NAO-003-001618 Seat No. _____

B. Sc. (Sem. VI) (CBCS) Examination

March / April - 2017

Mathematics : BSMT-603

Faculty Code : 003

Subject Code : 001618

Time : $2\frac{1}{2}$ Hours] [Total Marks : **70**

1 Answer the following questions briefly : **20**

(1) Define: Convex Linear Combination.

(2) Define: Optimum solution of LPP.

(3) If $f(x) = x^3$ then find $f(1,3,5,7)$.

(4) In Simpon's $\frac{1}{3}$ rule what is the form of the function $f(x)$?

(5) State the matrix form of LPP.

(6) Define : Extreme points.

(7) Bessel's Formula is better suited if ---------. Complete the statement to make it true.

(8) Write the full form of NWCM.

(9) Define : Non-Degenerate B.F.S.

(10) When do we use VAM to solve transportation problem ?

(11) Which types of differential equation can be solved using the Picard's method ?

(12) State Gauss-Backward interpolation Formula.

(13) What is Interpolation ?

(14) If $y_2 = 10, y_1 = 8, y_0 = 5, y_{-1} = 10$ then find $y_{\frac{1}{2}}$.

(15) Which formula is known as Newton-Cot's formula ?

(16) Interpolating x corresponding to a certain value of y is known as-------. Fill in the blank.

(17) Find the value of $\int_2^6 \frac{dx}{x}$ by trapezoidal rule.

(18) Solve the differential equation $\frac{dy}{dx} = x + y$. Obtain the second approximation of y at $x = 0.1$ by Picard's method, the initial condition is y(0) = 1.

(19) What is the special case of Bessel's formula ?

(20) Write the Euler's improved method.

2 (a) Attempt any **three** : **6**

(1) Derive the relation between divided differences and forward differences (any four).

(2) In usual notation prove that

$$D = \frac{1}{h}\left[\Delta - \frac{\Delta^2}{2} + \frac{\Delta^3}{3} - \frac{\Delta^4}{4} + \ldots\ldots\right].$$

(3) Find the value of y at $x = 0.2, 0.4, 0.6, 0.8$ by Euler's method $\frac{dy}{dx} = 2x + y$, $y(0) = 1$.

(4) Obtain the value of $f'(90)$ using Strling's formula to the following data :

x	60	75	90	105	120
$f(x)$	28.2	38.2	43.2	40.9	37.7

(5) Write Lagrange's interpolation formula.

(6) Evaluate $\int_0^{10} \frac{dx}{1+x^2}$ by using Simpon's $\frac{3}{8}$ formula.

(b) Attempt any **three** : **9**

(1) Solve $\frac{dy}{dx} = 3x + y^2, y(1) = 1.2$. Obtain the value of y for $x = 1.1, 1.2$ by Range's method.

(2) Find the value of y at $x = 0.2$ by Taylor's method $y = 2y + 3e^x$, y(0) = 0.

(3) Given

θ	0°	5°	10°	15°	20°	25°	30°
tan θ	0	0.875	0.1763	0.2679	0.3640	0.4663	0.5774

Then show that tan 16° = 0.2867 using Stirling's formula.

(4) Solve differential equation $\frac{dy}{dx} = f(x, y), y(x_0) = y_0$ by Taylor's method.

(5) Derive: Trapezoidal Rule.

(6) Derive Laplace- Everet's formula.

(c) Attempt any **two** : **10**

(1) Derive Bessel's formula for central differentiation.

(2) Derive Milne- Thomson Predictor-Corrector formula.

(3) Using Gauss forward interpolation formula find y at x = 1.7489 given that

x	1.72	1.73	1.74	1.75	1.76	1.77	1.78
y	0.1791	0.1773	0.1775	0.1738	0.1720	0.1703	0.1686

(4) Derive Simpon's $\frac{3}{8}$ rule.

(5) Solve $\frac{dy}{dx} = 1 - y$, $y(0) = 0$ in the range $0 \le x \le 0.3$ using (i) Euler's method (ii) Improved Euler's method (iii) Modified Euler's method, by choosing h = 0.1.

3 (a) Attempt any **three** : **6**

(1) (i) Define: Slack variables w.r.t LPP.

(ii) Define: Unbounded solution of LPP.

(2) Maximize Z = $11x_1 + 9x_2$
Subject to $3x_1 + 2x_2 \le 8$ Where $x_1, x_2 \ge 0$
$2x_1 + 3x_2 \le 7$ Using graphical method.

(3) (i) What is the full-form of NWCH ?

(ii) What is the full-form of LCM ?

(4) (i) Define: Basic Feasible Solution.

(ii) Define: Optimal Solution.

(5) State the general mathematical form of LPP.

(6) State the general mathematical form of LPP from assignment problem.

(b) Attempt any **three** : **9**

(1) Explain the steps of VAM to find initial solution of transportation problem.

(2) Explain the steps of two phase method to solve the LPP.

(3) Explain Primal-dual relationship for LPP.

(4) Solve the following LPP by using two phase method
Minimize Z = $x_1 + x_2$
Subject to $2x_1 + x_2 \ge 4$ Where $x_1, x_2 \ge 0$
$x_1 + 7x_2 \ge 7$

(5) Explain: Mathematical formulation of an assignment problem.

(6) Obtain the INITIAL solution of given transportation problem using NWCM method :

	To	D_1	D_2	D_3	D_4	Supply
From	O_1	6	4	1	5	14
	O_2	8	9	2	7	16
	O_3	4	3	6	2	5
Demand		6	10	15	4	35

(c) Attempt any **two** : **10**

(1) Explain BIG M method to solve the LPP.

(2) Explain Hungarian method to solve an assignment problem.

(3) Find initial basic feasible solution for given problem by using

(a) North-West corner rule.

(b) Least cost method.

(c) Vogel's approximation method.

If the object is to minimize the total transportation cost :

		D_1	D_2	D_3	D_4	
From	P_1	2	3	11	7	6
	P_2	1	0	6	1	1
	P_3	5	8	15	9	10
	Demand	7	5	3	2	

(4) Solve the following transportation problem :

	D_1	D_2	D_3	D_4	*Supply*
S_1	19	30	50	10	07
S_2	70	30	40	60	9
S_3	40	10	60	20	18
Demand	5	8	7	14	34

(5) Solve the following assignment problem :

MEN		A	B	C
TASK	1	120	100	80
	2	80	90	110
	3	110	140	120