PVP 20

Code: 20BS1302

II B.Tech - I Semester – Regular / Supplementary Examinations DECEMBER 2023

NUMERICAL METHODS AND COMPLEX VARIABLES

(Common for ECE, EEE)

Duration: 3 hours | Max. Marks: 70

Note: 1. This paper contains questions from 5 units of Syllabus. Each unit carries 14 marks and have an internal choice of Questions.
2. All parts of Question must be answered in one place.

BL – Blooms Level | CO – Course Outcome

			BL	CO	Max. Marks
		UNIT-I			
1	a)	Using method of false position find a positive root of equation $x^3 - 2x + 0.5 = 0$.	L3	CO2	7 M
	b)	From the following table of values of $f(x)$ and x, estimate $f(0.29)$. x: 0.20, 0.22, 0.24, 0.26, 0.28, 0.30 $f(x)$: 1.6596, 1.6698, 1.6804, 1.6912, 1.7024, 1.7139	L4	CO4	7 M
		OR			
2	a)	Apply bisection method, find a real root of equation $e^x - x = 2$ lying between 1 and 1.4 correct to three decimal places.	L3	CO2	7 M
	b)	Find the value of $f(5)$ from the following data. Given $f(2) = 0.2107$, $f(4) = 0.2527$, $f(7) = 0.3386$, $f(8) = 0.3794$.	L4	CO4	7 M

Table for 1 b):

x	0.20	0.22	0.24	0.26	0.28	0.30
$f(x)$	1.6596	1.6698	1.6804	1.6912	1.7024	1.7139

<table>
<tr><td colspan="6">UNIT-II</td></tr>
<tr><td rowspan="2">3</td><td>a)</td><td>Evaluate the first derivative at $x = -3$ from the following table.

x	-3	-2	-1	0	1	2	3
y	-33	-12	-3	0	3	12	33

</td><td>L3</td><td>CO2</td><td>7 M</td></tr>
<tr><td>b)</td><td>Use suitable method for estimating $\int_0^{\frac{3\pi}{2}} xe^x \sin x\, dx$ by taking $n = 4$.</td><td>L4</td><td>CO4</td><td>7 M</td></tr>
<tr><td colspan="6">OR</td></tr>
<tr><td>4</td><td colspan="2">Using Taylor's series method, compute the solution of $\frac{dy}{dx} = x + y$, $y(0) = 1$ at the point $x = 0.2$ and 0.4 correct to three decimal places.</td><td>L4</td><td>CO4</td><td>14 M</td></tr>
<tr><td colspan="6">UNIT-III</td></tr>
<tr><td rowspan="2">5</td><td>a)</td><td>Show that the real and imaginary parts of
$$f(z) = \begin{cases} \frac{x^3(1+i) - y^3(1-i)}{x^2+y^2} & if\ z \neq 0 \\ 0 & if\ \ z = 0 \end{cases}$$
satisfies Cauchy-Reimann(C-R) equations at $z = 0$, but $f(z)$ is not analytic at the origin.</td><td>L4</td><td>CO5</td><td>7 M</td></tr>
<tr><td>b)</td><td>Let $f(z) = u + iv$ be an analytic function such that $u - v = (x-y)(x^2 + 4xy + y^2)$. Construct the function $f(z)$ in terms of z.</td><td>L3</td><td>CO3</td><td>7 M</td></tr>
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OR					
6	a)	Find an analytic function f(z), whose real part is $f(z)=\dfrac{\sin 2x}{\cosh 2y-\cos 2x}$	L4	CO5	7 M
	b)	Find an analytic function whose real part is $e^{-x}(x\sin y-y\cos y)$	L3	CO3	7 M
UNIT-IV					
7	a)	Evaluate $\int_C \dfrac{z+1}{z^4-4z^3+4z^2}dz$ where C is the circle $\lvert z-2-i\rvert=2$ using Cauchy's integral and derivatives formulas.	L4	CO5	7 M
	b)	Expand $f(z)=sin\, z$ in Taylor's series about $z=\frac{\pi}{4}$.	L3	CO3	7 M
OR					
8		Find Laurent's series expansion of $f(z)=\dfrac{4-3z}{z(1-z)(2-z)}$ in the following regions i) $0<\lvert z\rvert<1$ ii) $1<\lvert z\rvert<2$ iii) $\lvert z\rvert>2$	L3	CO3	14 M
UNIT-V					
9		Evaluate $\int_C \dfrac{e^{2z}}{z^3(z-1)^2}\,dz$ where C is the circle $\lvert z\rvert=2$ using Cauchy residue theorem.	L3	CO3	14 M

OR					
10	a)	Evaluate $\int_0^{2\pi} \frac{d\theta}{a+b\cos\theta}, a>b>0$, using the residue theorem.	L3	CO3	7 M
	b)	Evaluate $\int_{-\infty}^{\infty} \frac{dx}{1+x^2}$ using contour integration.	L4	CO5	7 M