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

Name: \_\_\_\_\_

**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).

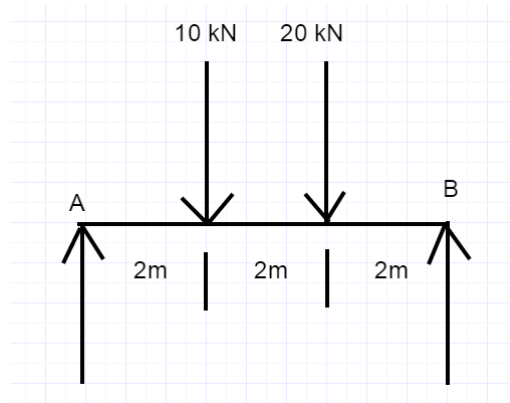


Fig.1

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

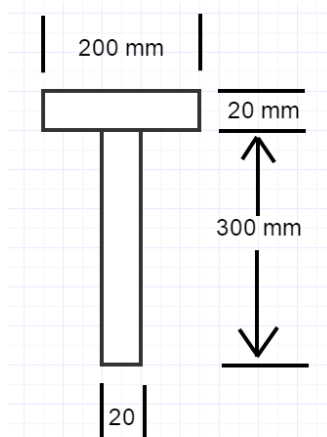


Fig.2

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

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  $k_1$  and  $k_2$ . 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 11N 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.

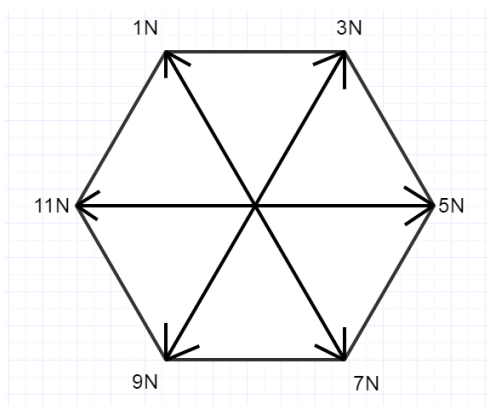


Fig.3

10. A ball of weight 120N 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  $R_A$  and  $R_C$  at the points of contact.

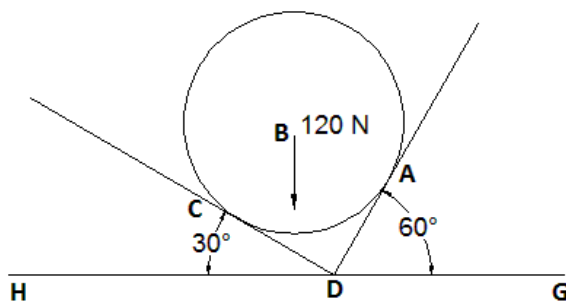


Fig.4

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.

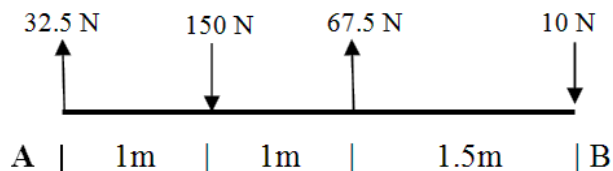


Fig.5

## 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.

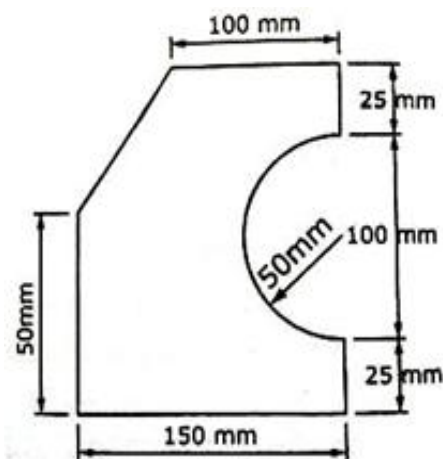


Fig.6

13. A uniform ladder of 4m length rests against a wall which it makes an angle  $45^\circ$  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?

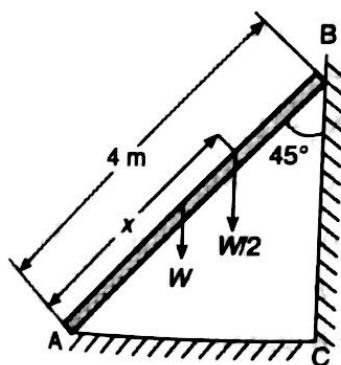


Fig.7

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.

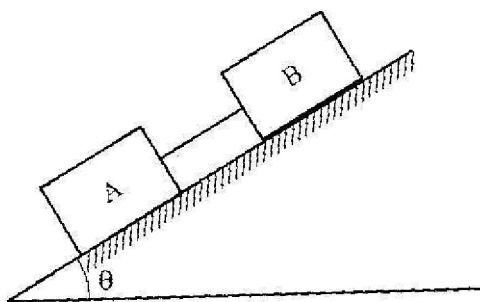


Fig.8

**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  $3 \text{ m/s}^2$ . 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 50N suspended from a spring vibrates vertically with amplitude of 8cm 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 100N suspended from a spring vibrates vertically with amplitude of 8cm and a frequency of 1 oscillation per second. Find
- (a) The stiffness of the spring
  - (b) The maximum tension induced in the spring
  - (c) The maximum velocity of the weight