Dr Neha Yadav MA-203
29/11/2022 (1)

National Institute of Technology, Hamirpur (H.P.)

End-Semester Examination – (November-December 2022)

Title of the Course: <Engineering Mathematics-III>

Class: B.Tech (CSE &CSE DD, Civil, Electrical, M&SC)

Course Code: MA-203 **Semester: 3rd**

Duration: 3:00 hrs **Max. Marks: 50**

Instructions:

- All Questions are compulsory.
- Marks are given against each question.

Q1. (a) Find the general and principal values of $\left(1+i\sqrt{3}\right)^{1+i}$.

(b) Show that the function $u=\frac{1}{2}\log(x^2+y^2)$ is harmonic.

(c) Evaluate $\sqrt{12}$ correct to four decimal places using Newton Raphson method.

(d) Evaluate $\Delta^n e^{ax+b}$; where the interval of differencing taken to be unity.

[4×02 Marks = 08 Marks]

Q2. Represent the function $f(z)=\frac{1}{(z+1)(z+3)}$ in Laurent's series valid for following domains

(a) $1<|z|<3$ (b) $0<|z+1|<2$.

[03+03=06 Marks]

Q3. Use Cauchy Residue theorem to evaluate the integral $=\oint_C \frac{e^z-1}{z\,(z-1)(z-i)^2}\,dz$, where $C: |z|=2$.

[06 Marks]

Q4. Find the best-fit values of a and b using least square method to fit an approximation of the form $y=a+bx+cx^2$ for the data given in following table

x	0	1	2	3	4
y	-4	-1	4	11	20

[06 Marks]

(2)

Q5. Determine the percentage number of criminals under 35 years for the following data using Lagrange's interpolation formula. Use 3 decimal places for computation.

Age	Under 25 years	Under 30 years	Under 40 years	Under 50 years
% no. of criminals	52	67.3	84.1	94.4

[06 Marks]

Q6. Evaluate $\int_0^1 \frac{1}{1+x^3}\,dx$, with number of grid points 3, 5 and 9 using Trapezoidal rule and Compute the extrapolated value using Romberg Integration method with Trapezoidal rule. Use 4 decimal places for computation.

[06 Marks]

Q7. Apply Runge Kutta Method to solve $\frac{dy}{dx} = xy^{1/3}$, $y(1) = 1$ to obtain $y(1.1)$, where $h = 0.1$. Use 4 decimal places for computation.

[06 Marks]

Q8. Given $\frac{dy}{dx} = \frac{1}{2}(x + y)$ and $y(0) = 2$, $x \in [0,2]$. Take step length $h = 0.5$ and Milne's predictor-corrector formula to evaluate $y(2.0)$ correct to three decimal places. Given $y(0.5) = 2.6336$, $y(1.0) = 3.595$, *and* $y(1.5) = 4.968$.

[06 Marks]

*********ALL THE BEST********