

STATISTICAL QUALITY CONTROL AND COMPUTATIONAL TECHNIQUES - II

(Semester - VI)

Time Allowed : 3 Hours]

[Maximum Marks : 36

Note : The candidates are required to attempt two questions each from Section A and B carrying 5 marks each and the entire Section C consisting of 8 short answer type questions carrying 2 marks each.

Section - A

1. (a) Evaluate : $\Delta^6 (1 - ax)(1 - bx^2)(1 - cx^2)$.
 (b) Construct Newton's forward interpolation polynomial for the following data :

x	4	6	8	10
$f(x)$	1	3	8	16
2. The values of $f(x) = \log_{10} x$ at given values of x are :

x	300	304	305	307
$f(x)$	2.4771	2.4829	2.483	2.4871

 Find the value of $\log_{10} 310$ using (i) Lagrange's and (ii) Newton's divided difference formulae.
3. Find the value of $f'(0.04)$ from the following table :

x	-3	-2	-1	0	1	2
$f(x)$	0.01	0.02	0.03	0.04	0.05	0.06
4. Calculate by Simpson's one third rule an approximate value of $\int_{-3}^3 x^4 dx$ by taking seven equidistant ordinates. Compare it with exact value and the value obtained by Trapezoidal rule.

Section - B

5. Define a Linear Programming Problem (LPP) clearly explaining the Canonical and the standard forms of LPP. What are its major assumption and limitations ?
6. Solve the following LPP :

Minimize : $z = 2x + 3y + 4z$
 Subject to $2x + 3y + 5z \geq 2$
 $3x + 4y + 7z = 3$
 $x + 4y + 6z \leq 5$

7. What is meant by duality in LPP? Solve the following problem through its dual?
Minimize $z = x + 7y$ $x, y, z \geq 0$.

Subject to
$$\begin{bmatrix} 1 & 2 \\ 0 & 1 \\ 2 & 3 \end{bmatrix} \begin{bmatrix} x \\ y \end{bmatrix} \geq \begin{bmatrix} 5 \\ 4 \\ 9 \end{bmatrix} \text{ and } x, y \geq 0.$$

8. Solve the following transportation problem :

		To			
From		W_1	W_2	W_3	W_4
F_1		11	13	17	14
F_2		16	18	14	10
F_3		21	24	13	10
		200	225	275	250

Section - C

9. (a) Prove that $\nabla E = \delta E^{1/2}$.
 (b) If $y(x) = x(x-1)(x-2)$, then find the value of $\Delta y(x)$.
 (c) What is the value of $f'(a)$ using forward difference formula?
 (d) If $f(0) = 1$, $f(0.5) = 0.8$, $f(1) = 0.5$, then what is the value of $\int_0^1 f(x) dx$ obtained by Trapezoidal rule?
 (e) Define Optimum Basic Feasible Solution.
 (f) State fundamental theorem of LPP.
 (g) Solve the following LPP using graphical method :
 Max $z = 6x + y$
 Subject to $2x + y \geq 3$
 $y - x \geq 0$,
 $y \leq 5$
 $x, y \geq 0$.
 (h) Define a Transportation Problem.