Code No:R22MA401BS | R22 | H.T.No. | | | 8 | R | | | | |

CMR ENGINEERING COLLEGE: : HYDERABAD
UGC AUTONOMOUS
II–B.TECH–II–Semester End Examinations (Regular) -July- 2024
MATHEMATICAL AND STATISTICAL FOUNDATIONS
(CSM)

[Time: 3 Hours]   [Max. Marks: 60]

Note: This question paper contains two parts A and B.

Part A is compulsory which carries 10 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   (10 Marks)

1. a) Write the sample space for two coins are tossed.   [1M]
   b) What is the Probability of Occurrence of an Event?   [1M]
   c) If a coin is tossed 5 times, using binomial distribution find the probability of exactly 2 heads   [1M]
   d) State central limit theorem.   [1M]
   e) Compare point estimation and interval estimation.   [1M]
   f) Write the formula for test of hypothesis for single mean and explain terms.   [1M]
   g) Write the normal equation for linear equation Y=a+bX   [1M]
   h) Define spearman's rank correlation.   [1M]
   i) State fundamental theorem of arithmetic.   [1M]
   j) Find the least positive remainder of 3^{10} modulo 11.   [1M]

PART-B   (50 Marks)

2. Let X be a continuous random variable with p.d.f. Find E(X) and Var(X).   [10M]

$$f_X(x) = \begin{cases} 2x^{-2} & \text{for } 1 < x < 2, \\ 0 & \text{otherwise.} \end{cases}$$

OR

3. a) State and prove Baye's theorem   [5M]
   b) In a bolt factory, machines A, B and C manufacture 25%, 35% and 40% of the total bolts, [5M]
      respectively. Of their outputs, 5%, 4% and 2% are respectively, defective bolts. A bolt is
      drawn at random from the product. If the bolt drawn is found to be defective, what is the
      probability that it is manufactured by machine B?

4. An automobile battery manufacturer claims that its midgrade battery has a mean life of 50   [10M]
   months with a standard deviation of 6 months. Suppose the distribution of battery lives of
   this particular brand is approximately normal.
      i. On the assumption that the manufacturer's claims are true, find the probability that a
         randomly selected battery of this type is less than 48 months.
      ii. On the same assumption, find the probability that the mean life of between 36 and
          48 months.

OR

5. Define poisson distribution. A random variable X has a Poisson distribution with parameter   [10M]
   λ such that P (X = 1) = (0.2) P (X = 2). Find P (X = 0).

6. A sample of 400 items is taken from a population whose standard deviation is 10. The mean of sample is 40. Test whether the sample as come from population with mean 38. Also calculate 95% confidence interval for the population. [10M]

OR

7.a) Write the procedure test of hypothesis of a single portion. [5M]

b) Experience had shown that 20 % of a manufactured product is of top quality. In one day's production of 400 articles, only 50 are of top quality. Test the hypothesis at 0.05 significance level. [5M]

8. Consider the time series data given below. Use the least square method to determine equation of line of best fit for the data. [10M]

X_i	8	3	2	10	11	3	6	5	6	8
Y_i	4	12	1	12	9	4	9	6	1	14

OR

9. Discuss about Karl Pearson coefficient of correlation formula. For the given table, find Karl Pearson coefficient of correlation. [10M]

Age of husband	21	24	27	29	31	35	38
Age of wife	19	21	25	26	29	32	34

10.a) Use the Euclidian algorithm to find GCD of 384, 226. [5M]

b) Using prime factorization method, find the number of factors for 770. [5M]

OR

11.a) Use the Chinese Remainder Theorem to find the solution of the system of congruence
$x \equiv 2$ (mod 5), $x \equiv 3$ (mod 7) and $x \equiv 10$ (mod 11). [5M]

b) Find the inverse of 33 modulo 91. [5M]

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