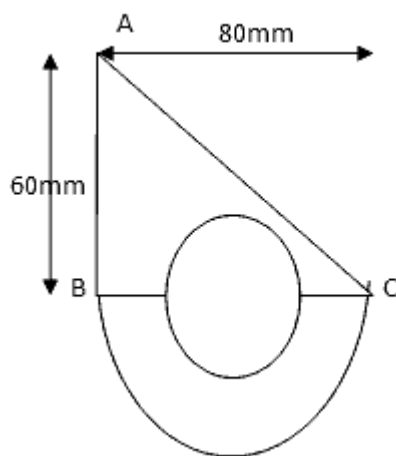


Fig.3

13. A uniform ladder of 4m length rests against a vertical wall with which it makes an angle of  $45^{\circ}$ . The coefficient of friction between the ladder and the wall is 0.4 and that between ladder and floor is 0.5. If a man, whose weight is one-half of the weight of ladder, ascends it, how high will he be when the ladder slips?
14. An effort of 200N is required just to move a certain body up an inclined plane of angle  $15^{\circ}$ , the force acting parallel to the plane. If the angle of inclination of the plane is made  $20^{\circ}$  the effort required, again parallel to the plane is found to be 230N. Find the weight of the body and the coefficient of friction.

**SET 3**

*Each question carries 10 marks*

15. For a reciprocating pump, crank OA rotates at a uniform speed of 300 rpm. The length of crank and connecting rod are 12 cm and 50cm respectively. Find (1) the angular velocity of the connecting rod AB and (ii) the velocity of piston when the crank makes an angle  $30^{\circ}$  with the horizontal.
16. Two blocks A and B of weight 150N and 100N are released from rest on a  $30^{\circ}$  inclined plane, when they are 15m apart. The coefficient of friction between the upper block A and the plane is 0.2 and that between the lower block B and the plane is 0.4. In what time block A reach block B? After they touch and move as a single unit, what will be acceleration with which it will move down?
17. A spring stretches by 0.015m when a 1.75 kg object is suspended from its end. How much mass should be attached to the spring so that its frequency of vibration is 3.0 Hz?