18MCU10

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

Branch – **MATHEMATICS WITH COMPUTER APPLICATIONS**

STATICS

Time: Three Hours Maximum: 75 Marks

SECTION-A (10 Marks)

Answer **ALL** questions
ALL questions carry **EQUAL** marks (10 x 1 = 10)

1 The resultant of two equal forces P,P at an angle α is _____.
(i) 2P (ii) $2P\cos\alpha$ (iii) $2P\cos\frac{\alpha}{2}$ (iv) $2P\cos\frac{\alpha}{4}$

2 A force no resolved part in a direction __ to itself.
(i) Parallel (ii) Perpendicular (iii) same (iv) different

3 Two parallel forces are said to be _____ when they act in the same direction.
(i) like (ii) unlike (iii) pair (iv) resultant

4 If the unit of force be a poundal and unit of distance be one foot then the unit of moment is a _____.
(i) dyne (ii) poundal (iii) foot (iv) poundal-foot

5 The moment of a couple is the _____ of either of the two forces of the couple and the perpendicular distance between them.
(i) Product (ii) sum (iii) difference (iv) none

6 The ratio of the limiting friction to the normal reaction is called the __ of friction.
(i) angle (ii) coefficient (iii) resultant (iv) equilibrium

7 Any system of forces acting in one plane on a rigid body can be reduced to a single force or _____.
(i) couple (ii) coplaner (iii) planar (iv) body

8 A single force R will be _____ if its components along two oblique directions are separately zero.
(i) zero (ii) R (iii) X (iv) Y

9 The _____ of a body is that point through which the line of action of the weight of the body always passes in which ever position the body is held.
(i) centre (ii) mass (iii) centre of gravity (iv) gravity

10 When a force and its displacement are perpendicular, the work done by the force in such a displacement is _____.
(i) R (ii) $R\cos\theta$ (iii) $R\sin\theta$ (iv) 0

SECTION - B (25 Marks)

Answer **ALL** questions
ALL questions carry **EQUAL** Marks (5 x 5 = 25)

11 a State and prove Lami's theorem.

OR

b Bring out the resultant of any number of coplanar forces acting at a point.

12 a If three parallel forces are in equilibrium, each is proportional to the distance between the other two.

12 Cont...

b Two men carry a load of 224 k.wt, which hangs from a light pole of length 8m. each end of which rests on shoulder of one of the men. the point from which the load is hung is 2m. nearer to one man than the other. What is the pressure on each other.

13 a Prove that, a couple and a single force acting on a body cannot be in equilibrium but they are equivalent to the single force acting at some other point parallel to its original direction.

OR

b State four laws of friction.

14 a State and justify the conditions for a system of forces to reduce to a single force or to a couple.

OR

b State and prove the third form of the conditions of equilibrium.

15 a Write the difference between centre of gravity and centre of mass.

OR

b A square hole is punched out of a circular lecmina with a diagonal of the square coinciding with a radius of the circle. show that the centre of mass of the reminder is at the distance $\frac{a}{8\pi - 4}$ from the centre of the circle, where a is its diameter.

SECTION -C (40 Marks)

Answer **ALL** questions

ALL questions carry **EQUAL** Marks (5 x 8 = 40)

16 a The resultant of two forces P,Q acting at a certain angle is X and that of P, R acting at the same angle is also X. The resultant of Q,R again acting at the same angle is Y. Prove that $P = \left(X^2 + QR\right)^{1/2} = \frac{QR(Q+R)}{Q^2 + R^2 - Y^2}$. Prove also that if P+Q+R=0, Y=X.

OR

b Prove that the algebraic sum of the resolved parts of two forces in any direction is equal to the resolved part of the resultant in the same direction.

17 a Find the resultant of two unlike and unequal parallel forces acting on a rigid body.

OR

b State and prove Varigon's theorem of moments.

18 a Prove that, if two couples, whose moments are equal and opposite, act in the same plane upon a rigid body, they balance one another.

OR

b A body is at rest on a rough plane inclined to the horizon at an angle greater than the angle of friction and is acted upon by a force, parallel to the plane and along the line of greatest slope. Find the limits between which the force must lie.

19 a Show that, a system of coplanar forces acting on a rigid body can be reduced to a single force acting at an arbitrary point in their plane together with a couple whose moment is equal to algebraic sum of the moments of the forces about the point.

OR

b State and prove the second form of the conditions of equilibrium of coplanar forces.

20 a Find the centre of gravity of a uniform solid hemisphere and a hollow sphere.

OR

b State and prove the principle of virtual work for a system of coplanar forces