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(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 $\frac{8z-z^3}{(4-z)^3}$

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

(c) Evaluate $\int_C \frac{z^2+1}{z^2-1}\,dz$ 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

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

$$f(0)=0$$

In the region including the origin.

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

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 evalute β_1 and β_2 and comment upon the skewness and kurtosis of the distribution.

c) Using the Fourier integral transformation, show that $e^{-ax} = \frac{2a}{\pi}\int_0^{\infty}\frac{\cos sx}{s^2+a^2}ds, a>0, x\geq 0$

Q.11 a) Evaluate by Cauchy integral formula $\oint_C \frac{z^2-2z}{(z+1)^2(z^2+4)}dz$ 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.

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

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