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B.Tech 3rd Semester Examination, 2016
N.M.C.T.

Time : 3 hours**Full Marks : 70****Instructions :**

- (i) There are Nine Questions in this Paper
- (ii) Attempt Five questions in all.
- (iii) Question No. 1 is Compulsory.
- (iv) The marks are indicated in the right hand margin.

1. Answer any seven of the following as directed:

$$2 \times 7 = 14$$

- (a) _____ converts the programs written in assembly language into machine instructions.
- (i) Machine compiler
 - (ii) Interpreter
 - (iii) Assembler
 - (iv) Converter
- (b) What is class in c++ ?
- (i) When you define a class, you define a blueprint for a data type.

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- (ii) When you define a class, you make get more functionality
- (iii) When you define a class, you define the logic
- (iv) When you define a class, you make debugging
- (c) The correct statement is:
 - (i) `scanf("Enter the value of A%d",a)`
 - (ii) `scanf("%d; %d, %d", &a, &b, &c)`
 - (iii) (i) and (ii) both
 - (iv) none of these

(d) In which of the following method, we approximate the curve of solution by the tangent in each interval

- (i) Picard's method
- (ii) Euler's method
- (iii) Newton's method
- (iv) Runge Kutta method

(e) In Regular-falsi method, the first approximation is given by

$$(i) x_1 = \frac{af(b)-bf(a)}{f(b)-f(a)}$$

$$(ii) x_1 = \frac{bf(b)-af(a)}{f(b)-f(a)}$$

$$(iii) x_1 = \frac{bf(a)-af(b)}{f(b)-f(a)}$$

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 (iv) $x_1 = \frac{af(a) - bf(b)}{f(a) - f(b)}$

(f) The Newton-Raphson algorithm for finding the cube root of N is

(i) $x_{n+1} = \frac{1}{2}(x_n + N/x_n)$

(ii) $x_{n+1} = \frac{1}{3}(2x_n - N/x_n^2)$

(iii) $x_{n+1} = (x_n + N/x_n)$

(iv) $x_{n+1} = \frac{1}{3}(2x_n + N/x_n^2)$

(g) Gauss-Seidal iteration converges only if the coefficient matrix is

- (i) Upper Triangular
- (ii) Lower Triangular
- (iii) Diagonally dominant
- (iv) none of these

(h) In fitting a parabola $y = ax^2 + bx + c$ to n sets of observations, the normal equations are:

(i) $\Sigma y = a\Sigma x^2 + b\Sigma x + c$, $\Sigma xy = a\Sigma x^3 + b\Sigma x^2 + c\Sigma x$,

$$\Sigma x^2 y = a\Sigma x^4 + b\Sigma x^3 + c\Sigma x^2$$

(ii) $\Sigma y^2 = a\Sigma x^2 + b\Sigma x + nc$, $\Sigma xy^2 = a\Sigma x^3 + b\Sigma x^2 + c\Sigma x$,

$$\Sigma x^2 y^2 = a\Sigma x^4 + b\Sigma x^3 + c\Sigma x^2$$

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(iii) $\Sigma y^2 = a\Sigma x^2 + b\Sigma x + c$, $\Sigma xy = a\Sigma x^3 + b\Sigma x^2 + c\Sigma x$,
 $\Sigma x^2 y = a\Sigma x^4 + b\Sigma x^3 + c\Sigma x^2$

(iv) $\Sigma y = a\Sigma x^2 + b\Sigma x + nc$, $\Sigma xy = a\Sigma x^3 + b\Sigma x^2 + c\Sigma x$,
 $\Sigma x^2 y = a\Sigma x^4 + b\Sigma x^3 + c\Sigma x^2$

(i) In the Newton's Forward difference formula what is u

(i) $u = \frac{x - x_n}{h}$

(ii) $u = x - x_n$

(iii) $u = \frac{(x - x_n)^2}{h}$

(iv) $u = \frac{(x - x_n)^3}{h}$

(j) While using Simpson's three-eighth rule, the given interval of integration must be divided into sub-interval whose number n is multiple of

- (i) 1
- (ii) 2
- (iii) 3
- (iv) 4

2. (a) Discuss the advantages and disadvantages of machine language. 7

(b) Develop a flow chart to select the largest number of a given set of 500 numbers. 7

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3. (a) Write down an algorithm to find the real roots of the equation $ax^2+bx+c=0$: a,b,c are real and $a,b \neq 0$.

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(b) Write a 'C' program to do the following:

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(i) Accept length and breadth of a rectangle as input and display the area after calculation

(ii) Accept 5 numbers and calculate their average.

4. (a) Write a C++ program to convert decimal number to binary number.

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(b) Write a C++ Program to Find Transpose of a Matrix.

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5. Prove that Newton Raphson method has quadratic convergence and hence find the real root of the equation $\log x - \cos x = 0$.

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6. (a) Apply Gauss Seidel iteration method to solve the following equations:

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$$10x + y + 2z = 44, 2x + 10y + z = 51, x + 2y - 10z = 61$$

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(b) Prove the following relation:

$$\sum_{i=1}^n \Delta^2 f_i = \Delta f_{n+1} - \Delta f_0$$

7. (a) Find the polynomial of the lowest possible degree which takes the values 3, 12, 15, -21 when x has the values 3, 2, 1, -1 respectively using Lagrange Interpolation.

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(b) Find the curve of best fit of the type $f(x) = ae^{bx}$ to the following data by the method of Least square :

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| | | | | | |
|----------|-----|------|------|------|------|
| x | .5 | 1.0 | 2.0 | 2.5 | 3.0 |
| $f(x)$: | 5.7 | 1.46 | 5.10 | 7.65 | 9.20 |

8. (a) Obtain the Simpson's 3/8-Rule

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(b) A solid of revolution is formed by rotating about the x-axis the area between the x-axis, the lines $x=0$ and $x=1$, and a curve through the points with the following coordinates:

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| | | | | | |
|---|--------|--------|--------|--------|--------|
| x | 0.00 | 0.25 | 0.50 | 0.75 | 1.00 |
| y | 1.0000 | 0.9896 | 0.9589 | 0.9089 | 0.8415 |

Estimate the volume of the solid formed, giving the answer to three decimal places.

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9. (a) Derive Euler's method for solving the initial value problem

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$$y'(x)=f[x,y(x)], \quad y(x_0) = y_0$$

(b) Solve the boundary-value problem $y''(x)-64y+10=0$, $y(0) = y(1) = 0$ by the finite difference method. Compute the value of $y(0.5)$ and compare it with true value. 7
