UNIT-IV

8. a. A slider in a machine moves along a fixed rod. Its distance x centimeters along the rod is given below for various values of the time t seconds. Find the velocity and acceleration of the slider at 0.1 second **8M**

t	0	0.1	0.2	0.3	0.4	0.5	0.6
x	30.13	31.62	32.87	33.64	33.95	33.81	33.24

b. Calculate by Simpson's rule an approximate value of $\int_{-3}^{3} x^4\,dx$ by taking seven equidistant ordinates. Compare it with exact value. **7M**

(or)

9. a. Apply R-K method of fourth order to solve $10\frac{dy}{dx} = x^2 + y^2$, $y(0) = 1$ at $x = 0.2$ in steps of 0.1. **8M**

b. Solve $\frac{\partial^2 u}{\partial x^2} + \frac{\partial^2 u}{\partial y^2} = -10\left(x^2 + y^2 + 10\right)$ over the square with x=0=y, x = 3 = y with u = 0 on the boundary and mesh length is 1. **7M**

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 Reg. No: | | | | | | | | | | |

VELAGAPUDI RAMAKRISHNA

SIDDHARTHA ENGINEERING COLLEGE

(AUTONOMOUS)

II/IV B.Tech. DEGREE EXAMINATION, NOVEMBER, 2019

Third Semester

17MA1301A COMPLEX ANALYSIS & NUMERICAL METHODS

(CE/EC/EI/IT)

Time: 3hours ***Max. Marks: 70***

Part-A is compulsory

Answer One Question from each Unit of Part-B

Answer to any single question or its part shall be written at one place only

PART-A

10 x 1 = 10M

1. a. Express e^z in the form a + ib.
   b. Define harmonic function.
   c. Write C-R equations in polar form.
   d. Classify the type of the singular point of $\frac{z - \sin z}{z^2}$.
   e. Find the invariant points of the transformation $w = \frac{z-1}{z+1}$.
   f. Illustrate transcendental equation.
   g. State Trapezoidal rule.
   h. Show that $(1 + \Delta)(1 - \nabla) = 1$.
   i. When does Newton – Raphson method fail?
   j. Write the limitation of Picard's method.

PART-B

4 x 15 = 60M

UNIT-I

2. a. Find v(x, y) such that the function f(z) = u(x, y) + iv(x, y) is an analytic function, where u(x, y) = 2sinx sinhy – $3x^2y + y^3$. **7M**

b. Show that the function f(z) defined by $f(z)=\begin{cases}\frac{xy^2(x+iy)}{x^2+y^2} & ; \text{ if } z\neq 0\\ 0 & ; \text{ if } z=0\end{cases}$ is not analytic at the origin even though C-R equations are satisfied at the origin. **8M**

(or)

3. a. Evaluate $\int_C \frac{\sin z}{4z+\pi}dz$, where c is the circle $|z|=1$ with positive orientation using Cauchy's integral formula. **7M**

b. Evaluate $\int_C |z|\,dz$, where c is the contour left half of the circle $|z|=1$ from z = i to z = -i in clock wise direction. **8M**

UNIT-II

4. a. Evaluate $\int_C \frac{z\cos z}{(z-\pi/2)^3}dz$, where 'c' is the circle $|z-1|=1$, by using Cauchy's residue theorem. **7M**

b. Find the bilinear transformation which maps the points z = 1, i, -1 in to the points w = i, 0, -i. Hence find the image of $|z|<1$ under this transformation. **8M**

(or)

5. a. Expand $f(z)=\frac{(z-2)(z+2)}{(z+1)(z+4)}$ in the region **8M**

i) $|z|<1$ ii) $1<|z|<4$ iii) $|z|>4$

b. Evaluate $\int_0^{2\pi}\frac{d\theta}{1-2a\sin\theta+a^2}$, $0<a<1$, by using residue theorem. **7M**

UNIT-III

6. a. Using Newton-Raphson method find an iterative scheme to compute the cube root of a positive number. Hence find $\sqrt[3]{18}$ correct to four decimals. **8M**

b. Solve the following equations by Gauss Seidel method **7M**
7x + 52y + 13z = 104; 83x + 11y – 4z = 95; 3x + 8y + 29z = 71

(or)

7. a. Discuss the use of various interpolation formulae. **7M**

b. Find the polynomial f(x) of the lowest possible degree which assumes the values -21, 15, 12, 3 when x has the values -1, 1, 2, 3 respectively. **8M**