

PSG COLLEGE OF ARTS & SCIENCE  
(AUTONOMOUS)  
BSc DEGREE EXAMINATION DECEMBER 2019  
(Third Semester)

Branch – MATHEMATICS  
MECHANICS – I (STATICS)

Time : Three Hours

Maximum : 75 Marks

SECTION-A (20 Marks)

Answer ALL questions

ALL questions carry EQUAL marks (10 x 2 = 20)

- 1 State the polygon law of forces.
- 2 If the forces P and Q are at right angles, then find the resultant of P and Q.
- 3 Define moment of a force about a point.
- 4 Define centre of two parallel forces.
- 5 When two couples balance one another?
- 6 Define the moment of a couple.
- 7 Write down the conditions for a system of forces to reduce to a single force or to a couple.
- 8 State third form of the conditions of equilibrium for a system of forces will be equilibrium.
- 9 Define the centre of gravity.
- 10 What is the centre of gravity of a uniform circular sector?

SECTION - B (25 Marks)

Answer ALL Questions

ALL Questions Carry EQUAL Marks (5 x 5 = 25)

- 11 a Write an extended form of the parallelogram law of forces.  
OR  
b ABC is a given triangle. Forces P, Q, R acting along the lines OA, OB, OC are in equilibrium. Prove that  $P:Q:R = \cos \frac{A}{2} : \cos \frac{B}{2} : \cos \frac{C}{2}$  if O is the incentre of the triangle.
- 12 a State and prove the generalized theorem of moments.  
OR  
b Find the conditions of equilibrium of three coplanar parallel forces.
- 13 a Find the resultant of a couple and force.  
OR  
b Prove that the resultant of any number of couples in a same plane on a rigid body is single couple whose moments is equal to the algebraic sum of the moments of several couples.
- 14 a Write the necessary and sufficient conditions that a system of coplanar forces acting on a rigid body.  
OR  
b If forces  $P_1, P_2, P_3$  act along the sides BC, CA, AB of a  $\Delta ABC$  and if they reduce to a couple, show that  $\frac{P_1}{BC} = \frac{P_2}{CA} = \frac{P_3}{AB}$ .
- 15 a Distinguish between centre of gravity and centre of mass.  
OR  
b Find the centre of gravity of a uniform circular arc subtending an angle  $2\alpha$  at the centre.



**SECTION - C (30 Marks)**

Answer any **THREE** Questions

**ALL** Questions Carry **EQUAL** Marks (3 x 10 = 30)

- 16 State and prove theorem on resolved parts.
- 17 State and prove Varignon's theorem of moments.
- 18 Explain resultant of coplanar couples.
- 19 Discuss the second form of the conditions of equilibrium.
- 20 Obtain the centre of gravity of a uniform solid hemisphere.

Z-Z-Z

END