Registration No : | | | | | | | | | | |

Total Number of Pages : 02

B.Tech

PMA4E001

4th Semester Regular / Back Examination 2018-19

APPLIED MATHEMATICS-III

BRANCH : AEIE, AERO, AUTO, BIOMED, BIOTECH, CIVIL, CSE, ECE, EEE, EIE, ELECTRICAL, ENV, ETC, FAT, IEE, IT, MANUTECH, MECH, METTA, MINERAL, MINING, MME, PE, PLASTIC, PT, TEXTILE

Time : 3 Hours

Max Marks : 100

Q.CODE : F1005

Answer Question No.1 (Part-1) which is compulsory, any eight from Part-II and any two from Part-III.

The figures in the right hand margin indicate marks.

Part- I

Q1 **Only Short Answer Type Questions (Answer All-10)** **(2 x 10)**

a) Why $\int_{C:|z-1|=2} \frac{z^2}{(z-5)^4} dz = 0$

b) Determine zeros and poles of the function $(z) = \frac{\sin z}{z^2(z-2)}$.

c) Determine residue of the function $f(z) = \frac{1}{(z^2+1)^2}$ at $z = i$.

d) Round-off the number 4.5126 to four significant figures and write the relative percentage error.

e) Write the period of $f(z) = e^z$.

f) How many nodes are required to obtain a polynomial of degree 10 in Lagrange's Interpolation?

g) Find $f[x_0, x_1, x_2]$ for given tabulated values.

X	1	6	10	12	13
f(x)	20	45	90	98	110

h) A fair coin is tossed 6 times. Determine the probability of getting exactly 2 heads.

i) A continuous random variable X has probability distribution $f(x) = \begin{cases} k(1-x), for\ 0 < x < 1 \\ o, Elsewhere \end{cases}$ what is the value of k.

j) In which distribution mean and variance are same?

Part- II

Q2 **Only Focused-Short Answer Type Questions- (Answer Any Eight out of Twelve)** **(6 x 8)**

a) Explain whether the function $U(x,y) = \frac{x}{x^2+y^2}$ is harmonic or not. If yes, determine the corresponding analytic function $f(z)$.

b) Calculate :

$$\oint_{C:|z|=2} \frac{z}{(z^2-9)(z+i)} dz$$

c) Calculate Laurent series of $f(z) = \frac{2}{z^2+5z+6}$ valid for $2 < |z| < 3$.

d) Calculate the value of the integral by using Residue integration method.

$$\oint_{C:|z|=2} \frac{e^z}{z(z-1)^2} dz$$

e) Approximate the integral of $f(x) = e^{-x}$ on the interval [0,2] using trapezoidal rule using $h = 0.2$.

f) If z is normally distributed with mean 0 and variance 1, find $P(z \geq -1.64), P(-1.96 \leq z \leq 1.96), P(z \leq 1), P(z \geq 1)$.

g) Formulate $f(1.5)$ for given tabulated points.

x	0	1	3	4
f(x)	-12	0	6	12

h) Calculate the value of $y(0.4)$ by using Euler's method for $\frac{dy}{dx} = -2xy, y(0) = 1, h = 0.2$ and compare the result with its actual value.

i) Design a parabola $y = ax^2 + bx + c$ in least square sense to the following data

x	10	12	15	23	20
Y	14	17	23	25	21

j) Calculate residues at the poles for the given function $(z) = \frac{z^2+9z-2}{(z^2+9)^2(z-1)}$.

k) Determine probability distribution function for a continuous random variable x with probability density

$f(x) = \begin{cases} \frac{3}{2}(1-x^2), for\ 0 < x < 1 \\ 0 \qquad\quad elsewhere \end{cases}$. Hence find $F(x < 0.3) and\ F(0.4 < x < 0.6)$.

l) Evaluate $f(1.2)$ by using Newton's forward difference interpolation for given tabulated values.

x	0	1	2	3	4
f(x)	1	1.5	2.2	3.1	4.3

Part-III

Only Long Answer Type Questions (Answer Any Two out of Four)

Q3 **a)** Prove that **(10)**

$$\int_0^{2\pi} \frac{d\theta}{5 + 3\sin\theta} = \frac{\pi}{2}$$

b) Discuss Taylor's series of $f(z) = \frac{2}{(z+3)(z+4)}$ in the region $|z + 1| < 1$. **(6)**

Q4 Classify a polynomial for given tabulated values. Hence find $y(0.5)$ and $y'(0.5)$. **(16)**

X	-1	0	2	3
f(x)	-8	3	1	2

Q5 Evaluate $y(1.3)$ by using Runge-Kutta method of order 4 for initial value problem $\frac{dy}{dx} = x^2 + y^2, y(1) = 0$ by taking $h = 0.1$. **(16)**

Q6 Using a sample of 10 values with mean 14.5 from a normal population with variance 0.25, test the hypothesis $\mu_0 = 15.0$ against the alternative $\mu_1 = 14.5$ on the 5% level. **(16)**