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

CMR ENGINEERING COLLEGE: : HYDERABAD
UGC AUTONOMOUS
II–B.TECH–I–Semester End Examinations (Supply) – December- 2025
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)	What is the probability for a leap year to have 52 Mondays and 53 Sundays?	[2M]
b)	List the important Properties of probability density function.	[2M]
c)	In eight throws of a die 5 or 6 is considered a success. Calculate the mean number of success.	[2M]
d)	Explain the properties of Poisson distribution.	[2M]
e)	If X is normally distributed with mean 2 and variance 0.1, then Calculate P ($\lvert x-2\rvert \geq 0.01$)?	[2M]
f)	Define Gamma Distribution.	[2M]
g)	Write the properties of Regression Lines.	[2M]
h)	List out the types of correlation.	[2M]
i)	The mean weekly wages of workers are with standard deviation of rupees 4. A sample of 625 is selected. Find the standard error of the mean.	[2M]
j)	Distinguish between large sample and small sample?	[2M]

PART-B **(50 Marks)**

2. In a bolt factory machines A, B, C manufacture 20%, 30%, and 50% of the total of their output and 6%, 3% and 2% are defective. A bolt is drawn at random and found to be defective. Find the probabilities that it is manufactured from (i) Machine A (ii) Machine B (iii) Machine C. [10M]

OR

3.a) Let X denotes the maximum of the two numbers that appear when a pair of fair dice is thrown once. Calculate the (i) Discrete probability distribution (ii) Expectation (iii) Variance. [5M]

b) Is the function defined as follows a density function $f(x)=\begin{cases} e^{-x}, x \geq 0 \\ 0, x<0 \end{cases}$. If so, estimate the probability that the variate having this density will fall in the interval (1, 2)? Calculate the cumulative probability F (2)? [5M]

4.a) A car-hire firm has two cars which it hires out day by day. The number of demands for a car on each day is distributed as a Poisson distribution with mean 1.5. Calculate the proportion of days (i) on which there is no demand (ii) on which demand is refused. [5M]

b) The variance and mean of a binomial variable X with parameters n and p are 4 and 3. Calculate *i) P(X=1) ii) P(X≥1) iii) P(0<X<3).* [5M]

OR

5. Calculate the expected frequencies of the Binomial distribution to the following data [10M]

x	0	1	2	3	4	5	6
f	13	25	52	58	32	16	4

6. If the masses of 300 students are normally distributed with mean 68 kgs and standard deviation 3 kgs. Calculate How many students have masses (i) greater than 72 kg (ii) less than or equal to 64 kg (iii) between 65 and 71 kg inclusive. [10M]

OR

7.a) The marks obtained in statistics in an examination found to be normally distributed. If 15% of students greater than or equal to 60, 40% of the students are less than or equal to 30. Find mean and standard deviation of the distribution. [5M]

b) Write a short note on Gamma Distribution and its Properties. [5M]

Using the properties of the gamma function, show that the gamma PDF integrates to 1, i.e., show that for $\alpha, \lambda>0$

, we have

$$\int_0^{\infty} \frac{\lambda^{\alpha} x^{\alpha-1} e^{-\lambda x}}{\Gamma(\alpha)} dx = 1$$

8.a) Write the properties of correlation coefficient. Calculate the coefficient of correlation from the following data [5M]

x	12	9	8	10	11	13	7
y	14	8	6	9	11	12	13

b) Explain the properties of rank correlation coefficient. The ranks of 16 students in Mathematics and Statistics are as follows (1,1), (2,10), (3,3), (4,4), (5,5), (6,7), (7,2),(8,6), (9,8), (10,11), (11,15), (12,9), (13,14),(14,12), (15,16), (16,13). Calculate the rank correlation coefficient for proficiencies of this group in mathematics and statistics. [5M]

OR

9.a) In the following table S is weight of Potassium bromide which will dissolve in 100 grams. Of water at V^{o} C. Fit an equation of the form [6M]

$S = mT + b$by the method of least squares. Use This relation to estimate S when T=50^{o}.

T	0	20	40	60	80
S	54	65	75	85	96

b) If $\sigma_x = \sigma_y = \sigma$ and the angle between the regression lines is $\text{Tan}^{-1}\left(\frac{4}{3}\right)$. Calculate r. [4M]

10. Two independent samples of items are given respectively had the following values. Examine whether there is any significant difference between their means? [10M]

Sample I	11	11	13	11	15	9	12	14
Sample II	9	11	10	13	9	8	10	-

OR

11.a) According to norms established for a mechanical aptitude test, the persons who are 18 years have an average weight of 73.2 with S.D 8.6 if 40 randomly selected persons have average 76.7. Examine the truth value of the hypothesis H_0 : μ =73.2 against alternative hypothesis: μ >73.2. [5M]

b) In a big city 325 men out of 600 men were found to be smokers. Does This information support the conclusion that the majority of men in the city are smokers? [5M]

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