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National Institute of Science and Technology (Autonomous)



B. Tech 3 rd Semester (2021 Batch)				Branch	All
Subject Code	19CM3BS01T	Subject Name	Mathematics-III		
Time	1 hour 30 min	Exam	Mid-Sem	Max. Marks	50
Examination Superintendent	Dr. Manabendra Patra				
Name of the Instructor(s)	Dr. Deepak Acharya, Dr. Subrat ku. Sahu, Dr. Radhakrushna Sahu, Prof. M. Rajendra, Dr. Chinmaya Giri				
Date of Examination	21 /11/2022 (1 st Sitting)				

Answer Question No.1 from PART-I which is compulsory, any Four from PART-II and any One from PART-III.

The figures in the right hand margin indicate marks.

PART-I
(Answer all the questions)

Q1.		CO	Level	(1) Knowledge (4) Analysis	(2) Comprehension (5) Synthesis	(3) Application (6) Evaluation	2 x 5
(a)		3	1	Prove $(1 + \Delta)(1 - \nabla) = 1$.			2
(b)		3	3	Calculate the 3 rd divided difference of $1/x$, based on points x_0, x_1, x_2, x_3			2
(c)		3	3	Perform two iteration of bisection method to obtain the positive root of equation $f(x) = x^3 - 5x + 1 = 0$, lies in the interval $[0, 0.5]$			2
(d)		4	1	Convert $\int_0^{\pi/2} \sin x \, dx$ to the standard Gauss-quadrature formula.			2
(e)		4	2	What is the formula of Simpson's 1/3 rule if nodes are x_0, x_1, x_2 .			2

PART-II
(Answer Any Four Questions Out Of Six)

Q2.		CO	Level	(1) Knowledge (4) Analysis	(2) Comprehension (5) Synthesis	(3) Application (6) Evaluation	6 x 4
(a)		3	3	Apply Newton-Raphson's method to determine a root of the equation $f(x) = \cos x - xe^x = 0$. Take the initial approximation as $x_0 = 1$.			6
(b)		3	3	Use Lagrange interpolation to find the value of $\ln(301)$			6
				x	300	304	305
				ln(x)	2.4771	2.4829	2.4843

(c)	3	2	Find a real root of the equation $f(x) = x^3 - 5x + 1 = 0$. Perform three iteration of the Secant method to obtain this root.	6
(d)	4	2	Find the value of y at $x = 0.6$ by Euler's method where $y' = (y + x)^2$, $y(0) = 0$, $h = 0.2$	6
(e)	4	1	Use Gauss-Legendre two-point formula to evaluate $I = \int_0^1 (3x^2 + 5x^4) dx$.	6
(f)	4	3	Use Simpson's 1/3 rule to evaluate $\int_0^1 \frac{dx}{1+x^2}$, $n = 4$ where n is number of sub-interval.	6

PART-III

(Answer any one Question out of two)

		CO	Level	(1) Knowledge (2) Comprehension (3) Application (4) Analysis (5) Synthesis (6) Evaluation	16 x 1										
Q3.	(a)	3	3	Derive Trapezoidal Rule.	8										
	(b)	4	3	Solve by Adams-Moulton method. $\frac{dy}{dx} = -2x - y, y(0) = -1$. Find $y(0.4)$	8										
Q4.	(a)	4	2	Given $\frac{dy}{dx} = x + y^2, y(0) = 1$. Find $y(0.2)$ where $h = 0.2$ using R-K method.	8										
	(b)	3	2	Use Newton's Divided difference interpolation formula compute $f(9.2)$ from the given data: <table><tr><td>x</td><td>8</td><td>9</td><td>9.5</td><td>11</td></tr><tr><td>f(x)</td><td>2.0794</td><td>2.1972</td><td>2.2513</td><td>2.3979</td></tr></table>	x	8	9	9.5	11	f(x)	2.0794	2.1972	2.2513	2.3979	8
x	8	9	9.5	11											
f(x)	2.0794	2.1972	2.2513	2.3979											

0.1466

0.1178
x 1