

B.TECH
(SEM IV) THEORY EXAMINATION 2017-18
MATHEMATICS III

*Time: 3 Hours**Total Marks: 100***Note:** Attempt all Sections. If require any missing data; then choose suitably.**SECTION A****1. Attempt all questions in brief. 2 x 10 = 20**

- (a) Write necessary condition for a function to be analytic.
 (b) Write Cauchy's Integral Formula.
 (c) Give formula for Karl Pearson's coefficient of correlation.
 (d) Find the moment generating function of Binomial distribution $P(x) = {}^n C_x p^x q^{n-x}$
 where $q = 1-p$
 (e) Discuss chi-square test.
 (f) What is time series analysis?
 (g) Prove that $e^x = \left(\frac{\Delta^2}{E} \right) e^x \cdot \frac{Ee^x}{\Delta^2 e^x}$
 (h) Write the formula for Newton forward difference interpolation method.
 (i) Evaluate $\int_1^2 e^{-\frac{x}{2}} dx$ using four intervals.
 (j) Write Euler's formula.

SECTION B**2. Attempt any three of the following: 10 x 3 = 30**

- a. Using complex integration method, evaluate $\int_0^{2\pi} \frac{\cos 2\theta}{5 + 4 \cos \theta} d\theta$.
- b. Define skewness and kurtosis of a distribution. The following table represents the height of a batch of 100 students. Calculate kurtosis & skewness.

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

- c. Fit a Poisson distribution to the following data and calculate theoretical frequencies:

Deaths	0	1	2	3	4
Frequencies	122	60	15	2	1

Given that $e^{-0.5} = 0.61$

- d. Evaluate $\int_0^1 \frac{dx}{1+x^2}$ by Simpson's 1/3rd rule.
- e. Solve the initial value problem $u' = -2tu^2, u(0) = 1$ with $h=0.2$ on the interval $[0,0.4]$ using Runge-Kutta fourth order method.

SECTION C

3. Attempt any *one* part of the following: 10 x 1 = 10

- (a) Obtain the Taylor's series expansion of $f(z) = \frac{1}{z^2 + 4}$ about the point $z = -i$. Find the region of convergence.
- (b) Show that $u = x^3 - 3xy^2$ is harmonic. Also find the analytic function $f(z)$.

4. Attempt any *one* part of the following: 10 x 1 = 10

- (a) In a partially destroyed laboratory record of an analysis of a correlation data, the following results only are legible: Variance of $x = 9$
Regression equations: $8x - 10y + 66 = 0, 40x - 18y = 214$.
What were (i) the mean values of x and y (ii) the standard deviation of y and the co-efficient of correlation between x and y ?
- (b) Let the random variable X assume the value 'n' with the probability law $P(X = n) = pq^{n-1}$,
 $n = 1, 2, 3, \dots$. Find the moment generating function and hence mean and variance.

5. Attempt any *one* part of the following: 10 x 1 = 10

- (a) In a blade manufacturing factory, 1000 blades are examined daily. Draw the 'np' chart for the following table and examine whether the process is under control?

Date	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
No. of Defective blades	9	10	12	8	7	15	10	12	10	8	7	13	14	15	16

- (b) Out of 800 families with 5 children each, how many would you expect to have
i) 3 boys ii) 5 girls, iii) either 2 boys or 3 girls. Assume equal probabilities for boys and girls.

6. Attempt any *one* part of the following:

10 x 1 = 10

(a) Using Regula Falsi method, compute the smallest positive root of the equation $x e^x - 2 = 0$, correct up to three decimal places.

(b) Using the following table, find $f(x)$ as a polynomial in x using Lagrange's interpolation formula:

x	-1	0	3	6	7
$f(x)$	3	-6	39	822	1611

7. Attempt any *one* part of the following:

10 x 1 = 10

(a) Solve the following system of equations by Gauss-Seidal iterative method: $2x + 10y + z = 51$, $10x + y + 2z = 44$, and $x + 2y + 10z = 61$. Apply three iterations.

(b) The table given below reveals the velocity v of a body during a time t . Find the 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