Enrollment No: _____ Exam Seat No: _____ C. U. SHAH UNIVERSITY **Summer Examination-2022**

Subject Name : Numerical Methods

Subject Cod	e: 4SC04N	UM1	Branch: B.Sc. (Mathematics)	
Semester: 4	D	ate: 06/05/2022	Time: 11:00 To 02:00	Marks: 70
Instructions: (1) Use (2) Instr (3) Draw (4) Assu	of Program uctions wri v neat diagr ume suitable	mable calculator & a tten on main answer ams and figures (if n e data if needed.	any other electronic instrument is prohil book are strictly to be obeyed. necessary) at right places.	pited.
Q-1 a)	Attempt to The interv	the following questing and the following questing the state of the sta	of the equation $x^3 - x - 11 = 0$	[14] (01)
	i) ii) iii) iii) iv)	-` (0,1) (2,3) (1,2) None of these		
b)	The order i) ii) iii)	of convergence in N 2 3 0	Jewton's Raphson method is	(01)
c)	iv) In Simpso i) ii) iii)	None of these n's $\frac{1^{rd}}{3}$ rule , <i>n</i> is mu 2 3 4	Iltiple of	(01)
d)	iv) Which of integral ? i) ii) iii) iv)	5 the following metho Euler's Modified M Picard's Method Runge-Kutta's Met Taylor Series Meth	nd can be used to evaluate a numerical Method thod nod	(01)
			_	

e) Newton's Iterative formula to find the value of \sqrt{N} is _____. (01)



		i)	$x_{n+1} = x_n$	+					
		ii)	$x_{n+1} = \frac{1}{2}$	$x_n + \frac{N}{n}$					
		iii)	$r_{1} = \frac{1}{2}$	$\left(\begin{array}{c} x \\ x \end{array} \right) $					
		• •	$x_{n+1} - \frac{2}{2}$	$x_n x_n$					
		1V)	$x_{n+1} = \frac{1}{3}($	$2x_n + \frac{1}{x_n^2}$					
	f)	Varies type	e of Runge-	Kutta met	hods are cla	assified acc	cording to	their	
	,	i)	degree				U		
		ii)	order						(01)
		111) iv)	rank						
	J	1V) True/False	\cdot The second	ese nd order R	unge-Kutta	formula i	s Fuler's m	nethod	(01)
	b)	True/False	: Newton	Raphson n	nethod is ar	policable to	the soluti	on of both	(01)
	/	algebraic and transcendental method.							
	i)	Write Milne's corrector formula. (01							
	j)	Which formula we use to derive Trapezoidal rule ? (01							
	k)	Write form	ula of Eule	r's Modifi	ed method.	· · · · · · · · ·			(02)
	I)	Write New	ton's Iterat	ive formul	a to find va	lue of ∛N	•		(02)
Attemnt	anv	four questi	ions from (0.2 to 0. 8	2				
0-2	any	Attempt a	ll auestion	Q-2 t0 Q-t S.	,				[14]
x -	a)	Derive Ger	neral Quadi	ature form	nula.				(07)
	b)	Find area b	ounded by	curve and	x –axisfro	m the follo	owing table	e from	(07)
		x = 7.47 t	x = 7.52						
		x	7.47	7.48	7.49	7.50	7.51	7.52	
0.3		Attempt	1.93	1.95	1.98	2.01	2.03	2.06	[1/]
Q-3		Attempt a	n question	5.					[14]
	a)	Find the 1 st	and2 nd or	der derivati	ves of $f(x)$	at $x = 1.05$	and $x = 1$.	.25	(08)
		$\begin{array}{c c} x & 1.0 \\ \hline f(x) & 1.0 \\ \end{array}$	$\frac{100}{10247}$	1.10	1.15	1.20	1.25	1.30	-
	b)	Obtain $f'($	90) using (90)	Sterling's f	<u>1 1.07230</u> formula froi	m the follo	wing table	1.14017	(06)
	~)		soj using :		01111414 1101			•	(00)
		x	60	75	90	105	120		
		f(x)	28.2	38.2	43.2	40.9	37.7		
0.4									F1 41
Q-4	a)	Derive diff	erentiation	s. formula h	ased on Ne	wton's for	ward inter	polation	[14] (07)
	u)	formula.							(0 T)
	b)	Derive Eul	er Maclaur	in Sum foi	mula.				(07)
Q-5		Attempt a	ll question	S.	2				[14]
	a)	Find a real	root of sin	x = 1 + x	correct to	o three dec	imal place	s using	(05)
	b)	Interview Raphson method. (05)						(05)	
	5)	Evaluate $\int_0 \frac{1}{1+x^2}$ by Simpson's $\frac{1}{3}$ Rule. Take $h = 1$.							(03)
	c)	Find a posi	tive root of	the equat	ion $xe^x = 1$	1 which lie	es between	0 and	(04)



1 ,correct to three decimal places using Bisection method.

Q-6		Attempt all questions.	[14]
	a)	Evaluate $\int_0^5 \frac{dx}{1+x}$ by Trapezoidal Rule. Take $h = 1$.	(05)
	b)	Find a real root of the equation $2x - log_{10}x = 7$, correct to three decimal places using Iteration method.	(05)
	c)	Find a real root of the equation $xe^x - 2 = 0$ which lies between 0.8 and 0.9 ,correct to three decimal places using Regula-falsi method.	(04)
Q-7		Attempt all questions.	[14]
-	a)	Use Taylor series method to obtain approximate value of y at $x =$	(07)
		0.2 provided $\frac{dy}{dx} = 2y + 3e^x$, $y(0) = 0$. Compare the numerical solution with exact solution	
	b)	with exact solution. $G^{i} = \frac{dy}{dx}$ $f = 1$ (0.2) $F^{i} = 1$ (0.2) $F^{i} = 1$ (0.2) $F^{i} = 1$	(07)
	U)	Given $\frac{1}{dx} = y - x$ where $y(0) = 2$. Find $y(0.1)$ and $y(0.2)$ by Runge	(0)
		Kutta method for 3^{rd} order, correct upto four decimal places.	
Q-8		Attempt all questions.	[14]
	a)	Use Picard's method to compute $y(0.1)$ from the differential equation	(07)
		$\frac{dy}{dx} = x + y$, $y(0) = 1$.	
	b)	Given $\frac{dy}{dy} = r^3 \pm v$, $v(0) = 1$ Find $v(0.02)$ by Euler's method. Correct up	(07)

b) Given $\frac{dy}{dx} = x^3 + y$, y(0) = 1. Find y(0.02) by Euler's method . Correct up (07) to four decimal places. Take h = 0.01

