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NAS-401/EAS-401

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

Paper ID: 199419

Roll No.			 	
110111101	Roll No.			

B. TECH.

Theory Examination (Semester-IV) 2015-16

ENGG MATHEMATICS-III

Time: 3 Hours

Max. Marks: 100

-Section-A

- Attempt all questions of this section. Each question carry equal marks. $(2 \times 10 = 20)$
 - (a) Write the cauchy's Reimaun conditions in polar coordinates system.
 - (b) Write the statement of generalized cauchy's integral formula for nth derivative of an analytic function at the $\overline{point} Z = Z_o$.
 - (c) Find the Z transform of $U_n = \{a^n\}$
 - Write the normal equations to fit a curve $y = ax^2 + b$ by least square method.
 - P.T.O.

- (e) If covariance between x and y variable is 10 and the variance of x and y are respectively 16 and 9, find the coefficient of correlation.
- The regression equations calculated from a given set of observations for two random variable are

x = -0.4y + 6.4 and y = -0.6x + 4.6 calculate mean -values of x and y.

- (g) Write the Newton's Raphson iterative formula to find the value of \sqrt{N} .
- (h) Find the missing data in the given table:



If f(n) is given in following table:

х	0	0.5	1
f(x)	1	0.8	0.5

then using trapezoidal rule, evaluate

 $\int f(x)dx$

Find the third forward difference with the arguments -2, 4, 6, 8 of the function $f(x) = x^3 - 2x$

Section-B

Attempt any five questions from this section.

$$(10 \times 5 = 50)$$

(a) Find the Laurent series for the function

$$\frac{\overline{f(z)} = \overline{f(z^2 + 9z - 18}}{\overline{Z^3 - 9z}}, Z \text{ is complex variable}$$

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(i)
$$0 < |z| < 3$$
 (ii) $|z| > 3$

(ii)
$$|z| > 3$$

(b) Using calculus of residue, evaluate the following integral



- Find the inverse Fourier sine transform of $\frac{1}{-}e^{-}$
- =(d) Using least square method, fit a second degree polynomial from the following data:

x	0	1	2	3	4	5	6	7	8
у	12.0	10.5	10.0	8.0	7.0	8.0	7.5	8.5	9.0

Also estimate y at x = 6.5

P.T.O.

(e) For the following data, calculate the finite differences and obtain the forward and backward difference polynomials. Also interpolate at x = 0.25 and x = 0.35

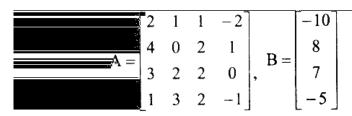
X	0.1	0.2	0.3	0.4	0.5
f(x)	1.40	1.56	1.76	2.00	2.28

Construct the divided difference table for the data.

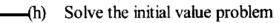
	X	0.5	1.5	3.0	5.0	6.5	8.0
:	f(x)	1.62	5.87	31.0	131.0	282.12	521.0

Hence find the interpolating polynomial and an approximation to the value of f(z).

(g) Solve the system of equations AX=B, where



using the LU decdomposition method. Take all the diagonal elements of L as 1.



$$\frac{dy}{dx} - 2xy^2, y(0) = 1$$

with h = 0.1 on the interval [0,0.3]. Use the fourth order Runge-Kutta method.

Section-C

Note: Attempt any two questions from this section. Each question carry equal marks. (15×2=30)

3. (a) Show that for the function give as -

$$\overline{z}(z) = \begin{cases} \frac{2xy(x+iy)}{x^z + y^z} & \text{if } z \neq 0 \\ 0 & \text{if } z = 0 \end{cases}$$

The C-R conditions are satisfied at origin but derivative of f(z) at origin does not exist.

(b) Verify that the function on 4(xy) = xy is harmonic and find its conjugate harmonic function. Express u+v as an analytic function f(z).

$$u = x^2 - y^2 - y$$

(5) P.T.O.

(c) Find the Fourier transform of Block function f(t) of height 1

$$(t) = \begin{cases} 1 & \text{for } |t| \le \frac{a}{2} \\ 0 & \text{otherwise} \end{cases}$$

4. (a) Using Z - tranform, solve the difference equation

$$u_{n+2} - 4u_{n+1} + 3u_n = 5^n$$

with
$$u_0 = u_1 = 1$$

- (b) The first four moments of a distribution about x = 4 are1, 4, 10, 45. Comment on the skewness and Kurtosis of the distribution.
- (c) For 10 observations on price (x) and supply (y) the following data were obtained

$$\Sigma x = 130, \Sigma y = 220, \Sigma x^2 = 2288$$

$$\Sigma x^2 = 5506 \text{ and } \Sigma_{xy} = 3467$$

—Obtain the two lines of regression.

____5. (a) Find the root of the equation $xe^x = 3$ by regula talsi method correct up to two decimal places in the interval (1, 1.5).

(b) Prove the following identities:

$$\frac{\Delta^2}{E} \mu_x \neq \frac{\Delta^2 \mu_x}{E \mu_x}$$

$$\frac{\Delta^2}{E} e^x \cdot \frac{E(e^x)}{\Delta^2 e^x} = e^x$$

(c) The velocity v of a particle at distance s from a point on its path is given by the following table:

s (m.)	0	10	20	30	40	50	60
v (m./s.)	47	58	64	65	61	52	38

Estimate the time taken to travel 60m. Using Simpson's one—third rule.