

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

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

**APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY**  
FIRST/SECOND SEMESTER B.TECH DEGREE EXAMINATION, APRIL 2018

**Course Code: BE100**

**Course Name: ENGINEERING MECHANICS**

Max. Marks: 100

Duration: 3 Hours

**PART A**

*Answer all questions, each carries 5 marks.*

Marks

- 1 What are the conditions of equilibrium in concurrent and non concurrent force system? (5)
- 2 A force of magnitude 60 N is applied at the origin of the x-y-z axes and through the point A (1,1.5,2.25). Determine the components of force along x,y,z axes and the direction of force with respect to the axes. (5)
- 3 Define radius of gyration and product of inertia. (5)
- 4 Define coefficient of friction and angle of friction. Establish a relation between them. (5)
- 5 What do you mean by instantaneous centre of rotation? How can it be located? (5)
- 6 A man weighing 500 N gets into a lift. Calculate the force exerted by him on the floor of the lift when it is: (5)
  - i) Moving up with an acceleration of  $2.5 \text{ m/s}^2$  and
  - ii) Moving down with same acceleration.
- 7 Define stiffness and equivalent stiffness of spring. Give the expression for equivalent stiffness of spring in series and parallel. (5)
- 8 What is a simple harmonic motion? Give the expression for the acceleration of particle executing simple harmonic motion. (5)

**PART B**

*Answer any 2 questions from each SET, each question carries 10 marks.*

**SET I**

- 9 Find the magnitude and direction of the resultant force, if 30,40,50 and 60 N forces are acting along the lines joining the centre of a square of side 2m to its vertices. (10)
- 10 Two cylinders of weights 400 N and 200 N with radius 2m and 1m rest in a horizontal channel having vertical walls and base width 5.6m as shown in figure A. Find the reactions at A,B and D. (10)

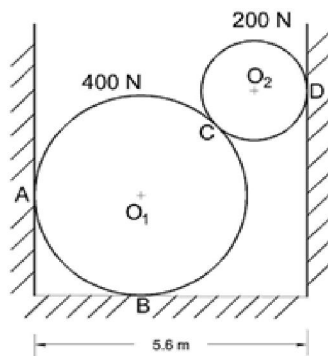


Figure A

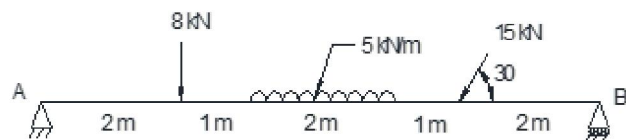
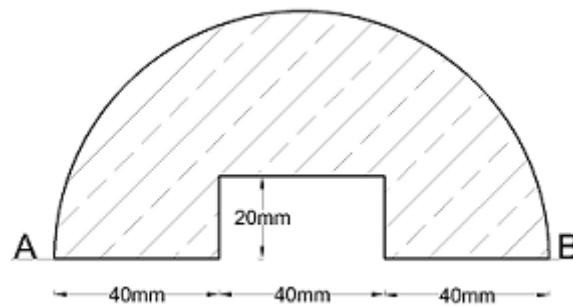


Figure B

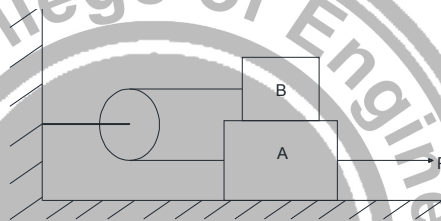
- 11 Determine the reactions at the supports of the beam shown in figure B. (10)

## SET II

- 12 Calculate the moment of inertia of the area about the base AB. (10)



- 13 a) State the theorems of Pappus Guldinus. (3)  
 b) A block weighing 400N resting on a rough horizontal floor supports a block B weighing 200 N. The blocks are connected to a string passing over a smooth pulley as shown in figure. Determine the least horizontal P to be applied to block A so as to just move it towards right.  $\mu=0.25$  (7)



- 14 a) A uniform ladder of weight 100 N and length 5 m is placed against a vertical wall in a position where its inclination to vertical is  $30^\circ$ . A man weighing 800 N climbs the ladder. At what position will the ladder slip? Coefficient of friction for all contact surfaces is 0.2. (5)  
 b) A simply supported beam AB of span 4 m is carrying a uniformly distributed load of 5kN/m over a length of 2 m from the right hand support. Calculate the support reactions using the principle of virtual work. (5)

## SET III

- 15 In a crank and connecting rod mechanism, the length of the crank and the connecting rod are 12 cm and 50 cm respectively. The crank is rotating at 300 rpm. Find the angular velocity of the connecting rod and velocity of the piston when the crank is at an angle of  $45^\circ$  with the horizontal. (10)  
 16 Two bodies of weights 60N and 40N are connected to the two ends of a light inextensible string, which passes over a smooth pulley. The weight 60N is placed on a smooth inclined plane of angle of inclination of  $10^\circ$ , while the weight 40N is hanging free in air. Determine acceleration and tension in the string. (10)  
 17 A body performing simple harmonic motion has a velocity of 12m/s when the displacement is 50 mm and 3m/s when the displacement is 100 mm, the displacement being measured from the midpoint. Calculate the frequency and amplitude of motion. What is the acceleration when the displacement is 75mm? (10)

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