

SEMESTER EXAMINATION-2021
BSC III SEMESTER – COMPUTER SCIENCE
BCS-C301: NUMERICAL COMPUTING

Time: 3 hour

Max. Marks: 70
Min. Pass: 40%

Note: Question Paper is divided into two sections: **A and B**. Attempt both the sections as per given instructions.

SECTION-A (SHORT ANSWER TYPE QUESTIONS)

Instructions: Answer any five questions in about 150 words each. Each question carries six marks. (5 X 6 = 30 Marks)

Question-1: Write a short note on Runge-Kutta (RK) methods.

Question-2: Define a cubic spline $S(x)$ which is commonly used for interpolation.

Question-3: Find the polynomial which takes the following values

X	0	1	2
Y	1	2	1

Question-4: State two-point Gaussian quadrature formula to evaluate $\int_{-1}^1 f(x)dx$

Question-5: Write a short note on methods for finding complex roots.

Question-6: Evaluate $\int_0^1 \frac{dx}{1+x}$ by using trapezoidal rule, taking $h = 0.5$ and $h = 0.25$

Question-7: Use Lagrange's formula to find a polynomial which takes the values $f(0) = -12$, $f(1) = 0$, $f(3) = 6$ and $f(4) = 12$. Hence find $f(2)$.

Question-8: Discuss initial and boundary value problems.

Question-9: Explain Rayleigh method of approximation.

Question-10: Find $y(0.2)$ given that $y' = x + y$, $y(0) = 1$ using Euler's method.

SECTION-B (LONG ANSWER TYPE QUESTIONS)

Instructions: Answer any FOUR questions in detail. Each question carries 10 marks. (4 X 10 = 40 Marks)

Question-11: Explain Iteration method. Also find a real root of the equation $\cos x = 3x - 1$ correct to three decimal places using Iteration method.

Question-12: What do you understand by Jacobi's Iteration Method? Solve, by Jacobi's iteration method, the equations
 $20x + y - 2z = 17$; $3x + 20y - z = -18$; $2x - 3y + 20z = 25$.

Question-13: Explain the bisection method. Also find a root of the equation $x^3 - 4x - 9 = 0$, using the bisection method in four stages.

Question-14: The table gives the distance in nautical miles of the visible horizon for the given heights in feet above the earth's surface:

Height	100	150	200	250	300	350	400
Distance	10.63	13.03	15.04	16.81	18.42	19.90	21.27

Find the values of y when $x = 218$ ft and $x = 410$ ft

Question-15: Using Picard's process of successive approximation, obtain a solution upto fifth approximation, of the equation $\frac{dy}{dx} = y + x$, such that $y = 1$ when $x = 0$. Check your answer by finding the exact particular solution.

Question-16: Give the meaning of systems of linear equations. And apply the Crout's method to solve the equations:
 $3x + 2y + 7z = 4$; $2x + 3y + z = 5$; $3x + 4y + z = 7$.

Question-17: Given that

X	1.0	1.1	1.2	1.3	1.4	1.5	1.6
Y	7.989	8.403	8.781	9.129	9.451	9.750	10.031

Find $\frac{dy}{dx}$ and $\frac{d^2y}{dx^2}$ at (a) $x = 1.1$ (b) $x = 1.6$

Question-18: Evaluate $\int_0^6 \frac{dx}{1+x^2}$ using (i) Simpson's 1/3 rule (ii) Simpson's 3/8 rule

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