

(Following Paper ID and Roll No. to be filled in your Answer Book)

Paper ID : 199301

Roll No.

B.Tech.

(SEM. III) THEORY EXAMINATION, 2015-16

ENGINEERING MATHEMATICS-III

[Time:3 hours]

[Maximum Marks:100]

Section-A

Q.1 Attempt all parts. All parts carry equal marks. Write answer of each part in shorts. (10×2=20)

(a) Find inverse Z-transformation of  $\frac{8z - z^3}{(4 - z)^3}$

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

(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 Newton - Gregory backward 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 :  $\Delta \log f(x) = \log \left[ 1 + \frac{\Delta f(x)}{f(x)} \right]$
- (j) Define regression lines.

### Section-B

Note: Attempt any five Questions from this section:

(10×5=50)

- Q.2 Find the Fourier transform of  $F(x) = \begin{cases} 1, & |x| < a \\ 0, & |x| > a \end{cases}$

- Q.3 Examine the nature of the function

$$f(z) = \frac{x^2 y^2 (x+iy)}{x^4 + y^4}; z \neq 0$$

$$f(0) = 0$$

In the region including the origin.

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- Q.4 Solve the following system of linear equations by Crout's Method :

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

- Q.5 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

- Q.6 A survey of 240 families with 4 children shows the following distribution :

No. of boys	4	3	2	1	0
No. of families :	10	55	105	58	12

Test the hypothesis that male and female births are equal probable.

(Given  $\chi^2_{0.05} = 9.49$  and 11.1 for 4 d.f. and 5 d.f. respectively)

- Q.7 Solve the following differential equation using Runge-Kutta method :

$$\text{Given that } \frac{dy}{dx} = \frac{1}{x+y} \text{ with } y(0) = 1, \text{ find } y(2).$$

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Q.8 Use the method of least squares to obtain the normal equations and fit the curve for  $y = \frac{C_0}{x} + c_1\sqrt{x}$  to the following table of values :

x	0.1	0.2	0.4	0.5	1	2
y	21	11	7	6	5	6

Q.9 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

### Section-C

Attempt any two questions from this section: (15×2=30)

Q10 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  $\beta_1$  and  $\beta_2$  and comment upon the skewness and kurtosis of the distribution.

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c) Using the Fourier integral transformation, show

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

Q.11 a) Evaluate by Cauchy integral formula

$$\oint_C \frac{z^2 - 2z}{(z+1)^2(z^2+4)} dz \text{ where } C \text{ is the circle } |z|=3.$$

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

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

$$y_{k+2} + 4y_{k+1} + 3y_k = 3^k$$

$$\text{given } y_{(0)} = 0, y_{(1)} = 1$$

Q.12 a) From the data given below, find the number of items n :

$$r_{xy} = 0.5 \sum XY = 120, \sum X^2 = 90, \sigma_y = 8 \text{ where } x \text{ and } y \text{ are deviations from the arithmetic mean.}$$

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

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

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