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Total Number of Pages : 02

B.Tech
PCE4E001

4th Semester Regular / Back Examination 2018-19

APPLIED MATHEMATICS - III

BRANCH : CHEM

Time : 3 Hours

Max Marks : 100

Q.CODE : F1004

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)

- Write the period of the function $f(z) = e^z$
- Determine singularities of the function $f(z) = \frac{\tan(z)}{(z^2+1)}$
- Determine residues of the function $f(z) = \frac{z}{z^2-1}$ at $z = 1$
- Find the mean of the distribution $Y = 4X - 2$ where $f(x) = e^{-x}$ ($x > 0$)
- Round-off the number 4.5126 to four significant figures and determine the relative percentage error.
- If the probability of producing a defective screw is $p = 0.01$, then what is the probability that a lot of 100 screws will contain more than 2 defectives ?
- Let X be a continuous random variable with distribution function $f(x) = \begin{cases} a(1+2x), & \text{for } 2 \leq x \leq 5 \\ 0, & \text{elsewhere} \end{cases}$. Determine a
- State $f(z) = z^4$ is analytic or not.
- In rolling two fair dice, what is the probability of obtaining a sum greater than 3 but not exceeding 6 ?
- State Trapezoidal rule of numerical integration for 20 node points.

Part- II

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

- Explain whether the function $U(x,y) = e^x \cos(y)$ is harmonic or not. If yes, determine the corresponding harmonic conjugate $v(x,y)$.
- Calculate $\int_{C:|z-i|=3} \frac{\sin z + z^2}{(z-1)(z-2)} dz$
- Design Laurent Series of $f(z) = \frac{z+1}{z^2-7z+10}$ valid for $2 < |z| < 5$.
- Calculate residue about the pole $f(z) = \frac{z^2-1}{(z^2+2z+1)(z-4)}$
- Calculate $f(0.5)$ for given tabulated points.

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

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

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

- Calculate the value of $y(0.4)$ by using Euler's method for

$$\frac{dy}{dx} = -2xy, y(0) = 1, h = 0.2 \text{ and compare the result with its actual value.}$$

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

i) The probability density function of babies, x years, being brought to a postnatal clinic is given by, $f(x) = \begin{cases} \frac{3}{4}x(2-x), & 0 < x < 2 \\ 0, & \text{otherwise} \end{cases}$

If 60 babies are brought in on a particular day, how many are expected to be under 8 months old?

j) Determine mean and variance for a continuous random variable x with probability density

$$f(x) = \begin{cases} \frac{3}{2}(1-x^2), & \text{for } 0 < x < 1 \\ 0, & \text{elsewhere} \end{cases}$$

k) The breaking strength X (Kg) of a certain type of plastic block is normally distributed with a mean of 1500 kg and a standard deviation of 50kg. What is the maximum load such that we can expect no more than 5% of the blocks to break?

l) If a random variable has a Poisson distribution such that $P(1) = P(2)$, Hence determine $P(4)$.

Part-III

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

Q3 a) Evaluate **(8)**

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

b) Evaluate Taylor's series of $f(z) = \frac{2}{(z+3)(z+4)}$ in the region $|z + 2| < 1$. **(8)**

Q4 Evaluate a polynomial for given tabulated values. Hence find $y(0.3)$ and $y'(0.3)$. **(16)**

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

Q5 Describe probability distribution function for a continuous random variable x with probability density **(16)**

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

Q6 Fit a parabola $y = ax^2 + bx + c$ in least square sense to the following data **(16)**

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