Printed Pages: 6   14   **NAS-301**

(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]   [MaximumMarks: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 $\dfrac{8z - z^3}{(4 - z)^3}$

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

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

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

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(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 : $\Delta \log f(x) = \log\left[1 + \dfrac{\Delta f(x)}{f(x)}\right]$

(j) Define regression lines.

Section-B

Note: Attempt any five Questions from this section:

$(10 \times 5 - 50)$

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

$$f(z) = \frac{x^2 y^5 (x + iy)}{x^4 + y^{10}}; z \neq 0$$

$$f(0) = 0$$

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 :

Given that $\dfrac{dy}{dx} = \dfrac{1}{x+y}$ with y(0) = 1, 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 $y = \dfrac{C_0}{x} + c_1 \sqrt{x}$ 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 evalute β_1 and β_2 and comment upon the skewness and kurtosis of the distribution.

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c) Using the Fourier integral transformation, show

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

Q.11 a) Evaluate by Cauchy integral formula

$\displaystyle\oint_C \dfrac{z^2 - 2z}{(z+1)^2 (z^2 + 4)} dz$ 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 :

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

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

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

$r_{xy} = 0.5 \sum XY = 120, \sum X^2 = 90, \sigma_y = 8$ where x and y 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 $\int_0^6 \dfrac{e^x}{1+x}\,dx$ approximately using Simpson's 3/8 rule on integration.

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