PVP 23

Code: 23BS1302

II B.Tech - I Semester – Regular Examinations - DECEMBER 2024

NUMERICAL METHODS AND COMPLEX VARIABLES
(ELECTRICAL & ELECTRONICS ENGINEERING)

Duration: 3 hours Max. Marks: 70

Note: 1. This question paper contains two Parts A and B.
2. Part-A contains 10 short answer questions. Each Question carries 2 Marks.
3. Part-B contains 5 essay questions with an internal choice from each unit. Each Question carries 10 marks.
4. All parts of Question paper must be answered in one place.

BL – Blooms Level CO – Course Outcome

PART – A

		BL	CO
1.a)	Under what conditions, Newton-Raphson's method fails to find root of an equation?	L2	CO1
1.b)	Prove that $(1+\Delta)(1-\nabla)=1$	L2	CO1
1.c)	Using Newton's forward interpolation formula, write the formula for 2nd order derivative.	L3	CO2
1.d)	Write Simpson's ⅜ rule.	L1	CO2
1.e)	Verify whether the function $u(x,y)=e^x\cos y$ is harmonic or not?	L2	CO3
1.f)	Write Cauchy-Riemann (C-R) equations in cartesian form.	L2	CO1
1.g)	State Cauchy's integral theorem.	L2	CO1
1.h)	Expand $f(z)=\frac{1}{(z-1)(z-2)}$ in Taylor's series about $z=0$	L3	CO3
1.i)	Find the residue of $f(z)=\frac{z^3}{z^2-1}$ at $z=1$.	L3	CO3

1.j)	Write the zeros and the poles of $f(z)=\frac{z^4+1}{z^3(1-z)}$	L2	CO1

PART – B

			BL	CO	Max. Marks
UNIT-I					
2	a)	Apply Bisection method to find a real root of the equation $x^3-x^2-1=0$ correct to two decimal places.	L3	CO2	5 M
	b)	Using regula falsi method, find a real root of an equation $e^x \tan x = 1$	L3	CO2	5 M
OR					
3	a)	Given $\log_{10}^{654}=2.8156$, $\log_{10}^{658}=2.8182$, $\log_{10}^{659}=2.8189$, $\log_{10}^{661}=2.8202$ Estimate the value of $\log_{10}^{656}$ using Lagrange's interpolation formula.	L4	CO4	5 M
	b)	Estimate $f(3.75)$ using Newton's forward interpolation formula from the following table x: 2.5, 3.0, 3.5, 4.0 $f(x)$: 24.1, 22.0, 20.2, 18.6	L4	CO4	5 M

x	2.5	3.0	3.5	4.0
$f(x)$	24.1	22.0	20.2	18.6

UNIT-II					
4	Apply Runge-Kutta (R-K) fourth order method, to find $y(0.2)$ and $y(0.4)$. Given that $\frac{dy}{dx}=\frac{y^2-x^2}{y^2+x^2}$, $y(0)=1$.		L3	CO2	10 M
OR					
5	a)	Evaluate $\int_0^1 x^3\,dx$ with three sub intervals by using Trapezoidal rule.	L4	CO4	5 M
	b)	Estimate the approximate value of the integral $\int_0^{\pi/2}\sqrt{\cos\theta}\,d\theta$ with step size $h=\frac{\pi}{12}$ using Simpson's ⅓ rule.	L4	CO4	5 M
UNIT-III					
6	a)	Show that the function $f(z)=\sqrt{\lvert xy\rvert}$ is not analytic at the origin, although Cauchy-Riemann equations are satisfied at that point.	L4	CO5	5 M
	b)	Construct an analytic function $f(z)=u+iv$ whose real part is $u=4xy-3x+2$.	L3	CO3	5 M
OR					
7	Construct an analytic function $f(z)=u+iv$ whose imaginary part is $e^x\,(x\text{sin}y+y\text{cos}y)$		L3	CO3	10 M

UNIT-IV				
8	Evaluate $\int_C \frac{e^z}{(z-1)(z+3)}dz$ where C is the circle $\lvert z\rvert = \frac{3}{2}$ using Cauchy's integral formula.	L4	CO5	10 M
OR				
9	Expand $f(z) = \frac{1}{(z-1)(z-3)}$ in Laurent's series expansion for $i)\ \lvert z\rvert < 1$ $ii)\ 1 < \lvert z\rvert < 3$ $iii)\lvert z\rvert > 3$	L3	CO3	10 M
UNIT-V				
10	Evaluate $\int_C \frac{e^z}{(z^2+\pi^2)^2}dz$ where C is the circle $\lvert z\rvert = 4$ using Cauchy's residue theorem.	L3	CO3	10 M
OR				
11	Using calculus of residues show that $\int_0^{\pi} \frac{d\theta}{a+b\cos\theta} = \frac{\pi}{\sqrt{a^2-b^2}}$, $(a > b > 0)$	L4	CO5	10 M