Printed Pages:2 **Sub Code: RAS-404**

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B TECH
(SEM-IV) THEORY EXAMINATION, 2018-2019
MATHEMATICS-III

Time: 3 Hours ***Total Marks: 70***

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

SECTION A

1. Attempt *all* questions in brief. **2 x 7 = 14**

a. Write the statement of Cauchy's Integral formula

b. Find the residue at the pole of the function $(z) = \frac{z^2}{(z-2)^2}$

c. Write the normal equations of the curve $= a + \frac{b}{x^2} + \frac{c}{x^3}$.

d. A die is tossed thrice .A success is getting 4 or 5 on a toss.Find the mean and variance of the number of successes.

e. Show that$\mu^2 = 1 + \frac{1}{4}\delta^2$.

f. Using Euler's method solves the differential equation in three steps:$\frac{dy}{dx} = x + y^2, y(1) = 2 \; and \; h = 0.2$.

g. Find the Z-transform of $\{-2, -1,0,2,4,5,10,15\}$.

SECTION B

2. Attempt any *three* of the following: **7 x 3 = 21**

a. State and prove Taylor's theorem.

b. Solve the following system by Jacobi's method:

$$x + y + 54z = 110$$
$$27x + 6y - z = 85$$
$$6x + 15y + 2z = 72$$

c. Find the root of the equation $xe^x = cosx$ by the Regula Falsi method , up to four decimal places.

d. Out of 1000 families with four children each, how many families would be expected to have:(i) 2 boys and 2 girls; (ii) at least one boy;(iii)no girl (iv) at most two girls ?

e. Solve the difference equation $y_{k+3} - 3y_{k+2} + 3y_{k+1} - y_k = U(k) \; where y_0 = y_1 = y_2 = 0$ by using Z-transform.

SECTION C

3. Attempt any *one* part of the following: **7 x 1 = 7**

(a) Prove that $u = x^2 - y^2 - 2xy - 2x + 3y$ is harmonic.Find a function v such that $f(z) = u + iv$ is analytic .Also express $f(z) in \; terms \; of \; z$.

(b) Expand $f(z) = \frac{1}{z^2-3z+2}$ in the region (i) $|z| < 1 \; (ii) 1 < |z| < 2 (iii) |z| > 2$

4. Attempt any *one* part of the following: **7 x 1 = 7**

(a) The following regression equations and variances are as follows: $7x - 16y + 9 = 0 \, , 5y - 4x - 3 = 0$,variance of x = 9. Find the value of (i)mean values of x and y (ii)the coefficient of correlation between x and y,(iii) the standard deviation of y.

(b) Fit a curve $y = ae^{bx}$ to the following data :

x	1	2	3	4	5	6
y	7.209	5.265	3.846	2.809	2.052	1.499

5. Attempt any *one* part of the following: 7 x 1 = 7

(a) Find missing term, given that

X	0	5	10	15	20	25
Y	6	10	….	17	….	31

(b) Find the values of F(2),F(8) and F(15) from the following table:

x	4	5	7	10	11	13
F(x)	48	100	294	900	1210	2028

6. Attempt any *one* part of the following: 7 x 1 = 7

(a) Use the Runge – Kutta method of fourth order to find y(0.1) with h=0.05 for $\frac{dy}{dx} = \sqrt{x+y}$,where y(0) = 1.

(b) State and prove Trapezoidal rule for numerical integration.

7. Attempt any *one* part of the following: 7 x 1 = 7

(a) Find the Fourier sine transform of $F(x) = \frac{e^{-kx}}{x}$ .Hence find the Fourier sine transform of $(x) = \frac{1}{x}$.

(b) FindZ^{-1} $(\frac{z^2}{(z-5)(z-6)^2})$.