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D.K.M. COLLEGE FOR WOMEN (AUTONOMOUS), VELLORE-1

SEMESTER EXAMINATIONS

NOVEMBER – 2018 15CMA5C

# STATICS

Time : 3 Hrs Max. Marks : 75

SECTION-A (10 x 2 = 20)

Answer ALL the questions.

1. *Define moment of a force about a line.*
2. *State Lami’s theorem.*
3. *Define couple.*
4. *What is called the moment of the couple?*
5. *Define coefficient of friction.*
6. *Define angle of friction.*
7. *Write down the intrinsic equation of a catenary.*
8. *Define span and sag of a catenary.*
9. *Define centre of mass.*
10. *Define centre of gravity.*

SECTION-B (5 x 5 = 25)

Answer any FIVE of the following questions.

1. *If two like parallel forces of magnitude P,Q , (P > Q), acting on a rigid body at A,B are interchanged in position , show that the line of action of the resultant is displaced through a distance .*
2. *Three forces acting along the sides of a triangle in the same order are equivalent to a couple. Show that they are proportional to the sides of the triangle.*
3. *ABCDEF is a regular hexagon. Forces P, 2P, 3P,2P, 5P,6P act along AB, BC, DC, ED, EF, AF. Show that the six forces are equivalent to a couple and find the moment of the couple.*
4. *A solid hemisphere rests on a rough inclined plane and against a smooth vertical wall. Show that, if the coefficient of friction is greater than 3/8 , then the hemisphere can rest in any position and if it is less, the least angle that the base of the hemisphere can make with the vertical is  .*
5. *If tangents at the points A and B of a hanging string are at right angles, show that the tension at the middle point M of the arc AB is equal to half of the weight of the string AB.*
6. *The sag of a telegraph wire tightly stretched between two poles distant a part, is b. Show that , if the weight per unit length is w , the terminal tension is approximately  .*
7. *A rod of length 5a is bent so as to form five sides of a regular hexagon . Show that its centre of mass is at a distance from either end of the rod.*
8. *A square hole is punched out of a circular lamina of radius a, having a radius as its diagonal . Show that the distance of centre of gravity of the remainder from the centre of the circle is .*

SECTION-C (3 x 10 = 30)

Answer ALL the questions.

1. *(a) State and prove Varignon’s theorem.*

*(Or)*

*(b) Prove that a system of coplanar couples acting on a rigid body is equivalent to a couple in the same*

*plane whose moment is equal to the sum of the moments of the given couples.*

1. *(a) A sphere of weight W resting on a rough inclined plane of inclination  is kept in equilibrium by a*

*horizontal string attached to the highest point of the sphere. Show that the angle of friction is greater*

*than  and that the tension of the string is  .*

*(Or)*

*(b) Show that the length of a chain whose ends are tied together and which is hanging over a circular*

*pulley of radius a, so as to be in contact with two – thirds of the circumferences of the pulley is*

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1. *(a) Find the mass centre of the cardioidal Lamina by the method of polar co-ordinates.*

*(Or)*

*(b) Find the centre of mass of*

1. *Solid hemisphere of radius ‘a’.*
2. *Solid right circular cone of height ‘h’.*

*Using integration.*

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