Graphic Era
Established by an Act of the State Legislature of Uttarakhand (Adhiniyam Sankhya 12 of 2011)
University under section 2(f) of UGC Act, 1956

Term Evaluation (Odd) Semester Examination September 2025

Roll no.....

Name of the Course: B.Tech. ECE
Semester: V
Name of the Paper: Probability Theory and Stochastic Processes
Paper Code: TEC-505

Time: 1.5 hour **Maximum Marks: 50**

Note:
(i) Answer all the questions by choosing any one of the sub-questions
(ii) Each question carries 10 marks.

Q1. (10 Marks)

a. A husband and wife appear in an interview for two vacancies in the same post. The probability of the husband's selection is 1/7 and that of the wife's selection is 1/5. What is the probability that only one of them will be selected.

OR (CO1)

b. A coin is tossed three times. Find the chances of throwing
(i) Three heads.
(ii) Two heads and one tail.
(iii) Head and tail alternately.

Q2. (10 Marks)

a. A can hit a target 3 times in 5 shots, B can hit 2 times in 5 shots and C can hit 3 times in 4 shots. Find the probability of the target being hit when all of them try.

OR (CO1)

b. A bag contains 6 white and 9 black balls. Four balls are drawn at a time. Find the probability for the first draw to give 4 white and the second to give 4 black balls in each of the following cases.
(i) The balls are not replaced before the second draw.
(ii)The balls are replaced before the second draw.

Q3. (10 Marks)

a. Suppose an item is manufactured by 3 machines A, B and C. All the 3 machines have equal capacity and operate at the same rate. It is known that percentages of defective items produced by A, B and C are 3%, 8% and 10%, respectively. All the items produced by A, B and C are put into one bin. From this bin 1 item is drawn at random and found to be defective. What is the probability that this item was produced by B?

OR (CO1 & CO3)

b. The lifetime in hours of a component is represented by a random variable X whose probability density function is given by $f_X(x) = 0.1\, e^{-0.1x}, x \geq 0$.
(i) What is the cumulative distribution function of X.

(ii) What is the probability that the component will last atleast 5 hours.

Q4. (10 Marks)

a) A random variable X has the following probability distribution:

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X	0	1	2	3	4	5	6	7
$P(x=X)$	k	$3k$	$5k$	$7k$	$9k$	$12k$	$5k$	$8k$

(i) Find the value of k.
(ii) Find the expected mean (expectation) and variance of X.
(iii) Find $P(X<3)$ and $P(2<X<6)$.

OR (CO2)

c. In the long run 3 vessels out of every 100 are sunk. If 10 vessels are out, what is the probability that
(i) Exactly 6 will arrive safely, and
(ii) Atleast 6 will arrive safely?

Q5. (10 Marks)

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 Poisson variate with mean 1.5. Calculate the proportion of days

OR (CO3)

d. X is normally distributed with mean 12 and standard deviation 4. Find
(i) $P(X \geq 20)$ (ii) $P(X \leq 20)$ (iii) $P(0 \leq X \leq 12)$
Given $P(Z=2)=0.4772$, $P(Z=20)=0.0228$ and $P(Z=3)=0.49865$.