B.Tech Even Semester Examination, May, 2025

Agricultural Engineering / Computer Science & Engineering Electronics & Communication Engineering

(2nd Semester)

Course No: ASH-202

(Mathematics-II)

Full Marks: 50

Pass Marks: 25

Time: 2 hours

Note:

1. Attempt any five questions.
2. Begin each answer in a new page
3. Answer parts of a question at a place
4. Assume reasonable data wherever required
5. The figure in the right margin indicates full marks for the question
6. All the mathematical symbols and abbreviations have their usual meanings.

1. A random variate X has the following probability distribution

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

(a) Find the value of k and obtain $P(X < 3)$ and $P(0 < X < 4)$.

(b) Find the mean and variance of X. 5+5

2. (a) A continuous random variable X has a probability density function given by $f(x) = \begin{cases} \lambda^2 x e^{-\lambda x}, & x \geq 0 \\ 0, & otherwise \end{cases}$

Then find the value of $E[x]$.

(b) From a bag containing 4 white and 6 red balls, three balls are drawn at random, then find the expected number of white balls drawn. 5+5

3. (a) The probability that a bomb dropped from a plane will hit the target is 1/5. If 6 bombs are dropped, find the probability that (i) exactly two will strike the target (ii) at least two will hit the target.

(b) The incidence of occupational disease in an industry is such that the workmen have 10% chances of suffering from it. What is the probability that in a group of 7, 5 or more will suffer from it? 5+5

4. (a) Suppose that, on an average, 1 house in 1000 houses gets fire in a year in a district. If there are 2000 houses in that district, find the probability that exactly 5 houses will have fire during that year.

(b) If the probability of a bad reaction from a certain injection is 0.001, determine the chance that out of 1000 individuals more than two will have bad reactions. 5+5

5. (a) Find the mean and variance of a normal distribution.

(b) X is normally distributed and the mean of X is 12 and standard deviation is 4. Find $P(X \geq 20)$ and $P(X \leq 20)$. 5+5

6. (a) Find the mean and variance of a random variable which is following an exponential distribution.

(b) X is a normal variate with mean 30 and standard deviation 5, Find $P(26 \leq X \leq 40)$ and $P(X \geq 45)$. 5+5

7. (a) A coin is tossed 400 times and head turns up 216 times. Discuss whether the coin is biased or unbiased.

(b) Using methods of least squares derive the normal equation to fit the curve $y = ax + b$. Hence fit this curve to the following data 5+5

x	1	2	3	4	5	6	7	8
y	1	1.2	1.8	2.5	3.6	4.7	6.6	9.1

8. (a) A coin was tossed 400 times and head turned up 225 times. Test the hypothesis that the coin is unbiased at 5% level of significance.

(b) What straight line best fits the following data, in the least square sense. 5+5

x	1	2	3	4
y	0	1	1	2

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