B-TECH
(SEM. III) THEORY EXAMINATION 2017-18
Engg. Mathematics-III

Time: 3 Hours   [Total Marks: 100]

Note: 1. Attempt all Sections. If require any missing data; then choose suitably.

SECTION-A

2x10 = 20

1.   **Attempt all questions in brief.**

a)   Find inverse Z-transformation of $\frac{z}{z^2-1}$.

b)   If $u(x,y) = x^2 - y^2$, prove that u satisfies Laplace equation.

c)   Evaluate $\int_C \frac{z^2+1}{z^2-1} dz$ where C is circle $|z| = 3/2$.

d)   Expand $\frac{1}{(z+1)(z+3)}$ in the regions $|z| < 1$.

e)   Estimate the production for 1964 and 1966 from the following data

Year:	1961	1962	1963	1964	1965	1966	1967
Production:	200	220	260	---	350	---	430

f)   State Gregory-Newton divided difference interpolation formula.

g)   Find Z-transformation of $f(k) = \begin{cases} 1, & k = 0 \\ 0, & k \neq 0 \end{cases}$

h)   State Cauchy's integral theorem.

i)   Prove that: $\Delta \log f(x) = \log[1 + \frac{\Delta f(x)}{f(x)}]$

j)   Define kurtosis of a distribution.

SECTION-B

$(3 \times 10 = 30)$

2.   **Attempt any three parts of the following:**

a)   Find the Fourier transform   of $F(x) = \begin{cases} 1, & |x| < a \\ 0, & |x| > a \end{cases}$,

hence evaluate $\int_0^\infty \frac{\sin x}{x} dx$

b)   Examine the nature of the function $f(z) = \begin{cases} \frac{x^2 y^5 (x+iy)}{x^4 + y^{10}}; z \neq 0 \\ 0 \qquad\qquad z = 0 \end{cases}$

In the region including the origin.

c)   Solve the following system of linear equations by Crout's Method :

x + y + z = 3; 2x - y + 3z = 16; 3x + y - z = -3

d) Find the rank correlation coefficient of marks of A and B from the following data :

Marks A	15	20	27	13	45	60	20	75
Marks B	50	30	55	30	25	10	30	70

e) Solve the following differential equations using Runge- Kutta method :

Solve $\dfrac{dy}{dx} = \dfrac{1}{x+y}$ for x = 0.5, to x = 1, h = 0.5 with y(0) = 1.

SECTION-C

3. **Attempt any two parts of the following:** $(2 \times 5 = 10)$

(a) Using Lagrange's interpolation formula, find y(10) from the following table:

x : 5   6   9   11

y : 12   13   14   16

(b) The first four moments about the working mean 28.5 of a distribution are 0.294, 7.144, 42.409 and 454.98. Calculate the moments about the mean. Also evaluate β_1 and β_2 and comment upon the skewness and kurtosis of the distribution.

(c) Using the Fourier integral transformation, show that

$$e^{-ax} = \frac{2a}{\pi} \int_0^\infty \frac{\cos sx}{s^2 + a^2}\, ds,\quad a > 0,\, x \geq 0.$$

4. **Attempt any two parts of the following:** $(2 \times 5 = 10)$

(a) Evaluate by Cauchy integral formula $\oint_C \dfrac{z^2 - 2z}{(z+1)^2 (z^2 + 4)}\, dz$ where C is the circle $|z| = 3$.

(b) Solve $x^3 - 5x + 3 = 0$ by using Regula – Falsi method.

(c) Using the Z-transform solve the following difference equations:

$y_{k+2} + 6y_{k+1} + 9y_k = 2^k$ given $y_{(0)} = 0,\ y_{(1)} = 0$.

5. **Attempt any two parts of the following:** $(2 \times 5 = 10)$

(a) If $f(z) = u + iv$ is analytic function and $u - v = e^x (\cos y - \sin y)$, find f (z) in terms of z.

(b) Using poisson distribution, find the probability that the ace of spades will be drawn from a pack of well shuffled cards at least once in 104 consecutive trails.

(c) Find $\int_0^6 \dfrac{e^x}{1+x}\, dx$ approximately using Simpson's 3/8 rule on integration.

6. **Attempt any two parts of the following:** $(2 \times 5 = 10)$

(a) The table given below reveals the velocity 'v' of a body during the time 't' specified. Find its acceleration at t=1.1 .

t :	1.0	1.1	1.2	1.3	1.4
v :	43.1	47.7	52.1	56.4	60.8

(b) Using Complex integration method to evaluate $\int_0^{2\pi} \frac{\cos 2\theta}{5+4\cos\theta} d\theta$.

(c) Compute $f'(3)$ *from* the following table

x :	1	2	4	8	10
y :	0	1	5	21	27

7. **Attempt any two parts of the following:** $(2 \times 5 = 10)$

(a) Using picards method obtain y for x=0.2, Given $\frac{dy}{dx} = x - y$ with initial condition y=1, when x=0.

(b) Discuss the Newton-Raphson method and prove that the order of convergence of Newten-Raphson method is quadratic.

(c) Fit a relation $y = ax + \frac{b}{x}$ which satisfies the following data , using method of least square.

x	1	2	3	4	5	6	7	8
y	5.4	6.2	8.2	10.3	12.6	14.8	17.2	19.5