

Exam. Code : 103203
Subject Code : 1115

B.A./B.Sc. 3rd Semester (Batch 2020-23)
QUANTITATIVE TECHNIQUES
(Quantitative Techniques—III)

Time Allowed—3 Hours] [Maximum Marks—100

Note :— Attempt *five* questions by selecting at least *one* question from each section, **fifth** question can be attempted from any section. Each question carries equal marks.

SECTION—A

1. Find all the first order and second order partial derivatives of the following function :

$u = 3x^2y^2 + x^5 + 3y^2$. Also show that for this function,
 $f_{xy} = f_{yx}$. 20

2. The manufacturing cost of an item consists of Rs. 1000 as overheads, material cost Rs. 2 per item and the labour cost $x^2/90$ for x items produced. Find how many items be produced to have Average Cost (AC) as minimum. 20

SECTION—B

3. Assume that the average revenue and average cost curves of coal are $AR = 2.34 - 1.34x$ and $AC = x^{-1} - 0.83 + 0.85x$; where x is the quantity of coal demanded or produced. Find consumer's surplus assuming the condition of monopoly. 20

4. Integrate the following functions :

(i) $\int \log x \, dx$

(ii) $\int x^2 e^x \, dx$. 10+10=20

SECTION—C

5. Find the inverse of the following matrix :

$$\begin{bmatrix} 0 & -3 & -2 \\ 1 & -4 & -2 \\ -3 & 4 & 1 \end{bmatrix} \quad 20$$

6. (a) Define a matrix. Also explain various types of matrices.

(b) Discuss the main properties of determinants. 10+10=20

SECTION—D

7. Solve the following LPP by simplex method :

Maximize $Z = 30x_1 + 40x_2 + 20x_3$

Subject to the constraints :

$$10x_1 + 12x_2 + 7x_3 \leq 10000$$

$$7x_1 + 10x_2 + 8x_3 \leq 8000$$

$$x_1 + x_2 + x_3 \leq 1000$$

$$x_1, x_2, x_3 \geq 0 \quad 20$$

8. (a) What are the main uses of Input-Output analysis ?

(b) Given the following input-output technology coefficient matrix :

	Steel	Coal	Final Demand
Steel	0.4	0.1	50
Coal	0.7	0.6	100
Labour	5	2	

Find :

(i) Gross Output

(ii) Total Labour Days Required

(iii) Equilibrium Prices, if wage rate is Rs. 10 per man day. 10+10=20