Code No.: MA302HS | R20 | H.T.No. | | | 8 | R | | | | | | |

CMR ENGINEERING COLLEGE: : HYDERABAD
UGC AUTONOMOUS
II–B.TECH–I–Semester End Examinations (Supply) - February- 2024
PROBABILITY AND STATISTICS
(AI&DS)

[Time: 3 Hours] **[Max. Marks: 70]**

Note: This question paper contains two parts A and B.
Part A is compulsory which carries 20 marks. Answer all questions in Part A.
Part B consists of 5 Units. Answer any one full question from each unit. Each question carries 10 marks and may have a, b, c as sub questions.

PART-A (20 Marks)

1. a) A pair of dice is tossed twice. Find the probability of scoring 7 points once. [2M]
b) Define discrete and continuous random variables. [2M]
c) Define Binomial distribution. [2M]
d) In a book of 520 pages, 390 typo-graphical errors occur. Assuming Poisson law for the number of errors per page, find the probability that a random sample of 5 pages will contain no error. [2M]
e) Define normal distribution. [2M]
f) Define exponential function. [2M]
g) Write the normal equations to fit the second-degree parabola $y = a + bx + cx^2$. [2M]
h) The two regression equations of the variables x and y are x = 19.13 – 0.87y and y = 11.64 – 0.50x. Find means of x's and y's. [2M]
i) A hypothesis is rejected at 5% level of significance. Is it rejected at 1% level of significance? Explain. [2M]
j) A die is tossed 960 times and it falls with 5 upwards 184 times. Is the die biased? [2M]

PART-B (50 Marks)

2. a) State and Prove Baye's theorem. [5M]
b) Two cards are drawn in succession from a pack of 52 cards. Find the chance that the first is a king and the second a queen if the first card is (i) replaced, (ii) not replaced. [5M]

OR

3. A random variable X has the following probability function: [10M]

x	0	1	2	3	4	5	6	7
p(x)	0	k	2k	2k	3k	k^2	$2k^2$	$7k^2+k$

i. Find the value of k
ii. Evaluate $P(X < 6)$, $P(X \geq 6)$
iii. Evaluate $P(0 < X < 5)$

4. a) Ten coins are thrown simultaneously. Find the probability of getting at least seven heads. [5M]
b) The mean and variance of binomial distribution are 4 and 4/3 respectively. Find $P(X \geq 1)$. [5M]

OR

5. A manufacturer, who produces medicine bottles, finds that 0.1% of the bottles are defective. The bottles are packed in boxes containing 500 bottles. A drug manufacturer buys 100 boxes from the producer of bottles. Using Poisson distribution, find how many boxes will contain (i) no defective, and (ii) at least two defectives. [10M]

6. X is a normal variate with mean 30 and S.D. 5. Find the probabilities that [10M]

i. $26 \leq X \leq 40$, ii. $X \geq 45$, and iii. $|X - 30| > 5$

OR

7. Let X be a continuous random variable with p,d.f $f(x) = \begin{cases} ax, & 0 \leq x \leq 1 \\ a, & 1 \leq x \leq 2 \\ -ax + 3a, & 2 \leq x \leq 3 \\ 0, & elsewhere \end{cases}$ [10M]

Determine the constant a and compute $P(X \leq 1.5)$.

8. Fit the curve of the form $y = ae^{bx}$ to the following data [10M]

x	77	100	185	239	285
y	2.4	3.4	7	11.1	19.6

OR

9. Find the correlation coefficient between x and y from the given data: [10M]

x	55	56	58	59	60	60	62
y	35	38	38	39	44	43	45

10. A sample of 400 electric fuses is taken from a big lot of electric fuses. The mean life of the fuses in this sample is found to be 265 days. Can we assume that this sample has come from a population of fuses with mean life 280 days and variance 900 days? Test at 5% level of significance. [10M]

OR

11. Two random samples of sizes 7 and 6 have the following values of the variable [10M]

Sample 1: 12 16 18 22 19 28 21

Sample 2: 10 15 14 19 24 22

At 5% level of significance, do the estimates of population variances differ significantly?

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