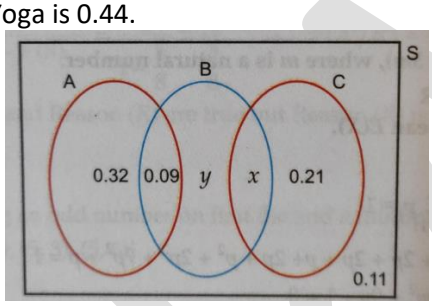
CHAPTER-13

PROBABILITY

05 MARKS TYPE QUESTIONS

Q. NO	QUESTION	MARK
1.	Read the following passage and answer the following questions: There are different types of Yoga which involve the usage of different poses of Yoga Asanas, Meditation and Pranayam as shown in the figure below:  The Venn diagram below represents the probabilities of three different types of Yoga A, B and C performed by the people of a society. Further, it is given that probability of a member performing type C Yoga is 0.44.  (i) Find the value of x (ii) Find the value of y (iii) Find $P(\frac{C}{B})$ (iv) Find the probability that a randomly selected person of the society does Yoga of type A or B but not C.	5
2.	Read the following text and answer the questions: For an audition of a reality singing competition, interested candidates were asked to apply under one of the two musical genres-folk or classical and under one of the two age categories-below 18 or 18 and above. The following information is known about the 2000 application received: • 960 of the total applications were the folk genre. • 192 of the folk applications were for the below 18 category. • 104 of the classical applications were for the 18 and above category. (i)What is the probability that an application selected at random is for the 18 and above category provided it is under the classical genre? (ii)An application selected at random is found to be under the below 18 category. Find the probability that it is under the folk genre.	5
3.	Ramesh is going to play a game of chess against one of four opponents in an inter school sports competition. Each opponent is equally likely to be paired against him. The table below	5

<table>
<tr><td></td><td>shows the chances of Ramesh losing, where paired against each opponent.
<table>
<tr><td>Opponent</td><td>Chance of losing</td></tr>
<tr><td>Opponent 1</td><td>12%</td></tr>
<tr><td>Opponent 2</td><td>60%</td></tr>
<tr><td>Opponent 3</td><td>x%</td></tr>
<tr><td>Opponent4</td><td>84%</td></tr>
</table>
If the probability that Ramesh loses the game that day is $\frac{1}{2}$, find the probability for Ramesh to be losing when paired against opponent 3.</td><td></td></tr>
<tr><td>4.</td><td>In a factory, machine A produces 30% of total output, machine B produces 25% and the machine C produces the remaining output. The defective items produced by machines A, B and C are 1%, 1.2%, 2% respectively. An item is picked at random from a day's output and found to be defective. Find the probability that it was produced by machine B?
 </td><td>5</td></tr>
<tr><td>5.</td><td>Probability that A speaks truth is $\frac{4}{5}$. A coin is tossed, A reports the head appears. What is the probability that actually it was head?</td><td>5</td></tr>
<tr><td>6.</td><td>A bag I contains 5 red and 4 white balls and a bag II
contains 3 red and 3 white balls. Two balls are transferred from the bag I to the bag II and then one ball is drawn from the bag II. If the ball drawn from the bag II is red, then find the probability that one red and one white ball are transferred from the bag I to the bag II.</td><td>5</td></tr>
</table>

ANSWERS:

<table>
<tr><th>Q. NO</th><th>ANSWER</th><th>MARKS</th></tr>
<tr><td>1.</td><td>(i) Given that probability of a member performing type C yoga is 0.44
$x + 0.21 = 0.44$
$x = 0.23$
(ii) $0.32 + 0.09 + y + x + 0.21 = 1 - 0.11$
$y = 0.04$
(iii) $P(C|B) = \frac{P(C \cap B)}{P(B)} = \frac{x}{0.09+y+x} = \frac{23}{36}$
(iv) Required probability=$0.32 + 0.09 + y = 0.45$</td><td>5</td></tr>
<tr><td>2.</td><td>According to the given information we construct the following table.
Given total applications=2000
<table>
<tr><td></td><td>Folk Genre</td><td>Classical Genre</td></tr>
<tr><td></td><td>960 (given)</td><td>2000-960=1040</td></tr>
<tr><td>Below 18</td><td>192 (given)</td><td>1040-104=936</td></tr>
<tr><td>18 or above 18</td><td>960-192=768</td><td>104 (given)</td></tr>
</table>
Let, E_1= Event that application for folk genre
E_2 = Event that application for classical genre
A = Event that application for below 18
B = Event that application for 18 or above 18
$P(E_2) = \frac{1040}{2000} \quad and \quad P(B \cap E_2) = \frac{104}{2000}$
(i)Required probability = $\frac{P(B \cap E_2)}{P(E_2)} = \frac{1}{10}$
(ii) Required probability = $P\left(\frac{folk}{below\ 18}\right) = P\left(\frac{E_1}{A}\right) = \frac{P(E_1 \cap A)}{P(A)}$
$P(E_1 \cap A) = \frac{192}{2000}$ and $P(A) = \frac{192+936}{2000} = \frac{1128}{2000}$
Required probability = $\frac{192}{1128} = \frac{8}{47}$</td><td>5</td></tr>
<tr><td>3.</td><td>Note that
$P(E_1) = P(E_2) = P(E_3) = P(E_4) = \frac{1}{4}$
Given $P(A) = \frac{1}{2}$
$P\left(\frac{A}{E_1}\right) = 12\% = \frac{12}{100}$
$P\left(\frac{A}{E_2}\right) = 60\% = \frac{60}{100}$
$P\left(\frac{A}{E_3}\right) = x\% = \frac{x}{100}$
$P\left(\frac{A}{E_4}\right) = 84\% = \frac{84}{100}$
Using total probability theorem, we have
$P(A) = P(E_1)P\left(\frac{A}{E_1}\right) + P(E_2)P\left(\frac{A}{E_2}\right) + P(E_3)P\left(\frac{A}{E_3}\right) + P(E_4)P\left(\frac{A}{E_4}\right)$
$\Rightarrow \frac{1}{2} = \frac{1}{4} \times \frac{12}{100} + \frac{1}{4} \times \frac{60}{100} + \frac{1}{4} \times \frac{x}{100} + \frac{1}{4} \times \frac{84}{100}$
$\Rightarrow x = 44$</td><td></td></tr>
</table>

	$P\left(\frac{A}{E_3}\right) = 44\%$	
4.	Consider the following events E_1 = item picked is produced by machine A E_2 = item picked is produced by machine B E_3 = item picked is produced by machine C A = producing a defective output Given, $P(E_1) = 30\% = \frac{30}{100} = 0.3$ $P(E_2) = 25\% = \frac{25}{100} = 0.25$ $P(E_3) = 45\% = \frac{45}{100} = 0.45$ And $P\left(\frac{A}{E_1}\right) = 1\% = \frac{1}{100} = 0.01$ $P\left(\frac{A}{E_2}\right) = 1.2\% = \frac{1.2}{100} = 0.12$ $P\left(\frac{A}{E_3}\right) = 2\% = \frac{2}{100} = 0.02$ Required Probability is $P\left(\frac{E_2}{A}\right)$ $P\left(\frac{E_2}{A}\right) = \frac{P(E_2)P\left(\frac{A}{E_2}\right)}{P(E_1)P\left(\frac{A}{E_1}\right) + P(E_2)P\left(\frac{A}{E_2}\right) + P(E_3)P\left(\frac{A}{E_3}\right)}$ $= \frac{0.25 \times 0.012}{0.3 \times 0.01 + 0.25 \times 0.012 + 0.45 \times 0.02} = \frac{300}{1500}$ $= \frac{1}{5}$	
5.	E_1: A speaks truth E_2: A speaks false Let X be the event that a head appears. P $(E_1) = \frac{4}{5}$ P $(E_2$:) = 1− P$(E_1) = 1 - \frac{4}{5} = \frac{1}{5}$ If a coin is tossed, then it may result in either head (H) or tail (T). The probability of getting a head is $\frac{1}{2}$ whether A speaks truth or not. P (X/E_1) = P$(X/E_2) = \frac{1}{2}$ The probability that there is actually a head is given by P $(E_1|X)$. $P\left(\frac{E_1}{X}\right) = \frac{P(E_1) \times P\left(\frac{X}{E1}\right)}{P(E_1) \times P\left(\frac{X}{E1}\right) + P(E_2) \times P\left(\frac{X}{E_2}\right)}$ $= \frac{\frac{4}{5} \times \frac{1}{2}}{\frac{4}{5} \times \frac{1}{2} + \frac{1}{5} \times \frac{1}{2}}$	1 1 1 1

	$= \frac{4}{5}$	1
6.	$Let\ E_1, E_2, E_3$ and A are event such that $E_1 =$ Both transferred balls from bag I to bag II are red $E_2 =$ Both transferred balls from bag I to bag II are white $E_3 =$ Out of two transferred balls one is red and other is white $A =$ Drawing a red ball from bag II	
	$\mathrm{P}(E_1) = \frac{5C_2}{9C_2} = \frac{5 \times 4}{9 \times 8} = \frac{20}{72} = \frac{5}{18}$	$\frac{1}{2}$
	$\mathrm{P}(E_2) = \frac{4C_2}{9C_2} = \frac{4 \times 3}{9 \times 8} = \frac{12}{72} = \frac{3}{18}$	$\frac{1}{2}$
	$\mathrm{P}(E_3) = \frac{5C_1 \times 4C_1}{9C_2} = \frac{5 \times 4 \times 2}{9 \times 8} = \frac{40}{72} = \frac{10}{18}$	$\frac{1}{2}$
	$\mathrm{P}\left(\frac{A}{E_1}\right) = \frac{5}{8}, \mathrm{P}\left(\frac{A}{E_2}\right) = \frac{3}{8}, \mathrm{P}\left(\frac{A}{E_3}\right) = \frac{4}{8}$	1
	$\mathrm{P}\left(\frac{\mathrm{E}_3}{\mathrm{A}}\right) = \frac{\mathrm{P}(\mathrm{E}_3) \times \mathrm{P}\left(\frac{A}{E_3}\right)}{\mathrm{P}(\mathrm{E}_1) \times \mathrm{P}\left(\frac{\mathrm{A}}{\mathrm{E1}}\right) + \mathrm{P}(\mathrm{E}_2) \times \mathrm{P}\left(\frac{\mathrm{A}}{\mathrm{E}_2}\right) + \mathrm{P}(\mathrm{E}_3) \times \mathrm{P}\left(\frac{A}{E_3}\right)}$	1
	$= \frac{\frac{10}{18} \times \frac{4}{8}}{\frac{5}{18} \times \frac{5}{8} + \frac{3}{18} \times \frac{3}{8} + \frac{10}{18} \times \frac{4}{8}} = \frac{20}{37}$	$1\frac{1}{2}$