3143-B

III Year (T.D.C.) Science Examination, 2017

MATHEMATICS

Paper–III-B

(Numerical Analysis and Operations Research)

Time Allowed : Three Hours
Maximum Marks : 75

PART - A [Marks : 20

Answer all questions (50 words each).

All questions carry equal marks.

PART - B [Marks : 35

Answer *five* questions (250 words each).

Selecting *one* from each unit. All questions carry equal marks.

PART - C [Marks : 20

Answer any *two* questions (300 words each).

All questions carry equal marks.

PART-A

UNIT - I

1. (i) Evaluate $\Delta\left(\tan^{-1} x\right)$.

(ii) Write Newton-Gregory formula for backward interpolation.

UNIT - II

(iii) Write the relation between δ and ∇.

(iv) Write Newton-cotes quadrature formula.

UNIT - III

(v) Using bisection method find first subsequent estimate of x of the equation

$$x^4 + 2x^3 - x - 1 = 0$$

lying in the interval [0, 1]

(vi) Write the iteration formula of Regula-Falsi method for finding root of an equation f(x) = 0.

UNIT - IV

(vii) Define linear independence.

(viii) Write fundamental theorem of linear programming.

UNIT - V

(ix) Write the mathematical formulation of an assignment problem.

(x) Write the mathematical formulation of transportation problem.

PART-B

UNIT - I

2. Show that $e^x = \left(\frac{\Delta^2}{E}\right) e^x \frac{Ee^x}{\Delta^2 e^x}$.

3. Use Newton formula for interpolation to find the net premium at the age 25 from the table given below :

Age :	20	24	28	32
Annual Net Premium :	0.01427	0.01581	0.01772	0.01996

UNIT - II

4. Use Gauss's forward interpolation formula to find f(32), given that :

f(25) = 0.2707, f(30) = 0.3027; f(35) = 0.3386 f(40) = 0.3794

5. Compute the value of following integral by Trapezoidal rule :

$$\int_{0.2}^{1.4} \left(\sin x - \log_e x + e^x\right) dx$$

UNIT - III

6. Evaluate the following integral by using Gauss-three point quadrature rule

$$\int_0^1 \frac{dx}{1+x}$$

7. Using method of Regula-Falsi, find the real root of the equation $x^3 - 2x - 5 = 0$.

UNIT - IV

8. Solve the following LPP by graphical method :

Max. $Z = 3x_1 + 2x_2$

s.t. $x_1 + x_2 \geq 1$

$x_2 - 5x_1 \leq 0$

$5x_2 - x_1 \geq 0$

$x_1 - x_2 \geq -1$

$x_1 + x_2 \leq 6$

$x_1 \leq 3$

and $x_1 \geq 0, x_2 \geq 0$

9. Solve the following LPP by simplex method

Max. $Z = x_1 + 5x_2$

s.t. $3x_1 + 4x_2 \leq 6$

$x_1 + 3x_2 \geq 2$

and $x_1, x_2 \geq 0$

UNIT - V

10. Find DP of the following LPP :

Max. $Z = x_1 + 3x_2$

s.t. $3x_1 + 2x_2 \leq 6$

$3x_1 + x_2 = 4$

and $x_1, x_2 \geq 0$

11. A company has three plants A, B, C and three warehouses X, Y and Z. Number of units available at the plants is 60, 70 and 80 respectively. Demands at X, Y and Z are 50, 80 and 80 respectively. Unit costs of transportation are as follows :

	X	Y	Z
A	8	7	3
B	3	8	9
C	11	3	5

what would be your transportation plan ? Give minimum distribution cost.

PART-C

UNIT - I

12. Find the form of the function given by the following table using Lagrange formula :

x	3	2	1	–1
f(x)	3	12	15	–21

UNIT - II

13. Evaluate $\int_0^1 \frac{dx}{1+x^2}$ using Simpson's $\frac{1}{3}$ and $\frac{3}{8}$ rule. Hence obtain the approximate value of in each case.

UNIT - III

14. Find the roots of the quadratic equation $x^2 - 5x + 2 = 0$ correct to four decimal places by the Newton-Raphron method.

UNIT - IV

15. Solve the following LPP :

Max. $Z = 3x_1 + 2x_2 + x_3$

s.t. $-3x_1 + 2x_2 + 2x_3 = 8$

$-3x_1 + 4x_2 + x_3 = 7$

and $x_1, x_2, x_3 \geq 0$

UNIT - V

16. There are five jobs to be assigned, one each to five machines and the associated cost matrix is as follows. Solve the following as;signment problem.

Jobs	← Machines →				
↓	I	II	III	IV	V
A	11	17	8	16	20
B	9	7	12	6	15
C	13	16	15	12	16
D	21	24	17	28	26
E	14	10	12	11	15