Reg.No : | | | | | | | | |

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

SEMESTER EXAMINATIONS

APRIL – 2016 **CMA6B**

STATICS

Time: 3 Hrs **Max. Marks: 75**

SECTION – A (10 X 2 =20)

Answer ALL the questions.

1. Define parallel forces.
2. The magnitude of the resultant of the forces $\overline{F_1}$ and $\overline{F_2}$ acting on a particle is equal to the magnitude of $\overline{F_1}$.when the first force is doubled, show that the new resultant is perpendicular to $\overline{F_2}$.
3. Define the moment of a couple.
4. ABCD is a square of side a. Forces 5P, 4P, 3P, 6P, $2\sqrt{2}$ P act along AB, BC, CD, DA, BD respectively. Show that the system reduces to a couple of moment 9aP.
5. State any two Laws of friction.
6. Define Coefficient of friction.
7. Define Catenary.
8. Define the Parameter of the catenary.
9. Define Centre of gravity.
10. Define Centre of mass.

SECTION – B (5 X 5 =25)

Answer any FIVE of the following questions.

11. Three like parallel forces P,Q,R act at the vertices of a triangle ABC.If their resultant passes through the orthocenter O,Show that $\frac{P}{\tan A} = \frac{Q}{\tan B} = \frac{R}{\tan C}$.
12. State and prove Lami's theorem.

13. To coplanar couples whose moments are equal in magnitude but opposite in direction keep a rigid body in equilibrium Prove this.

14. A uniform ladder AB rests in limiting equilibrium with the end A on a rough floor, the coefficient of friction being μ and with the other end B against a smooth vertical wall.Show that, if θ is the inclination of the ladder to the vertical then $\tan\theta$ =2 μ.If θ=30°, find μ

15. A string of length 21 hangs over two small smooth pegs in the same horizontal level. Show that if h is the sag in the middle, the length of either part of the string that hangs vertically is h +1-2$\sqrt{hl}$.

16. Find the C.G of a solid hemisphere.

17. Find the C.G of a uniform hemispherical shell.

18. Show that the forces $\overrightarrow{AB}, \overrightarrow{CD}, \overrightarrow{EF}$ acting at A,C,E of a rectangular hexagon ABCDEF, are equivalent to a couple of moment equal to the area of the hexagon.

SECTION – C (3 X 10 =30)

Answer ALL the questions.

19. a) State and prove varignon's theorem.

(Or)

b) 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.

20. a) A uniform rod AB rests within a fixed hemispherical bowl whose radius is equal to the length of the rod. If μ is the coefficient of friction between the rod and the bowl, show that in limiting equilibrium, the inclination θ of the rod to the horizontal is given by $\tan\theta = \frac{4\mu}{3-\mu^2}$.

(Or)

b) A telegraph wire, stretched between two points at a distance "a" feet apart, sags n feet in the middle. Prove that the tension at the ends is approximately $W\left(\frac{a^2}{8n} + \frac{7}{6}\,n\right)$, where w is the weight Per unit length of the wire.

21. a) Prove that for the arc of the curve $x^{2/3} + y^{2/3} = a^{2/3}$ between two successive cusps, the C.G $(\bar{x}, \bar{y})$is given by $\bar{x} = \bar{y} = \frac{2a}{5}$.

(Or)

b) I is the incentre of a triangle ABC.If forces of magnitudes P, Q, R acting along the bisectors IA, IB, IC are in equilibrium, show that

$$\frac{P}{\cos\frac{A}{2}} = \frac{Q}{\cos\frac{B}{2}} = \frac{R}{\cos\frac{C}{2}}$$

* * * * * * *