SECTION – I
(MULTIPLE CORRECT ANSWER TYPE)

This section contains 7 multiple choice questions. Each question has 4 options (A), (B), (C) and (D) for its answer, out of which ONE OR MORE than ONE option can be correct.

Marking scheme: +4 for all correct options & +1 partial marks, 0 if not attempted and -2 in all wrong cases

37. Six balls of different colours are to be placed is 3 boxes of different sizes randomly (Given each box can hold all the six balls). Then the probability that no box remains empty, is_____

A) $\frac{3^6 - 3.2^6 + 3}{3^6}$

B) $\frac{6^3 - 6.5^3 + 6_{C_2}4^3}{6^3}$

C) $\frac{20}{27}$

D) $\left(6_{C_4} + \frac{6!}{3!2!} + \frac{6!}{(2!)^3 3!}\right)\frac{3!}{3^6}$

38. Contents of the two urns is as given in this table. A fair die is tossed. If the face 1,2,4 or 5 comes, a marble is drawn from the urn A other wise a marble is chosen from the urn B.

Urn	Red Marbles	White marbles	Blue marbles
A	5	3	8
B	3	5	0

Let E_1 : Denote the event that a red marble is chosen

E_2 : Denote the event that a white marble is chosen

E_3 : Denote the event that a blue is chosen

Then:

A) The event E_1, E_2 and E_3 are equiprobable

B) $P(E_1), P(E_2), P(E_3)$ are in A.P

C) If the marble drawn is red, the probability that it came from the urn A is $\frac{4}{8}$

D) If the marble drawn is white, the probability that the face 5 appeared on the die is $\frac{3}{32}$

39. A bag initially contains one red ball and two blue balls. An experiment consists of selecting a ball at random, noting its colour and replacing it together with an additional ball of the same colour. If three such trials are made, then

A) Probability that atleast one blue ball is drawn is 0.9

B) Probability that exactly one blue ball is drawn is 0.2

C) Probability that all the drawn balls are red given that all the drawn balls are of the same colour is 0.2

D) Probability that atleast one red ball is drawn is 0.6

40. If $P(A)=\frac{3}{5}$ and $P(B)=\frac{2}{3}$ then

A) $P(A\cup B)\geq\frac{2}{3}$ B) $\frac{4}{15}\leq P(A\cap B)\leq\frac{3}{5}$

C) $P(A\cap\overline{B})\leq\frac{1}{3}$ D) $P(A\cup B)\geq\frac{3}{5}$

41. In a city, a person own independently a sedan car with probability $\frac{3}{10}$ and a SUV with probability $\frac{4}{10}$. If he has sedan only, then he keeps a driver with probability $\frac{6}{10}$, whereas if he owns SUV only, then he keeps a driver with probability $\frac{7}{10}$, whereas if he keeps both type of cars then his probability of keeping a driver is $\frac{9}{10}$. Then

A) Probability that person keeps a driver is $\frac{412}{1000}$

B) Probability that person keeps a driver is $\frac{71}{125}$

C) Given that person keeps driver, then probability that he owns SUV is $\frac{54}{103}$

D) Given that person gives driver, then probability that he owns SUV is $\frac{76}{103}$

42. Three missiles A, B and C whose probabilities of hitting the target are $\frac{2}{3}, \frac{1}{3}, \frac{2}{5}$ respectively are shot at an enemy ship simultaneously. A majority of hits is required to destroy the ship. If the ship is destroyed, then

A) the probability that missile B failed to hit the target is $\frac{1}{5}$

B) the probability that missile B failed to hit the target is $\frac{2}{5}$

C) the probability that at least one of B or C hit the target is 1

D) the probability that at least one of the missile B or C failed to hit the target is $\frac{7}{10}$

43. In a gambling between Mr. A and Mr. B a machine continues tossing a fair coin until the two consecutive throws either HT or TT are obtained for the first time. If it is HT, Mr, A wins and if it is TT, Mr, B wins. Which of the following is (are) true?

A) Probability of winning Mr.A is $\frac{3}{4}$

B) Probability of Mr.B winning is $\frac{1}{4}$

C) Given first toss is head probability of Mr. A winnings is 1

D) Given first toss is tail, probability of Mr.A winning is $\frac{1}{2}$

SECTION-II
(INTEGER ANSWER TYPE)

This section contains 5 questions. The answer is a single digit integer ranging from 0 to 9 (both inclusive).
Marking scheme +3 for correct answer , 0 if not attempted and 0 in all other cases.

44. If a set X contains k + 1 elements, Y be a set of all subsets of X, two distinct sets A and B are randomly selected from the set Y such that $A \cap B = \phi$. If probability that $A = B^C$ be $\left(\frac{m}{n}\right)^p$ where m,n,p are natural numbers and GCD(m,n)=1 then, $(2m+n)p-7k$ is equal to

45. If the integers m and n are chosen at random from $\{1,2,3,.....,100\}$ then the probability that a number of the form $7^m + 7^n$ is divisible by 5 is equal to $\frac{1}{k}$. The numerical value of k is

46. Die A has four red and two white faces whereas die B has two red and four white faces. A coin is flipped once. If it falls a head, the game continues by throwing die A, if it falls tail then die B is to be used. If the probability that die A used is $\frac{32}{33}$ when it is given that red turns up every time in first n throws, then the value of n is _____.

47. Let an octahedral dice (8 faces) marked the numbers 1 to 8 on its faces. On throwing two such dice three events A, B, C are defined as

A: getting a sum 10 or more.

B: getting a sum divisible by 2.

C: getting a sum divisible by 3.

If $P\left(\frac{C-B}{A}\right)=\frac{a}{b}$ where $a,b \in N$ and coprime to each other, then find the value of $|6a-b|$.

48. A letter is known to have either from "TATANAGAR" or from "CALCUTTA". On the envelope, just two consecutive letters TA are visible. If the probability that the letter came from "TATANAGAR" is in the form $\frac{p}{q}$, where p and q are co-prime positive integers, then find the sum of digits in $(p+q)$.

SECTION – III
(SINGLE CORRECT ANSWER TYPE)

This section contains 6 multiple choice questions. Each question has 4 options (A), (B), (C) and (D) for its answer, out of which **ONLY ONE** option can be correct.

Marking scheme: +3 for correct answer, 0 if not attempted and -1 in all other cases.

Answer Q,49, Q,50 and Q,51 by appropriately matching the information given in the three columns of the following table.

Three ordinary dice are rolled with outcomes x,y,z respectively.

Column-I consists of events, Column-II consists of Number of favourable cases, Column-III consists of their appropriate probabilities of occurrence of events.

	Column-I	Column-II	Column-III
I)	$(x+y+z)$ is divisible by 7	i) 8	P) 0.019
II)	xy is perfect square	ii) 30	Q) 0.03
III)	yz is perfect cube	iii) 4	R) 0.0139
IV)	$x+y$ is odd, x,y are prime numbers such that $x+y+z=11$	iv) 3	S) 0.139

49. Which of the following is the only **correct** combination?

A) III-iii-Q B) IV-iv-R C) II-ii-P D) I-ii-S

50. Which of the following the only **correct** combination?

A) I-i-Q B) II-iii-P C) III-iv-R D) IV-ii-S

51. Which of the following is the only **wrong** combination?

A) I-ii-S B) II-i-Q C) III-iv-R D) IV-iii-P

Answer Q,52, Q,53 and Q,54 by appropriately matching the information given in the three columns of the following table.

Let $X=\{1,2,3,.....,10\}$. A, B, C are three sets such that $A\subseteq X$, $B\subseteq X$ *and* $C\subseteq X$.

Column-1: Contains types of three subsets of X

Column-2: Contains number of ways of selecting three subsets of X according to Column-1

Column-3: Contains conditional probabilities $P\left(\frac{E}{E_1}\right)$ or $P\left(\frac{E}{E_2}\right)$ where

E : Selecting three subsets of X according to column-1

E_1 : Selecting three subsets of X such that $n(A\cap B)=5$

E_2 : Selecting three subsets of X such that $n(A\cup B)=5$.

	Column-I	Column-II	Column-III
I)	$A \cap B \cap C \supseteq \{2,3,4,5,6\}$ *and* $A = B = C$	i) 32	P) $P\left(\frac{E}{E_1}\right) = 0$
II)	$A \cup B \cup C = \{3,4,5\}$	ii) 242	Q) $P\left(\frac{E}{E_1}\right) = \frac{1}{{}^{10}C_5.12^5}$
III)	$A \cap B \cap C = \{3,4,5,6,7\}$ *and* $A = B \neq C$	iii) 243	R) $P\left(\frac{E}{E_2}\right) = \frac{31}{{}^{10}C_5.12^5}$
IV)	$A \cup B \cup C = \{6,7,8,9,10\}$ *and* $A = B \neq C$	iv) 343	S) $P\left(\frac{E}{E_2}\right) = 0$

52. Which of the following options is the only correct combination?

A) I-i-P B) II-ii-S C) III-ii-R D) IV-iv-P

53. Which of the following options is the only correct combination?

A) II-iv-P B) II-iii-Q C) III-i-R D) IV-ii-R

54. Which of the following options is the only incorrect combination?

A) I-i-Q B) II-iv-P C) II-iv-S D) IV-ii-S