Reg No.:_____ Name:_____

APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY

M.Tech Degree S1 (R,S) (FT/WP/PhD) Examination November/December 2025 (2022 scheme)

Course Code & Name:
221TCE100 - PROBABILITY AND STATISTICS

Max. Marks: 60 Duration: 2.5 Hours

PART A

Answer all questions. Each question carries 5 marks Marks

1 If 0.8% of the fuses delivered to an arsenal are defective, use the Poisson approximation to Binomial distribution to determine the probability that exactly 4 fuses will be defective in a random sample of 400. (5)

2 A machine produced 16 defective articles in a batch of 500.After overhauling it produced 3 defectives in a batch of 100.Has the machine improved. (5)

3 The following table gives the yield of three varieties: (5)

I	II	III
30	51	44
27	47	35
42	37	41
	48	36
	42	

Prepare an ANOVA table to determine whether there is a significant difference between the mean yield of these varieties.

4 Using the method of least squares fit a straight line to the four points given below.$(-1.3,0.103)$, $(0.1,1.099)$, $(0.2,0.808)$, $(1.3,1.897)$. (5)

5 Explain components of time series. (5)

PART B

Answer any 5 questions. Each question carries 7 marks

6 In a photographic process, the time to process 8 x 10 prints from a memory card may be looked upon as a random variable having the normal distribution with a mean of 16.28 seconds and a standard deviation of 0.12 seconds. Find the probability that it will take (i) anywhere from 16.00 to 16.50 seconds to process one of the prints. (ii) at least 16.20 seconds to process one of the prints (iii) at most 16.35 seconds to process one of the prints. (7)

7 From the records the number of male and female births in 800 families having 4 children are as follows. (7)

No. of male birth	0	1	2	3	4
No. of female birth	4	3	2	1	0

Test whether the data are consistent with hypothesis that the binomial law hold, and chance of male birth is equal to female birth.

8 The following data represents the number of units of production per day turned out by five different workers using four different types of machines. (7)

	Machine type			
	A	B	C	D
Worker 1	44	38	47	36
Worker 2	46	40	52	43
Worker 3	34	36	44	32
Worker 4	43	38	46	33
Worker 5	38	42	49	39

(i) Test whether the five men differ with respect to mean productivity.
(ii) Test whether the mean productivity is the same for the four different machine types.

(Use $\alpha = 0.05$)

9 Calculate the Karl Pearson's coefficient of correlation from the following data. (7)

x	2	3	4	5	6	7	8
y	4	5	6	12	9	5	4

10 Fit a linear trend to the following series by the method of least squares and estimate the most likely estimated production for the year 2009. (7)

Year	2001	2002	2003	2004	2005	2006	2007
Production of steel (000' tones)	10	13	12	14	12	16	14

11 A random variable X has the following probability distribution. (7)

Values of X	0	1	2	3	4	5	6	7	8
$P(X)$	a	3a	5a	7a	9a	11a	13a	15a	17a

(i) Determine the value of a .

(ii) Find $P(X < 3), P(X \geq 3), P(2 \leq X < 5)$.

(iii) Find the smallest value of x for which $P(X \leq x) > 0.5$.

12 Calculate 7 yearly moving average for the following data on number of commercial and industrial failures in a country during 1992-2007 (7)

Year	1992	1993	1994	1995	1996	1997	1998	1999	2000
No: of families	23	26	28	32	20	12	12	10	9
Year	2001	2002	2003	2004	2005	2006	2007		
No: of families	13	11	14	12	9	3	1		

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