PSG COLLEGE OF ARTS & SCIENCE
(AUTONOMOUS)

BSc DEGREE EXAMINATION MAY 2017
(Third Semester)

Branch - MATHEMATICS

MECHANICS -1 (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 Find the resultant of two equal forces P, P at an angle a.

3 Write the conditions of equilibrium of three coplanar parallel forces.

4 Define the moment of a force;

5 Define a couple.

6 Define the moment of a couple.

7 Find the centre of gravity of semicircular lamina.

8 Define the centre of gravity.

9 Write the necessary and sufficient conditions that a system of coplanar forces acting on a rigid body may be in equilibrium.

10 Forces 3, 2, 4, 5 kg wt. act respectively along the sides AB, BC, CD and DA of a square. Find the magnitude of their resultant.

SECTION - B (25 Marks)
Answer ALL Questions
ALL.Questions Carry EQUAL Marks (5 x 5 = 25)

13 a The resultant of two forces P and Q is of magnitude P. Show mat. if P be doubled, then new* resultant is at right angles to Q and its magnitude will he $_{\%}/4P^2-Q^2$.

OR

b State and prove the extended form of the parallelogram law of forces.

State and prove the generalized theorem of moments.

OR

P and Q are like parallel forces. If Q is moved parallel to itself through a distance X, then prove that the resultant of P and Q moves through a distance $\frac{QX}{P+Q}$ * ■

13 a Find the resultant of a couple and a force.

~ OR ./. : , ' ' . '* :'■*

b ABC is an equivalent triangle of side a : B,'E. F divide the sides BC. CA,'AB respectively in the ratio 2 : 1 . Three forces each equal to P act at D. E> V perpendicularly to the sides and outward from the triangie. Prove that they are equivalent to a couple of moment pa.

14 a Forces Fj, F_2, F_3, F_{4s} F_5, F_6 act along the sides of a regular hexagon taken in order. Show that they will be in equilibrium if Fi+F_2+F_3+F_4+F_5^F<s - 0.

' OR

b Forces P, 4P, 2P. 6? act along the sides AB, BC, CD. DA of a square of side a, then reduce the system to a force at A and a couple. \

15 a Find the centre of gravity of a uniform solid hemisphere.

OR

b Prove that the centre of gravity of a body is unique.

SECTION - C (30 Marks)

Answer any THREE Questions

• ALL Questions Carry EQUAL; Marks (3 x 10 ~ 30)

A 6 State and prove Lami ' s theorem.

17 State and prove Varignor/s theorem.

18 Prove that the resultant of any number of couples in the same plane on a rigid body is a single couple v/hose moment is equal to the algebraic sum of the moments of the several couples.

19 ABCDEF is regular hexagon : forces P, 2P, 3P, 2P, 5P, 6P act along AB. BC, DC, ED, EF, AF respectively. Show that the six forces are equivalent to a couple and find the moment of the couple.

20 Find the centre of gravity of a uniform sector of a circle, 2a being the' central angle.

Z-Z-Z END