

**LOYOLA COLLEGE (AUTONOMOUS), CHENNAI – 600 034**



**B.Sc. DEGREE EXAMINATION – MATHEMATICS**

**SIXTH SEMESTER – NOVEMBER 2022**

**UMT 6503 – MECHANICS**

Date: 02-12-2022

Dept. No.

Max. : 100 Marks

Time: 01:00 PM - 04:00 PM

**PART-A**

**Answer ALL questions**

**(10 × 2 = 20 Marks)**

1. Explain resultant and components of the forces.
2. Define Parallelogram Law of forces.
3. Define parallel forces.
4. Define arm of a couple
5. State Newton's second law with an example.
6. Define force of friction.
7. Define angle and velocity of projection
8. Write the formula for finding the greatest height attained by a projectile
9. Define Moment of Inertia.
10. State Dr, Routh's Rule.

**PART-B**

**Answer any FIVE questions**

**(5 × 8 = 40 Marks)**

11. State and prove Triangle Law of forces.
12. The magnitude of the resultant of two given forces P, Q is R. If Q is doubled. If Q is reversed, then also R is doubled. Show that  $P:Q:R = \sqrt{2} : \sqrt{3} : \sqrt{2}$
13. If P & Q be interchanged in position, show that the point of application of the resultant will be displaced along AB through a distance 'd' where  $d = \frac{P-Q}{P+Q} \cdot AB$ .
14. Find the resultant of two like parallel forces.
15. A mass of 20kg falls 500 cm from rest and then penetrates to a depth of 50cm. into the sand before coming to rest. Find the average thrust of the sand.

16. Show that the greatest height which a particle with initial velocity  $v$  can reach on a vertical wall at a distance 'a' from the point of projection is  $\frac{v^2}{2g} - \frac{ga^2}{2v^2}$ .
17. A particle is thrown over a triangle from one end of a horizontal base and grazing the vertex falls on the other end of the base. If A, B are the angles, and  $\alpha$  the angle of projection, show that  $\tan \alpha = \tan A + \tan B$ .
18. Show that the M.I of a rectangular lamina

### PART-C

Answer any TWO questions

(2 × 20= 40 Marks)

19. (a) State and Prove Lami's theorem. (10)
- (b) Find the magnitude and direction of the resultant of two given forces with a common point of application. (10)
20. (a) State and prove Varignon's theorem on moments. (10)
- (b) Two particles of masses  $m_1$  and  $m_2$  are connected by a light inextensible string passing over a light smooth fixed pulley. If  $m_1 > m_2$ , find the resulting motion of the system and the tension in the string. (10)
21. Show that the path of the projectile is a parabola. (20)
22. (a) State and prove the theorem of parallel axes. (10)
- (b) Find the moment of inertia of a hollow sphere about its axis. (10)

\*\*\*\*\*