2020
MATHEMATICS – HONOURS
SEMESTER-1
TUTORIAL
Full Marks In each Course: 15

The figures in the margin indicate full marks .
Symbols and notations used here carry their usual meaning.
Candidates are required to give their answers in their own words as far as practical.

Course: CC1 (Calculus, Geometry & Vector Analysis) ***5×3***

1. Reduce the following equations to the canonical form and determine the nature of the conic: $6x^2 - 5xy - 6y^2 + 14x + 5y + 4 = 0$

2. Determine the volume of the solid obtained by rotating the region bounded by $y = \sqrt[3]{x} \ \ and \ \ y = \frac{x}{4}$ that lies in the first quadrant about the y-axis.

3. Find the equation of the common tangent to the hyperbolas $\frac{x^2}{a^2} - \frac{y^2}{b^2} = 1$ and $\frac{x^2}{b^2} - \frac{y^2}{a^2} = 1$. Also find the length of the common tangent between the points of contact.

Course: CC2 (Algebra) ***5×3***

4. If $(x^2 + 3px + q)$ has a factor of the form $(x - a)^2$, then Prove that $q^2 + 4p^3 = 0$.

5. Prove that an equivalence relation R on a set S determines a Partition of S. Conversely, each partition of S provides an equivalence relation on S.

6. Find the rank of the matrix $= \begin{bmatrix} 1 & 0 & 3 \\ 4 & -1 & 5 \\ 2 & 0 & 6 \end{bmatrix}$.