UG–469 **BMS-06**

B.Sc. DEGREE EXAMINATION
JANUARY 2009.

(AY – 2005-06 and CY – 2006 batches only)

Second Year

Mathematics

MECHANICS

Time : 3 hours Maximum marks : 75

PART A — ($5 \times 5 = 25$ marks)

Answer any FIVE questions.

Each question carries 5 marks.

1. Determine the magnitude and direction of the resultant of two given forces with a common point of application.

2. *ABCDEF* is regular hexagon. At A, for as represented in magnitude and direction by $\overrightarrow{AB}, 2\overrightarrow{AC}, 3\overrightarrow{AD}, 4\overrightarrow{AE}$ and $5\overrightarrow{AF}$ act. Show that their resultant is of magnitude $\sqrt{351}AB$ and is inclined at the angle $\tan^{-1}\left(\sqrt{3}\right)$ to *AB*.

3. Obtain the components of a given force along two specified directions.

4. Find the greatest height attained by the projectile in a parabolic path.

5. If a particle moves along a circle with uniform angular velocity, show that its projection on any diameter executes a simple harmonic motion.

6. Find the components of acceleration of a particle in tangential and normal directions.

7. A point P describes with a constant angular velocity about O the equiangular spiral $r = ae^{\theta}$, O being the pole of the spiral. Obtain the radial and transverse acceleration of P.

8. A partical describes the orbit $\frac{l}{r} = 1 + e\cos\theta$, under a central force, the pole being the centre. Find the law of force.

PART B — (5 × 10 = 50 marks)

Answer any FIVE questions.

Each question carries 10 marks.

9. State and prove polygon law of forces.

10. State and prove Lame's theorem.

11. State and prove Varignm' theorem on moments.

12. Two like parallel forces P and Q $(P > Q)$ act at A and B respectively. If the magnitudes of the forces are inter-changed show that the point of application of the resultant on AB will be displaced through the distance $\frac{P-Q}{P+Q} \cdot AB$.

13. Find the path of a projectile with initial velocity u and angle of projection α.

14. Find the velocity of two smooth spheres after a direct impact between them.

15. Obtain the resultant of two simple harmonic motions of the same period in the same straight lines.

16. Derive the pedal equation of the central orbit.

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