C. ABDUL HAKEEM COLLEGE (AUTONOMOUS),
MELVISHARAM - 632 509.
SEMESTER EXAMINATIONS, NOVEMBER - 2018

B.Sc., MATHEMATICS **SEMESTER V**

U15MMA504 / U14MMA504 – STATICS

Time: Three Hours Maximum: 75 Marks

SECTION - A (10 X 2 = 20 Marks)

Answer **ALL** Questions.

1. State Polygon of forces.
2. Write the equation of motion of the particle.
3. Define moment of a force.
4. What is parallel forces?
5. Define angle of friction.
6. What is meant by coefficient of friction?
7. Define mass centre.
8. Explain Solid tetrahedron.
9. Write intrinsic equation of the shape of the string.
10. Define Span.

SECTION - B (5 X 5 = 25 Marks)

Answer **ALL** Questions.

11. a) The magnitude of the resultant of two given forces P, Q is R. If Q is doubled, then R is doubled. If Q is reversed, then also R is doubled. Show that P : Q : R = $\sqrt{2}:\sqrt{3}:\sqrt{2}$.

(Or)

b) Show that, if three forces keep a particle in equilibrium, then the forces are coplanar.

12. a) 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.

(Or)

b) Show that the forces $\overline{AB}, \overline{CD}, \overline{EF}$ acting respectively at A, C, E of a regular hexagon ABCDEF, are equivalent to a couple of moment equal to the area of the hexagon.

13. a) 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 $\tan\theta = 2\mu$. If $\theta = 30^{o}$, find μ.

(Or)

b) A uniform ladder of length l rests on a rough horizontal ground with its upper end projecting slightly over a smooth horizontal rod at a height h above the ground. If the ladder is about to slip, show that the coefficient of friction is equal to $\frac{h\sqrt{l^2-h^2}}{l^2+h^2}$.

14. a) Explain Lamina in the form of a trapezium.

(Or)

b) OA and OB are two uniform rods of lengths 2a, 2b. If angle AOB = α, show that, the distance of the mass centre of the rods from O, is $\frac{\left(a^4+2a^2b^2\cos\alpha+b^4\right)^{1/2}}{(a+b)}$.

15. a) A string of length of $2l$ 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 $h + l - \sqrt{2hl}$.

(Or)

b) The span of a suspension bridge is 100m and the sag at the middle of each cable is 10m. If the total load on each cable is 750 quintals, find the greatest tension in each cable and the tension at the lowest point.

SECTION - C (3 X10 = 30 Marks)

Answer **ANY THREE** Questions.

16. Find the magnitude and direction of the resultant of $\bar{F}_1$ and $\bar{F}_2$.
17. State and prove varignon's theorem.
18. A solid hemisphere rests on a rough horizontal plane and against a smooth vertical wall. Show that, if the coefficient of friction μ is greater than $3/8$, then the hemispheres 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 $\cos^{-1}\frac{8\mu}{3}$.
19. Explain Cardioidal Lamina.
20. Derive Cartesian equation.

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