Roll No: -----



UNIVERSITY OF PETROLEUM AND ENERGY STUDIES

End Semester Examination, December 2018

Programme: B. Tech. [ME+ME(MD)+ME(MSNT)+ME(PROE)+ME(THE)] Semester – V

Course Name: Applied Numerical TechniquesMax. Marks:100Course Code: MATH 305Duration: 3 HrsNo. of page/s: 02Duration: 3 Hrs

Instructions:

Attempt all questions from Section A (each carrying 4 marks); attempt all questions from Section B (each carrying 10 marks); attempt Section C (each carrying 20 marks).

	Section A		
1.	Show that the bisection method always converges for the equation $f(x) = 0$.	[4]	CO2
2.	Evaluate $\int_{0}^{6} \frac{dx}{1+x^2}$, by using Simpson's 1/3 rule.	[4]	CO1
3.	Discuss the method of point collocation with an example.	[4]	CO4
4.	Classify the following equation $\frac{\partial^2 u}{\partial x^2} + 4 \frac{\partial^2 u}{\partial x \partial y} + 4 \frac{\partial^2 u}{\partial y^2} - \frac{\partial u}{\partial x} + 2 \frac{\partial u}{\partial y} = 0$	[4]	CO3
5.	Find $f(3)$ and $f'(3)$ from x 0 1 2 5 $f(x)$ 2 3 12 147	[4]	CO1
	SECTION B		
6.	Find an approximate solution of the differential equation by method of least squares $\frac{d^2 y}{dx^2} - u = x, x \in [0, 1]$ with boundary conditions $u(0) = u(1) = 0$. Use only two basis functions.	[10]	CO4
7.	Solve by Gauss-Seidel method (two approximations) 6x + y + z = 105 4x + 8y + 3z = 155 5x + 4y - 10z = 65	[10]	CO2
8.	Find the value of y for x=0.1 by Picard's method, given that $y(0)=1$ and	[10]	CO3

$\frac{dy}{dx} = \frac{y - x}{y + x}$	<u>(</u>												
Derive the newton Cotes formula for integration.ORThe velocity (v) of a car which starts from rest is given at fixed intervals of time (t) as follows. t 2 4 6 8 10 12 14 16 18 20 t 2 4 6 8 10 12 14 16 18 20										[10]	CO1		
Estimate approximately the distance covered by car in 20 units of time.													
Using Gauss Elimination Method Solve the following system of equations 2x + 4y + z = 3 3x + 2y - 2z = -2 x - y + z = 6								[10]	CO2				
Apply Runge-Kutta method (fourth order) to find an approximate value of $y(0.1)$, given that $\frac{dy}{dx} = x + y$ y(0)=1 with $h=0.1$										[10]	CO3		
Derive the Lagrange's interpolation formula for interpolation. OR Derive Newton's forward difference formula for interpolation.									[10]	CO1			
Solve the boundary value problem defined by y''-x=0 and $y(0)=1$, $y'(1)=-1/2OR$											[10]	CO4	
	Derive the The veloc (t) as follo t 2 v 10 Estimate Using Gau 2x 3x x - Apply Ru given that $\frac{dy}{dx} = x + y$ Derive the Derive Net Solve the y'' - x =	The velocity (v) o (t) as follows. t 2 4 v 10 18 Estimate approximation 2x + 4y + 2x $3x + 2y - 2x$ $x - y + z = 0$ Apply Runge-Kut given that $\frac{dy}{dx} = x + y$ Derive the Lagrant Derive the Lagrant Derive Newton's Solve the boundart y'' - x = 0 and	Derive the newton Cotes The velocity (v) of a car (t) as follows. t 2 4 6 v 10 18 25 Estimate approximately Using Gauss Elimination 2x + 4y + z = 3 3x + 2y - 2z = -2 x - y + z = 6 Apply Runge-Kutta method given that $\frac{dy}{dx} = x + y$ Derive the Lagrange's in Derive Newton's forward Solve the boundary value y'' - x = 0 and $y(0) = 1$,	Derive the newton Cotes formul The velocity (v) of a car which s (t) as follows. t 2 4 6 8 v 10 18 25 29 Estimate approximately the dist Using Gauss Elimination Method 2x + 4y + z = 3 3x + 2y - 2z = -2 x - y + z = 6 Apply Runge-Kutta method (for given that $\frac{dy}{dx} = x + y$ Derive the Lagrange's interpola Derive Newton's forward differ Solve the boundary value proble y'' - x = 0 and $y(0) = 1$, $y'(1)$	Derive the newton Cotes formula for in The velocity (v) of a car which starts from (t) as follows. t 2 4 6 8 10 $v 10 18 25 29 32$ Estimate approximately the distance constrained by the distan	Derive the newton Cotes formula for integration. OR The velocity (v) of a car which starts from rest is (t) as follows. $\frac{t 2}{v 10} \frac{4}{10} \frac{6}{12} \frac{8}{29} \frac{10}{32} \frac{12}{20}$ Estimate approximately the distance covered by SECTION Using Gauss Elimination Method Solve the follo 2x + 4y + z = 3 3x + 2y - 2z = -2 x - y + z = 6 Apply Runge-Kutta method (fourth order) to find given that $\frac{dy}{dx} = x + y$ y(0)=1 with $h=Derive the Lagrange's interpolation formula for intoORDerive Newton's forward difference formula forSolve the boundary value problem defined byy' - x = 0$ and $y(0)=1$, $y'(1)=-1/2OR$	Derive the newton Cotes formula for integration. OR The velocity (v) of a car which starts from rest is given at f (t) as follows. $\frac{t}{2}$ $\frac{2}{4}$ $\frac{4}{6}$ $\frac{6}{8}$ $\frac{10}{12}$ $\frac{12}{4}$ $\frac{14}{v}$ $\frac{10}{18}$ $\frac{12}{25}$ $\frac{14}{29}$ $\frac{12}{20}$ $\frac{11}{11}$ Estimate approximately the distance covered by car in 20 SECTION C Using Gauss Elimination Method Solve the following syste $\frac{2x + 4y + z = 3}{3x + 2y - 2z = -2}$ $x - y + z = 6$ Apply Runge-Kutta method (fourth order) to find an approximately given that $\frac{dy}{dx} = x + y$ $y(0)=1$ with $h=0.1$ Derive the Lagrange's interpolation formula for interpolation OR Derive Newton's forward difference formula for interpolation Solve the boundary value problem defined by y'' - x = 0 and $y(0)=1$, $y'(1)=-1/2$ OR	Or integration constrained in the second constrained in the second constraint of the second constraint is constrained in the second constraint is constraint in the second constraint is constraint.ORIntegration of the second constraint is constraint in the second constraint in the second constraint is constraint.SECTION CUsing Gauss Elimination Method Solve the following system of end constraint is constraint in the second constraint is constraint.OSECTION CUsing Gauss Elimination Method Solve the following system of end constraint is constraint in the second constraint is constraint.OSECTION CUsing Gauss Elimination Method Solve the following system of end constraint is constraint in the second constraint is constraint.OSECTION CUsing Gauss Elimination Method Solve the following system of end constraint is constraint.OSECTION COSECTION CDerive the Lagrange's interpolation formula for interpolation.OR <td col<="" td=""><th>Derive the newton Cotes formula for integration. 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OR Derive Newton's forward difference formula for interpolation. $(10]$ OR $(10]$

Roll No: -----

Max. Marks:

Duration: 3



UNIVERSITY OF PETROLEUM AND ENERGY STUDIES

End Semester Examination, December 2018

Programme: B. Tech. [ME+ME(MD)+ME(MSNT)+ME(PROE)+ME(THE)] Semester – V

Course Name: Applied Numerical Techniques 100 Course Code: MATH 305 Hrs No. of page/s: 02

Instructions:

Attempt all questions from Section A (each carrying 4 marks); attempt all questions from Section B (each carrying 10 marks); attempt Section C (each carrying 20 marks).

	Section A								
1.	Show that the fixed point iteration method may not converge for some equations $f(x)=0$ with the help of an example	[5]	CO2						
2.	Evaluate $\int_{0}^{6} \frac{dx}{1+x^2}$ using Simpson's 3/8 rule.								
3.	Discuss the method of point collocation with an example.	[5]	CO4						
4.	Derive the Bessel's formula for the interpolation.	[5]	CO3						
5.	x 0 1 2 3 f(x) 1 2 1 10	[5]	CO						
	SECTION B	I	1						
6.	6. Discuss the method of least squares with an example.								
7.	Solve by Gauss-Jacobi method (two approximations) 6x + y + z = 105 4x + 8y + 3z = 155 5x + 4y - 10z = 65	[10]	CO2						
8.	Find the value of y for x=0.1 by Taylor Series method, given that $y(0)=1$ and	[10]	CO3						
	$\frac{dy}{dx} = \frac{y - x}{y + x}$								

	Derive the Trapezoidal rule by deriving Newton-Cotes formula for integration.												
	OR												
9.	The velocity (v) of a car which starts from rest is given at fixed intervals of time (t) as follows.												CO1
	t v	2 10	4 18	6 25	8 29	10 32	12 20	14 11	16 5	18 2	20 0		l
	Estimate approximately the distance covered by car in 20 units of time. SECTION C												
	1												
9.A	Using LU (Crout's) decomposition Method Solve the following system of equations 2x + 4y + z = 3 $3x + 2y - 2z = -2$ $x - y + z = 6$										[10]	CO2	
9.B	Apply Euler's method to find an approximate value of $y(0.1)$, given that $\frac{dy}{dx} = x + y$ y(0)=1											[10]	CO3
10.A		Deri find x f(x)	<i>f</i> (3)	Newto 0 2	n's inte	1 3		a (divide 2 12	d differ	ence) a 5 147	and hence	[10]	CO1
	OR Derive Newton's backward difference formula for interpolation.												
10.B	Solve the BVP $y''-64y+10=0$ with $y(0)=y(1)=0$. OR Solve the equation $y''+y=-x$, $0 < x < 1$ and $y(0)=y(1)=0$									[10]	CO4		