Exam. Code : 103203

Subject Code : 1128

B.A./B.Sc. 3rd Semester

QUANTITATIVE TECHNIQUES—III

Time Allowed—3 Hours] [Maximum Marks—100

Note :— Use of simple **(Non-scientific)** calculators is allowed.

Note :— (1) The **first** question consists which of **10** short answer type parts is compulsory. Attempt **ALL** parts of this question with answer to each part in upto **5** lines. Each part carries **2** marks.

(2) The candidates will attempt **ONE** out of **TWO** questions from each of the **FOUR** units (of **20** marks each).

1. (a) Explain the condition of maxima/minima for y = f(x).

(b) Differentiate w.r.t. x : $y = a^x + x^a + x^x$.

(c) Evaluate $\int \frac{1}{x^5} dx$.

(d) Write down the formula for getting integration by parts of $\int uv\, dx$, where u and v are two functions of x.

(e) Conceptual meaning of producer's surplus.

(f) If $A=\begin{pmatrix}1 & -2\\ -3 & 4\end{pmatrix}$, then show that

(Adj. A) A = A (Adj. A).

(g) Give some applications of matrix algebra in Economics.

(h) If $A=\begin{pmatrix}5 & 3\\ 4 & 6\end{pmatrix}$ and $B=\begin{pmatrix}7 & 4\\ 4 & -6\end{pmatrix}$, examine if

AB = BA.

(i) General formulation of an LPP model.

(j) Assumptions of input-output analysis. $10\times2=20$

UNIT—I

2. (a) If $x^y = y^x$, then show that $\frac{dy}{dx}=\frac{xy\log y-y^2}{xy\log x-x^2}$.

(b) Find the total differential of the function $u = (x^2 + y^2)(2x^2 - y)$.

3. (a) Find the extreme values of the function

$u = x^3 + y^3 - 3x - 27y + 24.$

(b) If $u = x^3 + y^3 + z^3 - 3xyz$, then show that

$$x\frac{\partial u}{\partial x}+y\frac{\partial u}{\partial y}+z\frac{\partial u}{\partial z}=3u.$$

UNIT—II

4. (a) Evaluate $\int \frac{4x+5}{2x^2+5x+3}dx$.

(b) Find the value of $\int (x^2 - a^2)dx$.

5. The demand function for a commodity is : P = 30 – 2Q. And, the supply function is : P = 3Q. Find consumer's surplus and producer's surplus at the equilibrium price.

UNIT—III

6. (a) Find inverse of the matrix $A = \begin{bmatrix} 1 & 4 & 3 \\ 4 & 2 & 1 \\ 3 & 2 & 2 \end{bmatrix}$.

(b) If $A = \begin{pmatrix} 3 & -2 \\ 4 & -2 \end{pmatrix}$, then find k, such that $A^2 - kA + 2I = \underline{0}$.

7. Write a brief note on the method of solving a system of simultaneous equations by Cramer's rule. Apply the rule for solving the following system of such equations :

$3x + 2y - z = 4, -x + y = 1$ and $x + y + z = 6$.

UNIT—IV

8. (a) What is meant by the problem of *degeneracy* ? Write a brief note.

(b) Minimise by graphical method :

$600X_1 + 400X_2$, subject to

$$300X_1 + 100X_2 \geq 2400$$

$$100X_1 + 100X_2 \geq 1600$$

$$200X_1 + 600X_2 \geq 4800$$

$$X_1, X_2 \geq 0.$$

9. The input-output coefficient matrix A and the final demand vector D for an economy with three sectors are given below :

$$A = \begin{pmatrix} 0.3 & 0.4 & 0.2 \\ 0.2 & 0.0 & 0.5 \\ 0.1 & 0.3 & 0.1 \end{pmatrix}; D = \begin{pmatrix} 100 \\ 40 \\ 50 \end{pmatrix}$$

Work out the output level of the three factors.