Sub Code:RAS301

Paper Id: 910196 Roll No: | | | | | | | | | | | | | |

B TECH
(SEM III) THEORY EXAMINATION 2019-20
MATHEMATICS -III

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

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

SECTION A

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

a. Define analytic function.
b. Define the Binomial distribution with mean and variance.
c. Write the normal equation for the curve $y = \frac{a}{x} + bx$
d. Give comparison between Regula-falsi method and Newton Raphson method.
e. Write the relation between n^{th} divided difference and n^{th} forward difference.
f. What do you mean by initial value problem?
g. Find $Z^{-1}\left(\frac{5}{5z-1}\right)$

SECTION B

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

a. Show that the function $f(z) = \sqrt{|xy|}$ is not analytic at origin even though CR equations are satisfied at origin.

b. Find the measure of skewness and kurtosis based on moments for the following distribution and draw your conclusion

Marks	5-15	15-25	25-35	35-45	45-55
No. of students	1	3	5	7	4

c. Decompose $A = \begin{bmatrix} 5 & -2 & 1 \\ 7 & 1 & -5 \\ 3 & 7 & 4 \end{bmatrix}$ in the form LU, where L is lower triangular matrix and U is upper triangular matrix and hence solve the system of equations:

$$5x - 2y + z = 4$$
$$7x + y - 5z = 8$$
$$3x + 7y + 4z = 10.$$

d. Express the function $f(x) = \begin{cases} 1 \text{ when } |x| \le 1 \\ 0 \text{ when } |x| > 1 \end{cases}$ as a Fourier Integral.

Hence evaluate $\int_0^\infty \frac{\sin\lambda \cos\lambda x}{\lambda} d\lambda$.

OR

Find the value of $u(x,t)$ satisfying the parabolic equation $\frac{\partial u}{\partial t} = 4\frac{\partial^2 u}{\partial x^2}$ with boundary conditions $u(0,t) = 0 = u(8,t)$ and $u(x,0) = 4x - \frac{x^2}{2}$ at the points

$x = i, i = 0,1,2,3,.....7$ and $t = \frac{1}{8} j : j = 0,1,2,.....,5$

e. Given the initial value problem $\frac{dy}{dx} = x^3 - y^3,\ y(0) = 1.$
Find the numerical solution of differential equation at $x = 0.4\ with\ h = 0.2$ by using Runge-Kutta method of Fourth order.

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SECTION C

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

(a) Evaluate the integration: $\int_0^{\pi} \frac{d\theta}{3+2\cos\theta}$

(b) State Cauchy Integral formula and hence evaluate $\oint_C \frac{\cos \pi z^2}{(z-1)(z-2)} dz$,where C is the circle $|z| = 3$.

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

(a) Find Fourier cosine transform of $\frac{1}{1+x^2}$ and hence find Fourier sine transform of $\frac{x}{1+x^2}$.

(b) Find the inverse Z-transform of F(z), where F(z) is given by

(i) $\frac{z}{(z+2)(z+3)}$ (ii) $\frac{7z-11z^2}{(z-1)(z-2)(z+3)}$.

OR

(a) Classify the PDE $x^2 \frac{\partial^2 u}{\partial x^2} + 2xy \frac{\partial^2 u}{\partial x \partial y} + y^2 \frac{\partial^2 u}{\partial y^2} = 0$

(b) Solve $\frac{\partial^2 u}{\partial t^2} = \frac{\partial^2 u}{\partial x^2}$ with conditions

$u(0,t) = u(1,t) = 0; \quad u(x,0) = \frac{x(1-x)}{2}$ and $u_t(x,0) = 0$, taking $h = k = 0.1$ for $0 \le t \le 0.4$.

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

(a) In a partially distributed laboratory record of an analysis of a correlation data, the following result are legible:
Variance $of\ x = 9$
Regression equation: $8x - 10y + 66 = 0, 40x - 18y = 214.$
What were (i) the mean values of x and y. (ii) the standard deviation of y and the coefficient of correlation between $x\ and\ y$.

(b) Find the mean and variance of normal distribution.

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

(a) Find the real root of the equation$x^3 - 2x + 5$=0 by method of False position correct three decimal places.

(b) State Lagrange interpolation formula. Find the interpolating polynomial by Lagrange interpolation formula for the given data

x	5	6	9	11
y	12	13	14	16

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

(a) Apply Simpson's 3/8th rule to obtain approximate value of (i)$\int_0^{\pi/2} e^{Sin\ x}\, dx$(ii) $\int_0^{0.3} (2x - x^2)^{1/2}\, dx$ using Simpson's rule with 6 interval.

(b) Find x for which y is maximum and find the max value of y

x	1.2	1.3	1.4	1.5	1.6
y	0.9320	0.9636	0.9855	0.9975	0.9996