Code : 211404

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

   (ii) flowchart

   (iii) pseudocode

   (iv) All of the above

(2)

(b) Which of the following is not a High-level computer programming language?

   (i) FORTRAN

   (ii) MODEM

   (iii) COBOL

   (iv) ALGOL

(c) The type cast operator is

   (i) (type)

   (ii) cast()

   (iii) //

   (iv) " "

(d) The order of convergence in Newton-Raphson method is

   (i) 2

   (ii) 3

   (iii) 0

   (iv) 1

(e) If x_n is the nth iterate, then Newton-Raphson formula is

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

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

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

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

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

(i) $n+1$

(ii) n

(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

(h) In Newton's forward difference formula what is u?

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

(ii) $u = x - x_n$

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

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

(i) In application of Simpson's $\frac{1}{3}$rd rule, the interval h for closer approximation should be

(i) even

(ii) small

(iii) odd

(iv) even and small

(j) In the geometrical meaning of Euler's algorithm, the curve is approximated as a/an

(i) straight line

(ii) circle

(iii) parabola

(iv) ellipse

2. (a) Write an algorithm and draw a flow-chart to convert the length in feet to centimeter. 7

(b) What is high-level language? What are the different types of high-level languages? 7

3. What is a flowchart? How is it different from an algorithm? 14

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

(b) Define array. Explain different types of array in detail. 7

5. (a) Evaluate : 7

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

(b) Apply Gauss-Seidel iteration method to solve the following equations : 7

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

6. The equation $x^2+ax+b=0$ has two real roots α and β. Show that the method

(a) $x_{k+1}=-\dfrac{1}{x_k}(ax_k+b)$ converges to a if

$|\alpha|>|\beta|$. 7

(b) $x_{k+1}=-\dfrac{b}{x_k+a}$ converges to a if $|\alpha|<|\beta|$. 7

7. (a) Derive Newton's forward difference interpolation formula. 8

(b) A third degree polynomial passes through the points $(0, -1)$, $(1, 1)$, $(2, 1)$ and $(3, -2)$. Find the polynomial. 6

8. (a) Evaluate

$$\int_{30°}^{90°} \log_{10}(\sin x)\,dx$$

by Simpson's one-third rule by dividing the interval into 6 parts. 7

(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 : 7

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.

9. (a) Find the solution of following initial value problem by using Euler's method : 7

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

(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.　　7

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