AAI-003-001618 Seat No. _______

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

March / April - 2016

BSMT-603(A) : Mathematics

(Optimization & Numerical Analysis - II)

(New Course)

Faculty Code : 003
Subject Code : 001618

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

Instructions : (1) Write answer of MCQs in your answer book only.
(2) All questions are compulsory.
(3) Figures to the right indicate full marks.

1 Give answers of all following questions : **20**

(1) Which of the following is two step method?

(A) Picard's (B) Runge's

(C) Trapezoidal (D) Milne's

(2) Using Lagrange's interpolation formula one can fit ____ n degree polynomial from given n + 1 set of observation.

(A) almost (B) atleast

(C) exactly (D) None of these

(3) If A is solution produced using Runge-Kutta 2^{nd} order and B is solution produced using improved Euler method then

(A) $A = B$

(B) A is more accurate than B

(C) B is more accurate than A

(D) Cannot say

(4) Which of the following method can be used to find root of transcendental equation.

(A) Stirling's Interpolation

(B) Divided difference Interpolation

(C) Newton-Cotes quadrature method

(D) Inverse Lagrange Interpolation

(5) Minimum no of sub-intervals required to apply Simpson's 3/8 rule and Trapezoidal rule simultaneously is

(A) 1 (B) 2

(C) 3 (D) 6

(6) Runge-Kutta 2^{nd} order method is similar as

(A) Euler method

(B) Improved Euler method

(C) Runge's method

(D) None of these

(7) Divided difference interpolation method applicable for given domain data with ______ length of subintervals.

(A) common (B) uncommon

(C) both (A) and (B) (D) none of these

(8) If the value of $p = \frac{x - x_0}{h}$ lies in $\left[-\frac{1}{4}, 0\right]$, the best suitable interpolation to apply is

(A) Gauss-Backward (B) Gauss-forward

(C) Bessell's (D) None of these

(9) Picard's method can solve differential equation of the form :

(A) $y' = f(x, y)$

(B) $y' = f(x, y), y(x_0) = y_0$

(C) $y = f(x, y), y(x_0) = y_0$

(D) None of these

(10) Which of the following is an iterative method ?

(A) Picard's method

(B) Taylor series method

(C) Trapezoidal

(D) Bessel's interpolation

(11) Hungarian method is to get optimum solution of

(A) LPP (B) AP

(C) TP (D) none

(12) A transportation problem of n supply point and Trig, demand point is having degenerate solution, when number of allocation in basic feasible solution is

(A) $=m+n-1$ (B) $<m+n-1$

(C) $>m+n-1$ (D) Both (B) and (C)

(13) Graphical method is useful to solve LPP, if LPP consist _______ decision variables

(A) 2 (B) 3

(C) 4 (D) None

(14) In context of transportation problem, LCM means

(A) Least Common Multiple

(B) Least Cost Multiple

(C) Least Cost Method

(D) None of these

(15) If the line segment joining every pair of points of set S lies in S then S is ________

(A) convex set

(B) concave set

(C) both (A) and (B)

(D) can't say

(16) Primal contains second variable unrestricted in sign, the corresponding dual has second

(A) variable unrestricted in sign

(B) constraint of equality type

(C) variable negative

(D) constraint does not exist

(17) If Simplex method produces a solution of LPP, the solution can not be

(A) degenerate

(B) basic feasible

(C) feasible

(D) infeasible

(18) For maximization LP problem, the simplex method is terminated when all values

(A) $C_j - Z_j \leq 0$ (B) $C_j - Z_j \geq 0$

(C) $C_j - Z_j = 0$ (D) $Z_j \leq 0$

(19) Which of the following method/s is/are use to find optimal solution for the given TP?

(A) VAMP

(B) MODI method

(C) Both (A) and (B)

(D) None of the above

(20) To balance the given unbalanced TP we add

(A) one dummy row

(B) one dumpy column

(C) both (A) and (B)

(D) either (A) or (B)

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

(1) Derive first order derivative of Newton's-forward interpolation formula.

(2) If $f(x)=x^{-1}$, show that $f(a,b,c,d)=\frac{1}{abcd}$.

(3) Find $\int_0^1 y\,dx$ using Simpson's $1/3^{rd}$, rule from the following table :

x	0	0.25	0.5	0.75	1
y	1.0000	0.9896	0.9589	0.9089	0.8415

(4) Write working rule of Runge's method.

(5) Write two difference between Gauss-Backward interpolation and Lagrange's interpolation.

(6) In usual notation prove that

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

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

(1) Derive Newton's-forward interpolation formulae from divided difference interpolation formula.

(2) Solve $y'=x+y$ with $y(0)=1$, using Picard's method.

(3) Find y' at $x=0.04$ from given data below, using Bessel's interpolation formula :

x	0.01	0.02	0.03	0.04	0.05	0.06
y	0.1023	0.1047	0.1071	0.1096	0.1122	0.1148

(4) Derive stirling's interpolation formula.

(5) If $y_0, y_1, ...y_6$ are the consecutive terms of a series, then using Lagrange's formula prove that

$$y_3=0.05(y_0+y_6)-0.3(y_1+y_5)+0.75(y_2+y_4)$$

(6) Explain Improved Euler method graphically.

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

(1) Derive Lagrange's interpolation formula.

(2) Derive Newton-Cote's quadrature formula and hence deduce Simpson's 3/8 rule.

(3) Derive Milne-Thomson predictor-corrector formula.

(4) Derive Laplace- Everett's interpolation formula.

(5) Find y and z at x = 0.1 using Runge-Kutta forth order method, given that $\frac{dy^4}{dx} = x+z$, $\frac{dz}{dx} = x - y^2$, $y(0)=2$ and $z(0)=1$.

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

(1) Define : (i) Decision variable (ii) Slack variable.

(2) Write dual of Maximize $Z = 2x+3y$ subject to $x-y \le 3$, $3x+2y \le 2$ and $x, y \ge 0$.

(3) Explain canonical form of linear programming problem.

(4) Solve the following transportation problem, using North-West Corner method :

		Destinations				Supply
		D_1	D_2	D_3	D_4	
Source	S_1	19	30	50	10	7
	S_2	70	30	40	6	9
	S_3	40	8	70	20	18
Demand		5	8	7	14	34

(5) Define unbalanced transportation problem with suitable example.

(6) Define: (i) Convex hull (ii) Convex set

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

(1) Define feasible solution and basic feasible solution also write differences between them.

(2) Define alternate optimality in linear programming problem with suitable example.

(3) Describe Vogel's Approximation Method.

(4) Explain primal-dual relationship for linear programming problem.

(5) Solve the following LPP using graphical method

Minimize $Z = 6000x_1 + 4000x_2$

Subject to $x_1 + x_2 \geq 24$

$x_1 + x_2 \geq 16$

$x_1 + 3x_2 \leq 24$

$x_1, x_2 \geq 0$

(6) Solve the following LPP using the simplex method and also find out two different optimal solution

Maximize $Z = 2x + 3y$

Subject to condition $4x + 6y \leq 24$

$x \leq 5;$

$x, y \geq 0$

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

(1) Explain simplex algorithm.

(2) Solve the following assignment problem

Machines

		M_1	M_2	M_3	M_4	M_5
Job	J_1	11	7	10	17	10
	J_2	13	21	7	11	13
	J_3	13	13	15	13	14
	J_4	18	10	13	16	14
	J_5	12	8	16	19	10

(3) Find optimum solution of transportation problem stated in question 3(A)(4).

(4) Find dual of linear programming problem

Minimize $Z = 8x_1 + 5x_2 + 4x_3$

subject to $4x_1 + 2x_2 + 8x_3 = 12$

$7x_1 + 5x_2 + 6x_3 \geq 9$

$8x_1 + 5x_2 + 4x_3 \leq 10$

$3x_1 + 7x_2 + 9x_3 \geq 7$

$x_1 \geq 0, x_2$ unrestricted in sign, $x_3 \leq 0$.

(5) Solve the following linear programming problem by Big-M method

Maximize $Z = 2x_1 + x_2 + 3x_3$

Subject to $x_1 + x_2 + 2x_3 \leq 5$

$2x_1 + 3x_2 + 4x_3 = 12$

$x_1, x_2, x_3 \geq 0$