



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

PAPER ID : 199319

Roll No.

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B. Tech.

(SEM. III) (ODD SEM.) THEORY
EXAMINATION, 2014-15
MATHEMATICS - III

Time : 3 Hours]

[Total Marks : 100

Note : Attempt all questions. All questions carry equal marks.

1 Attempt any two parts of the following : $2 \times 10 = 20$

- (a) State the necessary and sufficient conditions for a function $f(z)$ of a complex variable z , to be analytic in a region. Prove that

$$\nabla^2 \left\{ |f(z)|^n \right\} = n^2 |f(z)|^{n-2} |f'(z)|^2$$

stating the restrictions on $f(z)$.

- (b) State Cauchy's theorem for an analytic function. Verify it by integrating the function $f(z) = z^3 + iz$ along the sides of the rectangle with vertices $(0,0)$, $(2,0)$, $(2,2)$ and $(0,2)$.

(c) Evaluate the following integrals :

(i) $\int_0^{\infty} \frac{\sin x}{x} dx$

(ii) $\int_0^{2\pi} \frac{\cos 3\theta}{(5-3\cos\theta)^4} d\theta$

2 Attempt any two parts : 2×10=20

(a) Define the coefficients of skew ness and kurtosis of a distribution.

Find the coefficients of the skew ness and kurtosis of the distribution given by

$$f(x) = \begin{cases} e^{-x} & \text{for } x \geq 0 \\ 0 & \text{other wise} \end{cases}$$

(b) Fit a least – square parabola having the form $y = a + bx + cx^2$ to the following data :

x:	1.2	1.8	3.1	4.9	5.7	7.1	8.6	9.8
y:	4.5	5.9	7.0	7.8	7.2	6.8	4.5	2.7

(c) Define the coefficients of regression and correlation. Compute the correlation coefficient between the height (x) of fathers and the heights y of their sons where x and y are given in the following table :

x (in cm)	160	165	170	175	180	185	190
y (in cm)	157	163	165	168	175	181	183

3 Attempt any two parts : 2×10=20

(a) Find the moment generating function of a random variable X that is binomially distributed.

(b) Ten percent of the tools produced in a certain manufacturing process turn out to be defective. Find the probability that in a sample of 10 tools chosen at random, exactly 2 will be defective, by using (a) the binomial distribution (b) the Poisson approximation to binomial distribution.

(c) 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

4 Attempt any two parts : 2×10=20

(a) Derive the Newton-Raphson's formula for finding the root of a function. Using this formula find a real root of the equation

$$x^3 + 2x^2 + 10x - 20 = 0$$

up to TEN iterations

(b) Find the Newton's forward interpolation polynomial for the following data :

x	1	2	3	4	5	6	7	8	9	10
f(x)	5	12	17	21	27	29	35	40	50	58

Find f(5.7).

- (c) Find a Lagrange's interpolation polynomial for the following data :

x	2	5	10	14	17	25
$f(x)$	5	11	21	27	35	47

Find the value of $f(8)$.

5 Attempt any two parts : 2×10=20

- (a) Solve the following system of linear equations by Gauss-Seidel method

$$10x + y - z = 13$$

$$x + 10y + z = 29$$

$$2x + y + 10z = 41$$

Correct up to two decimal- places

- (b) Derive the formula for $\frac{3}{8}$ - Simpson's rule for the numerical integration. Using this rule,

evaluate $\int_0^6 \frac{e^x}{1+x} dx$

- (c) Using Runge- Kutta method of order 4, find y for $x = 0.1, 0.2, 0.3$ given that $\frac{dy}{dx} = (x+y)y$ and $y = 1$ at $x = 0$.