Second Semester FYIMP in Computational Sciences
Second Internal Examination March 2025
KU2DSCSTA102-First Course on Theory of Probability

Time: 1 Hours Marks: 20

(Answer any ***all*** questions. Each carries ***five*** marks).

1. State and prove Bayes' Theorem.
2. A and B are two weak students of statistics and their chances of solving a problem in statistics correctly are $\frac{1}{6}$ and $\frac{1}{8}$ respectively. If the probability of their making a common error is $\frac{1}{525}$ and they obtain the same answer, find the probability that their answer is correct.
3. From a vessel containing 3 white and 5 black balls, 4 balls are transferred into an empty vessel. From this vessel a ball is drawn and is found to be white. What is the probability that out of four balls transferred 3 are white and 1 is black?
4. Marie is getting married tomorrow, at an outdoor ceremony in the desert. In recent years, it has rained only 5 days each year. Unfortunately, the weatherman has predicted rain for tomorrow. When it actually rains, the weatherman has predicted correctly forecast rain 90% of the time. When it doesn't rain, he incorrectly forecast rain 10% of the time. What is the probability that it will rain on the day of Marie's wedding?

DEPARTMENT OF STATISTICAL SCIENCES, KANNUR UNIVERSITY

Second Semester FYIMP in Computational Sciences

Second Internal Examination April 2025

KU2DSCSTA102-First Course on Theory of Probability

Time: 90 Minutes Marks: 30

SECTION-A

(Answer any 3 questions. Each carries ***four*** marks).

1. *a*) A deck of cards has 52 cards, 13 of each suit. What is the probability of drawing a red card given that the card drawn is a face card?
   b) A bag contains 7 red balls and 8 blue balls. A ball is drawn from the bag and then replaced. What is the probability that the ball drawn is red, given that the previous ball drawn was blue?

2. Explain pairwise and mutual independence of n events. What is the total number of conditions for the mutual independence of n events. If n events are pairwise independent, then can we say anything about their mutual independence.

3. If A and B are independent events then show that
   1) A and B 2) A and B are independent.

4. A problem in statistics is given to three students A, B and C whose chances of solving it are $\frac{1}{2}$, $\frac{3}{4}$ and $\frac{1}{4}$ respectively. What is the probability that the problem will be solved if all of them try independently.

SECTION-B

(Answer any 3 questions. Each carries ***Six*** marks)

5. State and prove Bayes' Theorem.

6. There are two bags A and B. A contains n white and 2 black balls and B contains 2 white and n black balls. One of the two bags is selected at random and two balls are drawn from it without replacement. If both the balls drawn are white and the probability that the bag A was used to draw the balls is $\frac{6}{7}$, find the value of n.

7. The joint probability function of a two dimensional discrete random variable is given below:

$Y \setminus X$	1	2	3	4	5	6
0	$\frac{1}{24}$	$\frac{1}{24}$	$\frac{1}{24}$	0	$\frac{1}{24}$	$\frac{2}{24}$
1	$\frac{3}{24}$	$\frac{3}{24}$	$\frac{3}{24}$	$\frac{3}{24}$	$\frac{3}{24}$	$\frac{3}{24}$

1)Find the Marginal distribution of X and Y.
2) Are X and Y independent?
3) Find the conditional probability function of X given $Y = 1$.

8. Two dimensional discrete random variables X and Y have the joint probability function $P(X = x, Y = y) = \frac{x+y}{21}$; $x = 1, 2$, $y = 1, 2, 3$.
1)Find the Marginal distribution of X and Y.
2) Are X and Y independent?
3) Find the conditional probability function of Y given $X = 2$.

Second Semester FYIMP in Computational Sciences
First Internal Examination February 2025
KU2DSCSTA102-First Course on Theory of Probability

Time: 1 Hours

Marks: 25

SECTION-A

(Answer any *four* questions. Each carries $2\frac{1}{2}$ marks)

1. Define exhaustive and mutually exclusive events. Also provide an example for each.
2. From 25 tickets, marked with first 25 numerals, one is drawn at random. Find the chance that
   (a) It is multiple of 5 or 7
   (b) It is a multiple of 3 or 7.
3. What is the chance that
   (a) a leap year selected at random will contain 53 sundays?
   (b) a non-leap year selected at random will contaion 53 sundays.
4. State the axiomatic definition of probability.
5. Prove that $P(A \cap B^c) = P(A) - P(A \cap B)$

SECTION-B

(Answer any *any* three questions. Each carries *five* marks)

6. (a) Explain classical definiton of probability and list out the limitations of classical approach using appropriate examples.
   (b) Explain Empirical definiton of probability. is there any limiatation for this probability approach.
7. In a box, there are 4 granite stones, 5 sand stones and 6 bricks of identical size and shape. Out of them 3 are choosen at random.Find the chance that
   (a) They all belong to different varities.
   (b) They all belong to the same variety.
   (c) They are all granite stones.
8. (a) State and prove addition theorem on probability for three events.
   (b) State Boole's inequality. A student is expected to sit for the examination in three courses C_1, C_2 and C_3. From his class performance it is observed that he has the chances to pass 0.80, 0.70 and 0.75, respectively in three courses. What is the least probability that the student will pass in all three courses?
9. A drum contains 50 bolts and 150 nuts. Half of the bolts and half of the nuts are rusted.
   (a) If one item is chosen at random, what is the probability that it is rusted or is a bolt?
   (b) If two items are chosen at random, what is the probability that both are rusted or both are nuts?

Name :.Hawara.....

Second Semester FYIMP Statistics Examination
MAY 2025 (2024 Admission onwards)
KU02DSCSTA102 (FIRST COURSE ON THEORY OF PROBABILITY)
(DATE OF EXAM: 02-05-2025)

Time : 120 min Maximum Marks : 50

Part A (Answer any 4 questions. Each carries 2 marks)

1. Define simple event and composite event with an example 2

2. Define universal set U. 2

3. Explain joint probability mass function for 2 random variables X and Y. State it's properties. 2

4. Show that two mutually exclusive events with positive probabilities cannot be independent. Also show that 2 independent events (with positive probabilities) cannot be mutually exclusive. 2

5. Define the partitioning of a sample space. (A3 2

6. In Monty Hall problem, how does the host's action of opening a door affect the probabilities of the remaining choices? 2

Part B (Answer any 3 questions. Each carries 6 marks)

7. If $P(A) = \frac{1}{3}$, $P(B) = \frac{3}{4}$ and $P(A \cup B) = \frac{11}{12}$. Find $P(A|B)$ and $P(B|A)$. When are two events said to be independent? Provide an example for 2 independent events. 6

8. In a packet there are 4 bulbs of 40 watt each and 3 bulbs of 60 watt each. Two bulbs are taken one by one without replacement. Find the probability that:
1)Both are 40 watt bulbs.
2) One is 40 watt another is of 60 watt. 6

9. What are the conditions required for one to use Bayes' theorem? 6

10. A person gets a construction job and agrees to undertake it. The completion of the job in time depends on whether there happens to be strike or not in the company. There are 40% chances that there will be a strike. The probability that the job is completed in time is 30% if the strike takes place and 70% if the strike does not take place. What is the probability that the job will be completed in time? 6

11. X speaks truth 4 out of 5 times. A die is tossed. He reports that there is a six. What is the chance that actually there was six ? 6

Part C (Answer any 3 question(s). Each carries 8 marks)

12. An urn contains 6 white, 4 red and 9 black balls. Ir three balls are drawn at random, find the probability that
a) two of the balls drawn are white
b) one is of each colour
c) none is red
d) atleast one is white
e) two white and two black 8

13. Describe with an example
i) Random experiment
ii) Sample space
iii) Events
iv) Independent event
v) Dependent event 8

14. a) if P(A) = 0.7, P(B) = 0.4 $P(A \cap B) = 0.3$, Find
i) $P(A' \cap B')$
ii) $P(A' U B')$
iii) $P(A' U B)$ 8
iv) $P(A \cap B')$

15. a) In a school of 500 students, 200 are learning French, and 180 are learning Spanish. If 70 students are learning both languages:
(i) Find the probability that a randomly selected student is learning Spanish but not French.
(ii)' Find the probability that a randomly selected student is learning French but not Spanish.
(iii). Find the probability that a randomly selected student is learning at least one of the two languages.
b) In a school of 500 students, 210 students participate in sports, and 190 students participate in music. If 75 students are involved in both activities:
(i) Find the probability that a randomly selected student participates in music but not sports.
(ii) Find the probability that a randomly selected student participates in exactly one .
(iii) Find the probability that a randomly selected student is involved in none of the sports. 8