Code: 211404

M FORTRAM

## B.Tech 4th Semester Exam., 2018

## NUMERICAL METHODS AND COMPUTATIONAL TECHNIQUE

Time: 3 hours Full Marks: 70

## Instructions:

- (i) The marks are indicated in the right-hand margin.
- (ii) There are **NINE** questions in this paper.
- (iii) Attempt FIVE questions in all.
- (iv) Question No. 1 is compulsory.
  - 1. Choose the correct answer (any seven): 2×7=14
    - (a) The \_\_\_\_ provides pictorial representation of a given problem.
      - (i) algorithm
      - (ji) flowchart
      - (iii) pseudocode
      - (iv) All of the above

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- (i) FORTRAN
- (ii) MODEM

- (iii) COBOL
- (iv) ALGOL
- (c) The type cast operator is
  - (i) (type)
  - (ii) cast()
  - (iii) //
  - (iv) " "



The order of convergence in Newton-Raphson method is

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- (i) 2
  - (ii) 3
- (iii) 0
- (iv) 1

(Continued)

(e) If  $x_n$  is the *n*th iterate, then Newton-Raphson formula is

(i) 
$$x_n = x_{n-1} + \frac{f(x_n)}{f'(x_n)}$$

(ii) 
$$x_n = x_{n-1} - \frac{f(x_{n-1})}{f'(x_{n-1})}$$

(iii) 
$$x_n = x_{n-1} - \frac{f(x_{n+1})}{f'(x_{n+1})}$$

(iv) 
$$x_n = x_{n-1} - \frac{f(x_n)}{f'(x_n)}$$

(f) A unique polynomial of degree \_\_\_\_ passes through (n+1) data points.

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(i) 
$$n+1$$



(iii) n or less

(iv) n+1 or less

- (g) The nth divided differences of a polynomial of the nth degree are
  - (i) constant
  - (ii) variable
  - (iii) equal
  - (iv) unequal



In Newton's forward difference formula what is u?

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

(ii) 
$$u = x - x_n$$

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

$$\int (iv) u = \frac{x - x_0}{h}$$

- In application of Simpson's  $\frac{1}{3}$ rd rule, the interval h for closer approximation should be
  - (i) even of the convious should be
  - (ii) small
  - (iii) odd
  - (iv) even and small
  - In the geometrical meaning of Euler's (j)algorithm, the curve is approximated as a/an
    - (i) straight line
    - (ii) circle
    - (iii) parabola
    - (iv) ellipse
- Write an algorithm and draw a flow-**2.** (a) chart to convert the length in feet to centimeter.

(Continued)

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(b) What is high-level language? What are the different types of high-level languages?

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**3.** What is a flowchart? How is it different from an algorithm?

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Write a C/C++ program to print all numbers between 1 to n divisible by 7.

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(b) Define array. Explain different types of array in detail.

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Evaluate :

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$$\Delta\left(\frac{2^x}{(x+1)!}\right);\ h=1$$

(b) Apply Gauss-Seidel iteration method to solve the following equations:

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$$20x + y - 2z = 17$$
$$3x + 20y - z = -18$$
$$2x - 3y + 20z = 25$$

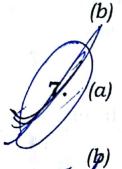
- 6. The equation  $x^2 + ax + b = 0$  has two real roots  $\alpha$  and  $\beta$ . Show that the method
  - (a)  $x_{k+1} = -\frac{1}{x_k}(ax_k + b)$  converges to a if  $|\alpha| > |\beta|$ .

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$$x_{k+1} = -\frac{b}{x_k + a}$$
 converges to  $a$  if  $|\alpha| < |\beta|$ .

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Derive Newton's forward difference interpolation formula.

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A third degree polynomial passes through the points (0, -1), (1, 1), (2, 1) and (3, -2). Find the polynomial.

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Evaluate sagna ......

$$\int_{30^\circ}^{90^\circ} \log_{10} \left( \sin x \right) dx$$

by Simpson's one-third rule by dividing the interval into 6 parts.

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(b) A river is 80 m wide. The depth 'y' of the river at a distance x from one bank is given by following table:

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x	0	10	20	30	40	50	60	70	80
y	0	4	7	9	12	15	14	8	3

Find approximately the area of cross-section of the river using Simpson's one-third rule.



Find the solution of following initial value problem by using Euler's method :

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$$\frac{dy}{dx} + 2y = 0, \ y(0) = 1$$

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(Continued)

(b) Solve the boundary value problem

y'' - 64y + 10 = 0; y(0) = y(1) = 0

by the finite-difference method. Compute the value of y(0.5) and compare it with the true value.

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