PVP 20

Code: 20BS1302

II B.Tech - I Semester – Regular / Supplementary Examinations
DECEMBER - 2022

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	CO	Max. Marks
UNIT-I					
1	a)	Find a real root of the equation $x \log_{10} x = 1.2$ by Regula-Falsi method correct to four decimal places.	L3	CO2	7 M
	b)	From the following data estimate the number of students who obtained marks between 45 and 50. Marks: 30-40, 40-50, 50-60, 60-70, 70-80 Number of students: 31, 42, 51, 35, 31	L4	CO4	7 M
OR					
2	a)	Using Newton-Raphson's Method, find a root of $e^x \sin x = 1$.	L3	CO2	7 M
	b)	Using Lagrange's interpolation formula estimate the value of y corresponding to x=10 from the following data. x: 5, 6, 9, 11 y: 12, 13, 14, 16	L4	CO4	7 M

Table for 1 b):

Marks	30-40	40-50	50-60	60-70	70-80
Number of students	31	42	51	35	31

Table for 2 b):

x	5	6	9	11
y	12	13	14	16

UNIT-II

3	a)	The population of a certain town is shown in the following table. Find the rate of growth of population in the year 1961.	L3	CO2	7 M

Year	1951	1961	1971	1981	1991
Population (in thousands)	19.96	39.65	58.81	77.21	94.61

	b)	Using Euler‘s method, find an approximate value of y corresponding to x = 1.5, given that $\frac{dy}{dx} = x + 2y$ and $y = 1$ when $x = 1$.	L3	CO2	7 M

OR

4	a)	Given that $y = \log x$ and	L4	CO4	7 M

x	4.0	4.2	4.4	4.6	4.8	5.0	5.2
y	1.3863	1.4351	1.4816	1.5261	1.5686	1.6094	1.6487

Evaluate $\int_4^{5.2} logx\, dx$ by (i) Trapezoidal rule and (ii) Simpson’s 1/3 rule. Compare it with exact value.

	b)	Using fourth order Runge Kutta Method with h=0.1 find $y(0.2)$ from $y' = y - x$ with $y(0) = 2$.	L3	CO2	7 M

UNIT-III

5	a)	Show that the function $f(z) = \sqrt{\lvert xy \rvert}$ is not analytic at the origin even though Cauchy Riemann equations are satisfied thereat.	L3	CO3	7 M
	b)	Find an analytic function f(z)=u+iv, if $u-v=(x-y)(x^2+4xy+y^2)$.	L3	CO3	7 M

OR

6	a)	Prove that the function $u=e^{-x}(x\sin y-y\cos y)$ is harmonic and find its harmonic conjugate.	L3	CO3	7 M
	b)	If *f(z)* is an analytic function of *z* then prove that $\left(\frac{\partial^2}{\partial x^2}+\frac{\partial^2}{\partial y^2}\right)\lvert f(z)\rvert^2 = 4\lvert f'(z)\rvert^2$.	L4	CO5	7 M
UNIT-IV					
7	a)	If $F(\xi)=\oint_C \frac{3z^2-6z+10}{(z-\xi)}dz$, where C is the circle $x^2+y^2=9$, find the value of *F*(3.5), $F(i)$, $F''(-1)$ and $F''(-i)$	L3	CO3	7 M
	b)	Find the Taylor series expansion of $f(z)=\frac{2z^3+1}{z^2+z}$ about the point *z* = *i*.	L3	CO3	7 M
OR					
8	a)	Evaluate $\int_C (z-z^2)dz$ where C is the upper half of the circle $\lvert z\rvert=1$	L4	CO5	7 M
	b)	Expand $f(z)=\frac{z}{(z-1)(z+2)}$ as a series valid in the region (i) $0<\lvert z\rvert<1$; (ii) $1<\lvert z\rvert<2$; (iii) $\lvert z\rvert>2$.	L3	CO3	7 M
UNIT-V					
9	a)	Use Residue theorem to evaluate $\oint_C \frac{\sin \pi z^2+\cos \pi z^2}{(z-1)^2(z-2)}dz$ where $c:\lvert z\rvert=3$	L4	CO5	7 M

	b)	Use Residue theorem to evaluate $I = \int_0^{2\pi} \frac{d\theta}{3+2sin\theta}$	L4	CO5	7 M
OR					
10	a)	State Residue theorem. Hence evaluate $\oint_c \frac{Cos\ \pi z}{(z+2)(z+5)^2} dz$, where $c : \lvert z \rvert = 3$.	L4	CO5	7 M
	b)	Use Residue theorem to evaluate $I = \int_0^{\infty} \frac{dx}{1+x^4}$.	L4	CO5	7 M