



MANIPAL INSTITUTE OF TECHNOLOGY

MANIPAL

A Constituent Institution of Manipal University

IV SEMESTER B.TECH. END SEMESTER EXAMINATIONS, APRIL 2024

SUBJECT: ENGINEERING MATHEMATICS IV (MAT – 2221)

AERONAUTICAL ENGINEERING

Date of Exam: -2024

Time of Exam: 5:00PM to 7:00PM

Max. Marks: 50

Descriptive Questions

Answer all the questions.

Q.no		BL	CO	Marks
A	Two aero planes bomb a target in succession. The probability of each correctly scoring a hit is 0.3 and 0.2 respectively. The second will bomb only if the first misses the target. Find the probability of that. i. Target is hit. ii. Both fails to score hits.	3	CO1	3
B	calculate the standard deviation of the random variable X has the pdf $f(x) = \begin{cases} \frac{3+2x}{18}; & 2 \leq x \leq 4 \\ 0; & \text{otherwise} \end{cases}$	3	CO1	3
C	A manufacturing firm produces steel pipes in three plants, with daily production volume of 500: 1000 and 2000 units respectively. According to past experience: it is known that the fraction of defective outputs produced by these plants are respectively 0.005, 0.008 and 0.010. If a pipe is selected from the day's total production and found to be defective, find out. i. From which plant the pipe came. ii. What is the probability that it came from the first plant?	4	CO1	4
2.				
A	Prove that the coefficient of correlation cannot be numerically greater than 1. ($-1 \leq \rho \leq 1$)	3	CO1	3
B	A perfect dice is tossed 100 times in sets of 8. The occurrence of 5 or 6 is considered to be success. How many times do you expect to get 3 successes?	3	CO2	3
C	The marks obtained in statistics in a certain examination were found to be normally distributed. If 15% of students greater than or equal to 60 marks, 40% of the students less than 30 marks. Find mean and standard deviation.	3	CO2	4
3.				
A	If $\bar{x}$ is Mean of random sample of size N taken from Normal distribution with mean μ and variance is 100. Find N such that $p(\mu - 5 < \bar{x} < \mu + 5) = 0.954$	4	CO3	3
B	Two Independent random variable X and Y having pdf $f(x) = e^{-x}$; $g(y) = 2e^{-2y}$ $0 \leq x, y \leq \infty$ Find Pdf of (X+Y)	3	CO3	3

- C Find MGF of Binomial distribution, hence find mean and variance of Binomial distribution using Mgf. 4 CO3 4

4

- A Consider the mark of 100 students given below and find the median. 5 CO4 3

Marks	1-10	11-20	21-30	31-40	41-50	51-60
frequency	3	16	26	31	16	8

- B The number of items produced in a factory during a particular week is a random variable with mean 500 and variance 100. Show that the production lies between 400 and 600 is at least 0.99 using Chebyshev's inequality. 4 CO1 3

- C Fit a parabola for the following data. 5 CO4 4

x	1	2	3	4	5	6	7
y	80	90	92	83	94	99	92

5.

- A Express $f(x) = x^4 + 3x^3 - x^2 + 5x - 2$ in terms of Legendre polynomial. 3 CO5 3

- B Find the value of $J_{\frac{1}{2}}$ by using Recurrence Relation. 5 CO5 3

- C Solve the given equation by Frobenius method $4x \frac{d^2y}{dx^2} + 2 \frac{dy}{dx} + y = 0$ 3 CO5 4