Exam. Code : 103201
Subject Code : 1037

B.A./B.Sc. 1st Semester

QUANTITATIVE TECHNIQUES—I

Time Allowed—3 Hours] [Maximum Marks—100

Note :— There are **eight** questions, **two** from each of Sections A to D. Candidates are required to attempt **five** questions, selecting at least **one** question from each Section. **Fifth** question may be attempted from any Section.

SECTION—A

1. (i) Solve the equation, $\frac{3}{x}+\frac{2}{y}+1=\frac{1}{x}+\frac{3}{y}=10$. 6

   (ii) Solve $\frac{a}{x-b}+\frac{a}{x-a}=2$. 7

   (iii) Solve $3^x + 3^{-x} - 2 = 0$. 7

2. (i) Find sum of 12 terms of an AP where n^{th} term is $5n+2$. 6

   (ii) How many terms of the series will amount to $39+13\sqrt{3}$?

   $\sqrt{3}+3+3\sqrt{3}...$ 6

(iii) Sum of three numbers in GP is 19 and their product is 216. Find the numbers. 8

SECTION—B

3. (i) Find the equation of a straight-line which passes through the point (–1, 3) and is making an angle of 30° with x-axis. 7

(ii) Prove $(1 + \cot\theta - \operatorname{cosec}\theta)(1 + \tan\theta + \sec\theta) = 2$. 6

(iii) Find θ if $3\tan\theta + \cot\theta = 5\operatorname{cosec}\theta$. 7

4. (i) Define set. Explain various types of sets. 7

(ii) Explain difference and symmetric difference of sets. 6

(iii) Explain the concepts of Permutation and Combination. 7

SECTION—C

5. (i) Define function. Explain various types of function. 7

(ii) Prove that $\underset{x\to 0}{\text{Limit}} \frac{a^x - 1}{x} = \log_e a$. 7

(iii) Find the derivative of logx by first principle method. 6

6. (i) If $f(x) = x^2$, discuss continuity of $f(x)$ at $x = 2$. 6

(ii) Find $\lim_{x \to \alpha} \frac{6x^2 + 2x + 1}{6x^2 - 3x + 1}$. 7

(iii) Differentiate $\sqrt{x}$ ab-initio w.r.t. x. 7

SECTION—D

7. (i) Differentiate w.r.t. x, $\left(x + \frac{1}{x}\right)\left(\sqrt{x} + \frac{1}{\sqrt{x}}\right)$. 7

(ii) Differentiate $\log \sqrt{\frac{1 + x + x^2}{1 - x + x^2}}$. 6

(iii) Demand function is given to be $p = \frac{10}{3 + q}$, $0 \le q \le 9$ where p is price and q is quantity demanded. Find elasticity of demand at the end points (i.e. 0 and 9). 7

8. (i) If $x\sqrt{1+y} + y\sqrt{1+x} = 0$, show that $\frac{dy}{dx} = -(1+x)^{-2}$. 7

(ii) Differentiate $x^x + x^{1/x}$ w.r.t. x. 7

(iii) If Total Cost function is $C = ax^3 + bx^2 + cx + d$ prove that slope of Average Cost is $\frac{1}{x}[MC - AC]$. 6