**B.Sc. DEGREE EXAMINATION, APRIL 2016**

**III YEAR — IV SEMESTER**

**MAJOR PAPER – VIII - STATICS**

**Time : 3 hours Max. Marks : 75**

**SECTION A — (10 × 2 = 20 marks)**

**Answer any *TEN* questions.**

1. Define Force.
2. Forces  and acting at a point have resultant . When the first force is doubled, the new resultant bisects the angle between the former resultant and . Show that .
3. Define Equilibrium of a particle.
4. If is the centroid of a triangle and the forces of magnitudes  acting along are in equilibrium then show that .
5. Define Equivalent system of forces.
6. Two unlike parallel forces  and  act on a rigid body at and. If the forces are interchanged in position, show that the point of application of the resultant will be displayed along  through a distance given by .
7. Define a couple.
8. If three forces acting on a rigid body keep it in equilibrium, show that they must be either concurrent or parallel.
9. Write down the centre of a triangular lamina whose vertices , and .
10. Calculate elementary mass of a circular lamina at a distance from the vertex of a solid right circular cone of height , and base radius . The thickness of the lamina is , height , and  being the per unit volume.
11. State any three laws of friction.
12. Define moment of a force.

**SECTION B — (5 × 5 = 25 marks)**

**Answer any *FIVE* questions**

1. The resultant of two forces  and is . If one of the forces is reversed in direction , the resultant becomes . Show that .
2. If is the circumcentre of a triangle and forces of magnitudes  acting along  are in equilibrium , show that .
3. State and prove Varignon’s theorem.
4. Show that a system of coplanar forces reduce either to a single force or to a single couple.
5. Find the centre of gravity of a uniform circular arc subtending an angle  at the centre.
6. The greatest and least magnitude of the resultant of two forces are and  respectively. Show that when the forces act at an angle , the resultant is of magnitude .
7. State and prove the necessary conditions for a system of coplanar forces to keep a particle in equilibrium.

[P.T.O.]

**SECTION C — (3 × 10 = 30 marks)**

**Answer any *THREE* questions**

1. Three forces acting at a point are parallel to the sides of a triangle  , taken in order and in magnitude they are proportional to the cosines of the opposite angles. Show that the magnitude of their resultant is proportional to .
2. A weight is supported on a smooth plane inclined at an angle  to the horizon , by a string inclined to the vertical at an angle . If the slope of the plane is increased to  and the slope of the string is unaltered , then the tension in the string is doubled in supporting the weight. Prove that .
3. The forces  act along the three sides  of a triangle  . If their resultant passes through ,

 (a) Incentre , show that 

 (b) Circumcentre , prove that 

 (c) the centroid,then show that.

1. Show that a system of coplanar couples acting on a rigid body is equivalent to a single couple in the same plane whose moment is equal to the sum of the moments of the given couples.
2. Find the centre of gravity of a solid hemisphere.

––––––––––