C – 109

Seat No.	

B.Sc. (Part – I) (Semester – I) Examination, 2011
STATISTICS (Paper – II)
Elementary Probability Theory
Sub. Code : 47817

Day and Date : Monday, 14-11-2011
Time : 10.30 a.m. to 12.30 p.m.

Total Marks : 40

*Instructions : 1) **All** questions are **compulsory**.*
*2) Figures to the **right** indicate **full** marks.*

1. Choose the correct alternative : **8**

i) The sample space of an experiment consists of 'n' points, its power set will contain the following number of points.

a) 2^n b) 3^n c) 2^{n+1} d) 3^{n+1}

ii) If A and B are any two events then the probability of occurrence of either A or B is given by

a) $P(A \cap B)$ b) $P(A \cup B)$

c) $P(A)$ d) $P(A \cup B^C)$

iii) A bag contains 5 white and 6 black balls. A ball is drawn at random. The probability that the ball is white will be

a) $\frac{2}{33}$ b) $\frac{5}{6}$ c) $\frac{6}{11}$ d) $\frac{5}{11}$

iv) Which one of the following is false ?

a) $P(A \cap B) \leq P(A)$

b) $P(A) \leq P(A \cup B)$

c) $P(A \cup B) \leq P(A) + P(B)$

d) $P(A) > 1$

P.T.O.

v) If A and B are independent events, $P(A) = 0.8$, $P(A \cap B) = 0.2$ then $P(B)$ is

a) 0.25
b) 0.2
c) 1
d) 0.16

vi) A card is drawn from a pack of cards. The probability that it will be king card given that it is black card will be

a) $\frac{1}{52}$
b) $\frac{1}{2}$
c) $\frac{13}{52}$
d) $\frac{4}{52}$

vii) For any event B, $P(\phi | B)$ is

a) 1
b) 0
c) $P(B)$
d) $\frac{1}{2}$

viii) If A and B are two independent events then $P(B | A)$ is

a) $P(A)$
b) $P(B)$
c) $P(A \cap B)$
d) $P(A \cup B)$

2. Attempt **any two** of the following : **16**

i) State and prove addition law of probability for two events A and B.

ii) State and prove Baye's theorem.

iii) Define pairwise and mutual independence of three events A, B and C. Let $\Omega = \{1, 2, 3, 4\}$ and each has equal probability $\frac{1}{4}$. Let A = {1, 2}; B = {1, 3} and C = {1, 4}. Examine independence of A, B and C.

3. Attempt **any four** of the following : 16

i) Define :

a) Apriori definition and

b) Axiomatic definition of probability.

ii) Prove that :

a) $P(A \cap B^C) = P(A) - P(A \cap B)$

b) $P(\phi) = 0$

iii) A coin is tossed 3 times, find probability of getting

a) atleast two heads

b) atmost two heads

iv) Define :

a) Partition of sample space

b) Conditional probability.

v) If A and B are independent events, show that A^C and B^C are also independent.

vi) If $A \subset B$ then show that

a) $P(B|A) = 1$

b) $P(A|B) = \frac{P(A)}{P(B)}$

A – 141

Seat No. [ ]

B.Sc. (Part – I) (Semester – I) Examination, 2012
STATISTICS (Paper – II)
(Elementary Probability Theory)
Sub. Code : 47817

Day and Date : Friday, 4-5-2012 Total Marks : 40

Time : 11.00 a.m. to 1.00 p.m.

Instructions : *i)* ***All*** *questions are* ***compulsory.***

ii) Figures to the ***right*** *indicate* ***full*** *marks.*

1. Choose the most **correct** alternative : **8**

i) Which of the following is not an example of Random experiment ?

A) Rolling a single die B) Tossing a single coin

C) Reading a book D) Detection of blood group of a person

ii) The sample space of an experiment consists of n points. Its power set will contain the following number of points ___________

A) n B) 2n C) n^2 D) 2^n

iii) If A and B are two mutually exclusive events then $P(A^C \cap B)$ is _________

A) P(B) B) P(A) C) P(A) + P(B) D) P(A) . P(B)

iv) If a pair of dice is thrown then the probability that the sum of the two numbers is 7 is _______________

A) 1/36 B) 1/6 C) 1/12 D) 1/24

v) Which of the following is not an axiom of probability measure ?

A) $P(\Omega)=1$ B) $P(A)\geq 0$

C) $P(\Omega)\leq 1$ D) $P(A\cup B)=P(A)+P(B)$, provided $A\cap B=\phi$

vi) If A and B be any two events defined on a sample space Ω then $P(A\cap B)$ is

____

A) P(A).P(B/A) B) P(B).P(A/B) C) P(A)/P(B) D) both (A) and (B)

vii) If A and B be any two events defined on a sample space Ω then $P(A/B) + P(A^{c}/B)$ is ______

A) 1 B) 0 C) P(A) D) P(B)

viii) If A is event, then $P(A/A) =$ ______

A) 0 B) 1 C) P(A) D) Infinite number

2. Attempt **any two** of the following : 16

i) Define the terms :

a) Random Experiment

b) Mutually Exclusive Events

c) Sample space

d) Power set

ii) For any two events A and B prove that $0 \le P(A \cap B) \le P(A) \le P(A \cup B) \le P(A) + P(B)$

iii) State and Prove Baye's theorem.

3. Attempt **any four** from the following : 16

i) With usual notation prove that if $A \subset B$ then $P(A) \le P(B)$.

ii) Suppose that A, B, C are events such that P(A) = P(B) = P(C) = ¼ and $P(A \cap B) = P(B \cap C) = 0$ and $P(A \cap C) = 1/8$. Then evaluate Probability of at least one of the event A, B, C occurs.

iii) If A, B, C are any three events defined on Ω with $P(C) > 0$ then show that $P(A \cup B / C) = P(A/C) + P(B/C) - P(A \cap B/C)$.

iv) Define Pairwise and mutual independence for any three events.

v) If A and B are independent events, show that A^{C} and B^{C} are also independent.

vi) If 3 books are picked up at random from shelf containing 5 Novels, 3 book of poems, a dictionary. Find probability that

a) 2 novels and 1 book of poem is selected

b) A dictionary is selected.

______

Seat No.	

BSc.(Part - I) (Semester - I) Examination, 2013

STATISTICS (Paper - II) (Revised)

Elementary Probability Theory

Sub. Code : 55732

Day and Date :Thursday, 02 - 05 - 2013

Total Marks : 50

Time : 11.00 a.m. to 1.00 p.m.

Instructions :
1) All the questions are compulsory.
2) Figures to the right indicate full marks.

Q1) Choose the most correct alternative: **[10]**

a) For any two events A and B which one of the following is true?

i) $P(A\cap\overline{B})=P(B)-P(A\cap B)$
ii) $P(A\cap\overline{B})=P(A)-P(A\cap B)$
iii) $P(A\cap B)=P(B)-P(A\cap\overline{B})$
iv) None of these

b) If $A\subset B$,then the probability, P(A | B) is equal to ______.

i) Zero
ii) One,
iii) P(A) / P (B),
iv) P (B) / P(A)

c) Given that $P(A)=\frac{1}{3}, P(B)=\frac{3}{4} And\ p(A\cup B)=\frac{11}{12}$ then P(A/B) is ______

i) 1/4
ii) 2/9
iii) 1/2
iv) None of these

d) If $P(\overline{A}/A)$ is :

i) 0
ii) 1
iii) 0.5
iv) 0.25

e) The sample space of an experiment consists of 'n' points. Its power set will contain _____ points.

i) 2^n
ii) 3^n
iii) 2^n+1
iv) None of these

P.T.O.

f) $P(A/B)+P(\overline{A}/B)$ is:

i) 0 ii) 1

iii) 0.5 iv) None of these

g) If A and B are independent events, then P $(A\cap B)$ is _____ .

i) P (A) / P (B) ii) P(A) + P(B)

iii) P(A) . P(B) iv) None of these

h) If A is certain event and P(B)=1, the conditional Probability, P(A/B) is _____ .

i) Zero ii) P (B)

iii) one iv) None of these

i) The Probability of all possible outcome of a random experiment is always equal to _____.

i) Infinity ii) Zero

iii) One iv) None of these

j) The definition of classical-probability was originally given by _____.

i) Demoivre ii) Laplace

iii) Pascal iv) Von - Mises

Q2) Attempt **any two** of the following **[20]**

a) With usual notation, prove that,

i) $P(A\bigcup B)=p(A)+P(B)-P(A\bigcap B)$

ii) $P[(A\bigcap \overline{B})\bigcup(\overline{A}\bigcap B)]=P(A)+P(B)-2P(A\bigcap B)$

b) Define pair wise independence and mutually independence of three events A,B and C Let $\Omega=\{1,2,3,4\}$ and assume that each point has the probability 1/4. Let A=[1,2],B=[1,3], C=[1,4] Examine independence of A,B and C.

c) State and prove Baye's theorem.

Q3) Attempt any four of the following **[20]**

a) For any two events A and B, show that

$$P(A\cap\overline{B}) = p(A) - P(A\cap B)$$

b) If A and B are independent events then prove that A and $\overline{B}$ are also independent.

c) If $A \subset B$, then prove that,

i) $P(B \mid A) = 1$,

ii) $P(A) \leq P(B)$.

d) If the events A, B, and C form a partition of the sample space Ω. And if $3P(A) = 2P(B) = P(C)$ find $P(A\cup B)$

e) With usual notations, show that:

i) $P(\Phi)=0$

ii) $P(\overline{A}) = 1 - P(A)$

f) A coin and a die are tossed simultaneously,

i) Write a sample space for the above experiment.

ii) Find the probability of getting head and even number.

)()()(

Seat No.	

B.Sc. (Part - I) (Semester - I) Examination, Nov. - 2014
STATISTICS (Paper- II)
Elementary Probability Theory
Sub. Code: 59679

Day and Date : Wednesday, 5-11-2014

Time :12.00 noon to 2.00 p.m.

Total Marks :50

Instructions : 1) All questions are compulsory.
2) Figures to the right indicate full marks.

Q1) Choose the most correct alternative: [10]

a) Random experiment has_____ outcomes.
   i) only one ii) only two
   iii) at least two iv) at most two

b) Occurrence of an event A or B but not both is denoted by_____
   i) $(A\cap B^c)\cup(A^c\cap B)$ ii) $A\cap B^c$
   iii) $(A\cap B)^c$ iv) $(A\cup B)$

c) Which of the following statement is always true?
   i) $A=A\cup\Omega$ ii) $A=A\cap\Phi$
   iii) $A=(A\cap B)\cup(A\cap B^c)$ iv) $A=(A\cap B)\cap(A\cap B^c)$

d) Elementary event has_____ outcome/s.
   i) only one ii) at least one
   iii) more than one iv) zero

e) Power set is a set of all possible_____ of a sample space.
   i) elements ii) subsets
   iii) outcomes iv) powers

f) Range for probability is _____.
   i) 0 to 1 ii) 0 to ∞
   iii) -1 to 1 iv) $-\infty$ to ∞

g) If $A\subset B$ then which of the following is true?
   i) $P(A) < P(B)$ ii) $P(B) < P(A)$
   iii) $P(A) = P(B)$ iv) none of these

h) If odds in favor of an event A are 2:3 then P(A) = ______.

i) 2/5 ii) 3/5

iii) 0.2 iv) 0.3

i) If A and B are exhaustive events then ______.

i) $A \cup B = \Omega$ ii) $A \cap B = A$

iii) $A \cap B = \Phi$ iv) $A \cup B = B$

j) If A and B are independent events then which of the followings is not true?

i) $P(A^c \cap B^c) = P(A^c)P(B^c)$ ii) $P(A \cap B^c) = P(A)P(B^c)$

iii) $P(A^c \cap B) = P(A^c)P(B)$ iv) $P(A \cap B) = P(A) + P(B)$

Q2) Attempt any two of the following. **[20]**

a) State and prove addition law of probability for two events A and B. State the result for three events.

b) Give an axiomatic definition of probability. Show that conditional probability satisfies the axioms of probability.

c) State Baye's theorem. In a lot of total production, contribution of products manufactured on machine M1, M2 and M3 is 45%, 30% and 25% respectively. Proportion of defectives due to machines M1, M2 and M3 are 5%, 7% and 10% respectively. What is probability that a product selected at random from such a lot is produced on machine M2 if it was found to be non-defective?

Q3) Attempt any four of the following. **[20]**

a) Explain through an example a concept of a partition of sample space by events.

b) If two fair dice are tossed independently then what is probability that absolute difference between face values on first and second dice is not more than 3?

c) If $\Omega = \{\omega_1, \omega_2, \omega_3, \omega_4\}$, $A = \{\omega_1, \omega_2\}$, $B = \{\omega_2, \omega_3\}$ and $C = \{\omega_1, \omega_3\}$ then discuss about pair wise independence and mutual independence of these three events A,B and C.

d) If A and B are independent events with P(A) = 1/2 and P(B) = 1/4 then obtain $P(A \cup B)$ and P(A/B).

e) If A and B are independent events then show that A^C and B^C are also independent events.

f) Write a power set in an experiment of tossing a coin.

⊗ ⊗ ⊗

Seat No.	

B.Sc. (Part - I) (Semester - I) Examination, April - 2015
STATISTICS (Paper - II) (Regular)
Elementary Probability Theory
Sub. Code: 59679

Day and Date : Monday, 27-04-2015 **Total Marks : 50**

Time : 12.00 noon to 2.00 p.m.

Instructions : 1) All questions are compulsory.

2) Figures to right indicate full marks.

Q1) Choose the correct alternative: **[10]**

a) The probability that a leap year will have 53 Sundays is ———.

i) $\frac{1}{7}$ ii) $\frac{2}{7}$

iii) $\frac{2}{365}$ iv) $\frac{2}{366}$

b) If the sample space contains n elements then its power set contains —— elements.

i) 2^n ii) 3^n

iii) $2n$ iv) n^2

c) Which of the following is not axiom of probability ———.

i) $P(\Omega)=1$

ii) $P(A)\geq 0$

iii) $P(\Omega)\leq 1$

iv) $P(A\cup B)=P(A)+P(B)$, provided $A\cap B=\phi$

Seat No.

B.Sc. (Part - I) (Semester - I) Examination, April - 2015

STATISTICS (Paper - II) (Regular)

Elementary Probability Theory

Sub. Code: 59679

Day and Date : Monday, 27-04-2015 **Total Marks : 50**

Time : 12.00 noon to 2.00 p.m.

Instructions :
1) **All questions are compulsory.**
2) **Figures to right indicate full marks.**

Q1) Choose the correct alternative: **[10]**

a) The probability that a leap year will have 53 Sundays is ———.

i) $\frac{1}{7}$ ii) $\frac{2}{7}$

iii) $\frac{2}{365}$ iv) $\frac{2}{366}$

b) If the sample space contains n elements then its power set contains —— elements.

i) 2^n ii) 3^n

iii) $2n$ iv) n^2

c) Which of the following is not axiom of probability ———.

i) $P(\Omega)=1$

ii) $P(A)\geq 0$

iii) $P(\Omega)\leq 1$

iv) $P(A\cup B)=P(A)+P(B)$, provided $A\cap B=\phi$

d) If $A \cap B = \phi$, $A \cup B = \Omega$ and $P(A) = 2\,P(B)$ then the value of $P(B) =$ ———.

i) $\frac{1}{3}$

ii) $\frac{2}{3}$

iii) 1

iv) 0

e) If $A \subset B$ then $P(A|B) =$ ———.

i) 1

ii) $\frac{P(A)}{P(B)}$

iii) $\frac{P(B)}{P(A)}$

iv) 0

f) If $P(A) = 0.3$, $P(B) = 0.4$ and A and B are mutually exclusive then $P\left(A^c|B^c\right) =$ ———.

i) 0.3

ii) 0.4

iii) 0.12

iv) 0.5

g) If A and B are Independent events then $P(A|B)$ is ———.

i) $P(A)$

ii) $P(B)$

iii) $\frac{P(A)}{P(B)}$

iv) 1

h) For a sample space $\Omega = \{\omega_1, \omega_2, \omega_3, \omega_4\}$

$P(\omega_1) = P(\omega_2) = \frac{1}{8}, P(\omega_3) = k, P(\omega_4) = \frac{3}{8}$. For what value of k will this be a probability model

i) 0

ii) 1

iii) $\frac{1}{8}$

iv) $\frac{3}{8}$

i) Symbolic notation of occurance of both the events A and B is ———.

i) $A \cup B$ ii) $A \cap B$

iii) $(A \cup B)^C$ iv) $(A \cap B)^C$

j) If A and B are two independent events such that $P(A)=P(B)=\frac{1}{2}$, then $P(A \cap B^C)$ is ———.

i) 1 ii) $\frac{1}{2}$

iii) $\frac{1}{4}$ iv) 0

Q2) Attempt **any two** of the following: **[20]**

a) Define the following terms:

i) Sample space.

ii) Event.

iii) Impossible event.

iv) Mutually exclusive events.

v) Exhaustive events.

b) Give axiomatic definition of probability. State and prove addition theorem of probability for two events A and B.

c) Define pairwise and mutual independence for three events A, B and C. Suppose a box contains four tickets numbered 554, 545, 455 and 444. One ticket is drawn randomly. Let A_i $(i = 1, 2, 3)$ be the event that the i^{th} digit of the number on the ticket is 5. Discuss the independence of events A_1, A_2 and A_3.

Q3) Attempt **any four** of the following: **[20]**

a) If A and B are any two events defined on sample space Ω then prove that

i) $P(A|A^c)=0$.

ii) $P(A\cap B^c)=P(A)-P(A\cap B)$.

b) For any two events A and B, Show that $P(A\cap B)\geq P(A)+P(B)-1$.

c) Define:

i) Partition of sample space.

ii) Baye's theorem.

d) If A, B and C are three events defined on Ω with $P(B) > 0$ then show that $P\left[(A\cup C)|B\right]=P[A|B]+P[C|B]-P\left[(A\cap C)|B\right]$.

e) If $P(A) = x$, $P(B) = y$, $P(A\cap B)=z$ then express

i) $P(A\cup B)$.

ii) $P(A^c\cap B)$.

iii) $P(A^c\cap B^c)$.

iv) $P(A^c\cup B^c)$.

v) $P(A\cup B)^c$.

f) If A and B are Independent events then show that A^c and B^c are also Independent.

❀ ❀ ❀

Seat No.	

B.Sc. (Part - I) (Semester - I) Examination, November- 2015
STATISTICS (Paper - II) (New)
Elementary Probability Theory
Sub. Code : 59679

Day and Date :Monday, 23 - 11 - 2015 **Total Marks :50**

Time :12.00 noon to 02.00 p.m.

Instructions : 1) **All questions are compulsory.**

2) **Figures to the right indicates full marks.**

Q1) Choose the most correct alternative. **[10]**

a) If A and B are any two events defined on sample space Ω then symbolic notation for at least one of the two events A or B occurs is ________.

i) $A \cup B$ ii) $A \cap B$

iii) $A^C \cap B$ iv) $A \cap B^C$

b) The probability of sure event is ________.

i) 0 ii) 1

iii) 0.5 iv) 0.2

c) If sample space of an experiment consists of 'n' points then, total number of elements in its power set is ________ .

i) 2^n ii) 3n

iii) 2n+1 iv) 3^n

d) If events A and B are independent, then which of the following is true?

i) $P(A^C \cap B) = P(A^C).P(B)$

ii) $P(A \cap B^C) = P(A).P(B^C)$

iii) $P(A^C \cap B^C) = P(A^C).P(B^C)$

iv) all of these

e) The condition for events A and B to form partition of sample space Ω is ________

i) $A \cap B = \Phi$ ii) $A \cup B = \Omega$

iii) both (i) and (ii) iv) any one of A or B

f) Which one of the following is not an example of random experiment?

i) Rolling a die

ii) Tossing a coin

iii) Detection of blood group of a person

iv) Throwing a ball in air

g) If A and B are mutually exclusive events then, $P(A/A \cup B)$ is equal to _____

i) $\frac{P(A)}{P(A)+P(B)}$ ii) $\frac{P(A \cup B)}{P(A)+P(B)}$

iii) $\frac{P(B)}{P(A)+P(B)}$ iv) $\frac{P(A \cap B)}{P(A)+P(B)}$

h) If $B \subset A$ then, $P(A/B)$ is ________

i) 0 ii) 1

iii) $\frac{P(A)}{P(B)}$ iv) $\frac{P(B)}{P(A)}$

i) If $P(A) = \frac{1}{3}, P(B^C) = \frac{3}{4}$ and $P(A \cap B) = \frac{1}{6}$ then $P(A^C \cap B)$ is ______

i) $\frac{1}{6}$ ii) $\frac{1}{12}$

iii) $\frac{7}{12}$ iv) $\frac{2}{12}$

j) If A and B are mutually exclusive and exhaustive events, and if P(A)=0.6 then value of P(B) is ________

i) 0.6 ii) 0.4

iii) 0 iv) 0.1

Q2) Attempt any two of the following: [20]

a) Define the following terms with suitable example

i) Sample space

ii) Power set of Sample space

iii) Complement of Event

iv) Intersection of events

v) Mutually exclusive events

b) For any two events A and B, prove that

i) $P(A \cup B) = P(A) + P(B) - P(A \cap B)$

ii) $P(A/B) \geq \frac{P(A)+P(B)-1}{P(B)}$

c) Define pairwise independence and mutual independence of events A,B and C. A fair coin is tossed twice and A,B and C are defined as follows

A:Tail on first toss

B:Tail on second toss

C:same face on both the tosses.

Show that A,B and C are pairwise independent but not mutually independent.

Q3) Attempt any four of the following: [20]

a) Define

i) Apriori probability

ii) Axiomatic probability

b) If $A \subset B$ then prove that,

i) $P(B/A) = 1$

ii) $P(A) \leq P(B)$

c) If A and B are independent events with P(A)=0.25 and P(B)=0.3, find $P(A \cup B)$ and $P(A^C \cap B^C)$.

d) A bag contains 8 white and 3 black balls. Two balls are drawn at random. Find the probability that both of them are white.

e) With usual notations, prove that.

i) $P(\Phi) = 0$

ii) $0 \leq P(A) \leq 1$

f) If A and B are events defined on sample space Ω then, prove that $P(A^C/B) = 1 - P(A/B)$

////

Seat No.	

B.Sc. (Part - I) (Semester - I) Examination, October - 2017
STATISTICS
Elementary Probability Theory (Paper - II)
Sub. Code : 59679

Day and Date : Tuesday, 31 - 10 - 2017 **Total Marks : 50**

Time : 12.00 noon to 2.00 p.m.

Instructions :
1) **All questions are compulsory.**
2) **Figures to the right indicate full marks.**

Q1) Choose the most correct alternative : **[10]**

a) The probability of a non-leap year will have 53 Monday is _______.

i) $\frac{1}{7}$ ii) $\frac{2}{7}$

iii) 1 iv) 0

b) If the sample space Ω contains 3 elements then its power set $P(\Omega)$ contains _______ elements.

i) 8 ii) 6

iii) 3 iv) 9

c) If the events A and B are mutually exclusive and exhaustive and $P(A) = 2P(B)$ then $P(A) =$ _______.

i) $\frac{1}{3}$ ii) $\frac{2}{3}$

iii) $\frac{1}{2}$ iv) 1

d) If $B \subset A$ then $P(B/A) =$ _______.

i) $\frac{P(A)}{P(B)}$ ii) 1

iii) 0 iv) $\frac{P(B)}{P(A)}$

e) Symbolic notation of non-occurrence of both the events A and B is _____.

i) $A^C \cap B^C$ ii) $(A \cup B)^C$

iii) Both (i) and (ii) iv) $A^C \cup B^C$

f) If A and B are independent events then P(A/B) = _____.

i) P(B) ii) P(A)

iii) 0 iv) $\frac{P(A)}{P(B)}$

g) If the events A, B, C form partition of sample space and if P(A) = 0.35, P(B) = k, P(C) = 0.21 then k = _____.

i) 0.44 ii) 0.56

iii) 0.35 iv) 0.21

h) If Ω is the sample space and A be any event defined on sample space Ω then P(Ω/A) = _____.

i) Zero ii) One

iii) P(A) iv) $\frac{1}{P(A)}$

i) If A and B are independent events then _____.

i) $P(A \cap B) = P(A) \cdot P(B)$ ii) P(A/B) = P(A)

iii) P(B/A) = P(B) iv) All are true

j) If P(A) = 0.3, P(B) = 0.4, $P(A \cup B) = 0.5$ then P(A/B) is _____.

i) 0.2 ii) 0.5

iii) 0.4 iv) 0.3

Q2) Attempt any two of the following : **[20]**

a) Define the following terms :

i) Sample space.

ii) Mutually exclusive events.

iii) Equally likely events.

iv) Conditional probability of A given B.

v) Partition of sample space.

b) State and prove the Bayes' theorem.

c) Define pairwise independence and mutual independence for three events A, B, C. Let $\Omega = \{1, 2, 3, 4\}$ and assume that each point has the probability $\frac{1}{4}$, Let $A = \{1, 2\}$, $B = \{1, 3\}$, $C = \{1, 4\}$. Examine independence of A, B and C.

Q3) Attempt any four of the following : **[20]**

a) State and prove addition theorem of probability.

b) For any two events A and B show that $P(A \cap B) \geq P(A) + P(B) - 1$.

c) If $A \subset B$, prove that $P(A^c \cap B) = P(B) - P(A)$ hence deduce that $P(A) \leq P(B)$.

d) If A and B are mutually exclusive events then show that

i) $P(A/B) = 0$

ii) $P(A/B^c) = \frac{P(A)}{1 - P(B)}$

e) If A and B are independent events then show that A^c & B^c are also independent.

f) The odds against A solving a certain problem are 8 : 6 and the odds in favour of B solving the same problem are 14 : 10. Then if both of them try, find the probability that problem would be solved.

++++

Seat No.	

B.Sc. (Part - I) (Semester - I) Examination, April - 2018
STATISTICS
Elementary Probability Theory (Paper - II)
Sub. Code : 59679

Day and Date : Wednesday, 18 - 04 - 2018 Total Marks : 50

Time : 12.00 noon to 2.00 p.m.

Instructions :
1) All questions are compulsory.
2) Figures to the right indicate full marks.
3) Use of calculator is allowed.

Q1) Choose the most correct alternative : **[10]**

a) If A and B are any two events defined on Ω, then symbolic notation for both A and B does not occur is denoted by _______.

i) $(A \cup B)^C$ ii) $A \cap B$

iii) $A^C \cap B^C$ iv) $A^C \cup B^C$

b) Which of the following is an axiom of probability ______.

i) $P(\Omega)=1$ ii) $P(A) \geq 0$

iii) $P(A \cup B)=P(A)+P(B)$ iv) Only (i) and (ii)

c) If a sample space contains 4 elements, then it's power set IP(Ω) contains ________ elements.

i) 4 ii) 2^4

iii) 3^4 iv) 4^3

d) The odds in favor of an event A are 10 : 5 then $P(A^C)$ = ______.

i) 1/3 ii) 9/15

iii) 1/2 iv) 2/3

P.T.O.

e) The range of conditional probability is ______.

i) 0 to 1 ii) −1 to 1

iii) 0 to ∞ iv) None of these

f) If $B \subset A$ then, P(A/B) is ______.

i) 0 ii) 1

iii) $\frac{P(A)}{P(B)}$ iv) $\frac{P(B)}{P(A)}$

g) A box contains 6 black and 4 white balls. Two balls are drawn one after other without replacement. The probability that both are black is ______.

i) $\frac{1}{3}$ ii) $\frac{2}{15}$

iii) $\frac{2}{3}$ iv) $\frac{6}{25}$

h) If A and B are mutually exclusive events then, $P(A/A \cup B)$ is equal to ______.

i) $\frac{P(A)}{P(A)+P(B)}$ ii) $\frac{P(A \cup B)}{P(A)+P(B)}$

iii) $\frac{P(B)}{P(A)+P(B)}$ iv) $\frac{P(A \cap B)}{P(A)+P(B)}$

i) If A and B are any two events defined on a sample space, then probability of only event A occurs is given by ______.

i) P(A) ii) $P(A \cup B^{c})$

iii) $1-P(A^{c})-P(A \cap B)$ iv) $P(B)-P(A \cap B)$

j) If A and B are independent events, then $P(A^C \cap B)$ is equal to _____.

i) $P(A^C)[1 - P(B^C)]$ ii) $1 - P(A \cup B)^C$

iii) $P(A)P(B^C)$ iv) $P(B) - P(A \cup B)$

Q2) Attempt any two of the following : **[20]**

a) Define the following terms with suitable example

i) Sample space.

ii) Intersection of two events.

iii) Apriori (classical) definition of probability.

iv) Conditional probability.

v) Power set.

b) A box contains four tickets with numbers 111, 121, 211, 221 and one ticket is drawn from the box at random. Let A_i $(i = 1, 2, 3)$ be the event that i^{th} digit of the number on the ticket drawn is 1. Discuss the independence of A_1, A_2 & A_3.

c) Define the partition of sample space. State and prove the Baye's theorem.

Q3) Attempt any four of the following : **[20]**

a) With usual notation prove that

i) $P(A^C) = 1 - P(A)$.

ii) $P(A|B) \geq \frac{P(A)+P(B)-1}{P(B)}$.

b) State and prove addition law of probability for two events A and B.

c) Two urns identical in appearance contains respectively 3 white, 2 black and 2 white, 5 black balls. One urn is selected at random and a ball is drawn from it. What is the probability that it is a black ball?

d) If $P(A) = k$, $P(B) = 0.4$ and $P(A \cup B) = 0.8$ find the value of k if

i) A and B are independent.

ii) A and B are mutually exclusive events.

e) If A and B are independents events then show that A^C and B^C are also independent.

f) If $P(A|B^c) > P(A)$ then show that $P(A) > P(A|B)$.

++++