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Sub Code: RAS401
Roll No.

B. TECH.
(SEM-IV) THEORY EXAMINATION 2017-18
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) Discuss Singularity and its types.

b) Write Cauchy-Riemann equation in polar co-ordinates.

c) The life of army shoes is normally distributed with mean 8 months and standard deviation 2 months. If 5000 pairs are insured, how many pairs would be expected to need replacement after 12 months? Given that $P(z \geq 2) = 0.0228$.

d) Determine moment generating function of Binomial distribution.

e) Prove that: $E^{\frac{1}{2}} = \mu + \frac{1}{2}\delta$

f) Write Newton-Cote's quadrature formula.

g) Find Z-transform of $f(k) = u(-k)$.

SECTION B

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

a) Determine an analytic function f(z) in terms of z if $u + v = 2\frac{\sin 2x}{e^{2y}} + e^{2y} - 2\cos 2x$.

b) Find the mean variance of Poisson distribution.

c) Find $\int_0^6 \frac{e^x}{1+x} dx$ using (i) Trapezoidal rule, (ii) Simpson's 1/3rd rule and (iii) Simpson's 3/8th rule.

d) A rod is rotating in a plane. The following table gives the angle θ (in radians) through which the rod has turned for various values of time t (in seconds).

t:	0	0.2	0.4	0.6	0.8	1.0	1.2
θ:	0	0.12	0.49	1.12	2.02	3.20	4.67

Calculate the angular velocity and angular acceleration at t =0.2 and t = 1.2 second.

e) Find Fourier cosine transform of $\frac{1}{1+x^2}$, hence find Fourier sine transform of $\frac{1}{1+x^2}$

SECTION C

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

(a) Verify Cauchy theorem by integrating e^{iz} along the boundary of the triangle with the vertices at the points $1+i, -1+i$ and $-1-i$.

(b) Evaluate $\int_0^{\infty} \frac{\sin mx}{x} dx,\ m>0$..

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

(a) The following table represents the height of a batch of 100 students. Calculate skewness and kurtosis:

Height (in cm)	59	61	63	65	67	69	71	73	75
No. of students	0	2	6	20	40	20	8	2	2

(b) Use the method of least squares to fit the curve $y = \frac{c_0}{x} + c_1\sqrt{x}$ to the following table of values:

x	0.1	0.2	0.4	0.5	1	2
y	21	11	7	6	5	6

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

(a) Find the root of the equation $xe^x = \cos x$ using Regula-Falsi method correct to four decimal places.

(b) Find Newton's divided difference polynomial for the following data:

x:	-3	-1	0	3	5
f(x):	-30	-22	-12	330	3458

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

(a) Solve the initial value problem $u' = -2tu^2$, $u(0) = 1$ with $h = 0.2$ on the interval $[0, 0.4]$. Use Runge-Kutta fourth order method and compare your result with exact solution.

(b) Solve the following system of linear equations by Matrix decomposition method taking $l_{ii} = 1$ for $1 \le i \le 3$.

$$3x - y + 2z = 12;\quad x + 2y + 3z = 11;\quad 2x - 2y - z = 2$$

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

(a) Using Z-transform, solve the following difference equation:

$$y_{k+2} + 4y_{k+1} + 3y_k = 3^k, \text{ given that } y_0 = 0 \text{ and } y_1 = 1.$$

(b) The temperature u in the semi-infinite rod $0 \le x < \infty$ is determined by the differential equation $\frac{\partial u}{\partial t} = k\frac{\partial^2 u}{\partial x^2}$ subject to conditions

(i) $u = 0$ when $t = 0, x \ge 0$ **(ii)** $\frac{\partial u}{\partial x} = -\mu$ (a constant) when $x = 0$ and $t > 0$, (iii) u (x, t) is bounded.

Determine the temperature u (x, t).