10035
Reg. No:

## Name: <br> A P J ABDUL KALAM TECHNOLOGICAL UNIVERSITY

FIRST/SECOND SEMESTER B.TECH DEGREE EXAMINATION JULY 2016.
BE 100 - ENGINEERING MECHANICS
Time : 3 Hours
Maximum Marks : 100

## Part - A

Answer all the questions. Each question carries 5 Marks ( 8 X $5=40$ Marks)

1. Explain the conditions of equilibrium of two force and three force members.
2. Calculate the reactions at A and B of the given loaded beam (Fig.1).


Fig. 1
3. Locate the centroid of the ' $T$ ' section shown in Fig. 2


Fig. 2
4. Define angle of friction, coefficient of friction and cone of friction.
5. State and explain D'Alembert's principle

## C

6. Explain the concepts of instantaneous centre with figure.
7. Explain the following terms with respect to a simple harmonic motion
(a) amplitude
(b) time period
(c) frequency
8. How can we connect two springs in series? Draw a diagram. Stiffness of two springs are $\mathrm{k}_{1}$ and $\mathrm{k}_{2}$. Then what will be the stiffness of the combined system in series? Arrive at the expression.

## Part - B

## Answer two questions from each SET

## SET 1

## Each question carries 10 Marks (2 X $10=20$ Marks)

9. Concurrent forces $1,3,5,7,9$ and 11 N are applied at the centre of regular hexagon acting towards its vertices as shown in Fig. 3. Determine the magnitude and direction of the resultant.


Fig. 3
10. A ball of weight 120 N rests in a right angled groove, as shown in Fig.4. The sides of the groove are inclined at an angle of $30^{\circ}$ and $60^{\circ}$ to the horizontal. If all the surfaces are smooth, then determine the reaction $\mathrm{R}_{\mathrm{A}}$ and $\mathrm{R}_{\mathrm{C}}$ at the points of contact.


Fig. 4
11. A system of parallel forces is acting on a rigid bar as shown in Fig.5. Reduce this system to $a$ ) a single force $b$ ) a single force and a couple at $A$.


Fig. 5
SET 2
Answer any 2 questions. Each question carries 10 Marks ( 2 X 10 = 20 Marks)
12. Find the centroid of the given Fig. 6.


Fig. 6
13. A uniform ladder of 4 m length rests against a wall which it makes an angle $45^{0}$ as shown in

Fig.7. The coefficient of friction between the ladder and the wall is 0.4 and that between the ladder and floor is 0.5 . If the man whose weight is on half of that of ladder ascends it, how high will he when the ladder slips?


Fig. 7

## C

14. Two blocks A and B of weights 500 N and 1000 N are placed on an inclined plane (Fig.8). The blocks are connected by a string to the parallel plane. The coefficient of friction between the inclined plane and the block A is 0.15 and that for the block B is 0.4 . Find the inclination of the plane when the motion is about to take place. Also calculate the tension in the string.


Fig. 8

## SET 3

## Answer any 2 questions. Each question carries 10 Marks (2 X 10 = 20 Marks)

15. An elevator weighing 5000 N is ascending with an acceleration of $3 \mathrm{~m} / \mathrm{s}^{2}$. During this ascent its operator whose weight is 700 N is standing on the scales placed on the floor. What is the scale reading? What will be the total tension in the cables of the elevator during this motion?
16. A weight of 50 N suspended from a spring vibrates vertically with amplitude of 8 cm and a frequency of 1 oscillation per second. Find (a) the stiffness of the spring. (b) The maximum tension induced in the spring and (c) the maximum velocity of the weight
17. A weight of 100 N suspended from a spring vibrates vertically with amplitude of 8 cm and a frequency of loscillation per second. Find
(a) The stiffness of the spring
(b) The maximum tension induced in the spring
(c) The maximum velocity of the weight
