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 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)
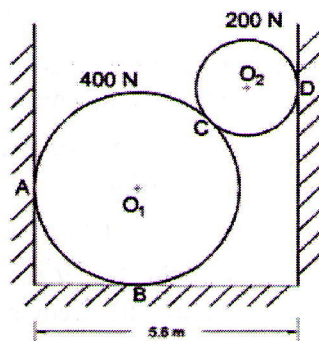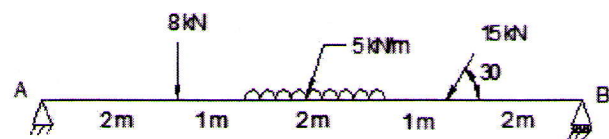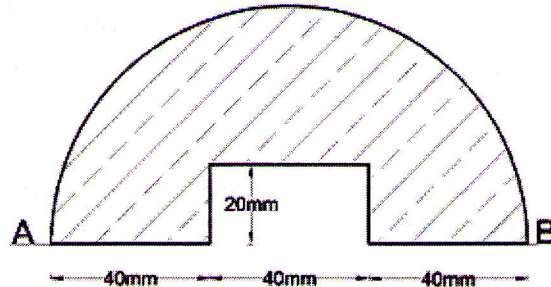

Figure A

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   (7)
          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. μ=0.25
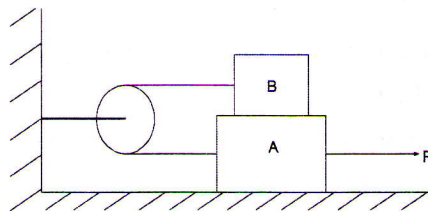
14   a)   A uniform ladder of weight 100 N and length 5 m is placed against a vertical wall   (5)
          in a position where its inclination to vertical is 30°. A man weighing 800 N climbs
          the ladder. At what position will the ladder slip? Coefficient of friction for all
          contact surfaces is 0.2.

     b)   A simply supported beam AB of span 4 m is carrying a uniformly distributed load   (5)
          of 5kN/m over a length of 2 m from the right hand support. Calculate the support
          reactions using the principle of virtual work.

SET III

15   In a crank and connecting rod mechanism, the length of the crank and the connecting rod   (10)
        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° with the horizontal.

16   Two bodies of weights 60N and 40N are connected to the two ends of a light   (10)
        inextensible string, which passes over a smooth pulley. The weight 60N is placed
        on a smooth inclined planeof angle of inclinationof 10°, while the weight 40N is
        hanging free in air. Determine acceleration and tension in the string.

17   A body performing simple harmonic motion has a velocity of 12m/s when the   (10)
        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?

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