

4. The conditional probability of B given A is
- a) $\frac{P(A \cap B)}{P(B)}$ b) $\frac{P(A \cap B)}{P(A)}$
- c) $\frac{P(A \cup B)}{P(B)}$ d) $\frac{P(A \cup B)}{P(A)}$
5. Probability that a person will not die is
- a) 0 b) 1
- c) 0.5 d) 0.8.
6. When a coin is tossed, the event of getting a head and a tail are
- a) mutually exclusive events
- b) non-mutually exclusive events
- c) independent event
- d) dependent event.
7. A coin is tossed 4 times. The number of points in the sample space is .
- a) 12 b) 16
- c) 32 d) 64.
8. $\sum_{t=1}^n P(x_t) =$
- a) 0 b) 1
- c) -1 d) ∞ .
9. Variance of the random variable X is
- a) $E(X^2) - [E(X)]^2$ b) $[E(X)]^2 - E(X^2)$
- c) $E(X^2)$ d) $[E(X)]^2$.

22. The standard normal distribution has
- a) $\mu = 1, \sigma = 0$ b) $\mu = 0, \sigma = 1$
c) $\mu = 0, \sigma = 0$ d) $\mu = 1, \sigma = 1$.
23. The probability that standard normal variate lies between 0.78 and 2.75, is
- a) 0.4970 b) 0.2823
c) 0.2147 d) 0.7793.
24. The standard error of observed sample proportion P is
- a) $\sqrt{\frac{P(1-Q)}{n}}$ b) $\sqrt{\frac{PQ}{n}}$
c) $\sqrt{\frac{(1-P)Q}{n}}$ d) $\frac{PQ}{n}$.
25. Under null hypothesis the value of the test statistic Z is
- a) $\frac{t - S.E(t)}{E(t)}$ b) $\frac{t + E(t)}{S.E(t)}$
c) $\frac{t - E(t)}{S.E(t)}$ d) $\sqrt{\frac{PQ}{n}}$.
26. Alternative hypothesis is
- a) always left tailed
b) always right tailed
c) always one tailed
d) one tailed or two tailed.
27. Critical region is
- a) Rejection area b) Acceptance area
c) Probability area d) Test statistic value.

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28. Test Statistic for difference between two means is

a) $\frac{\bar{x} - \mu}{\sigma / \sqrt{n}}$

b) $\frac{p - P}{\sqrt{\frac{PQ}{n}}}$

c) $\frac{\bar{x}_1 - \bar{x}_2}{\sqrt{\frac{\sigma_1^2}{n_1} + \frac{\sigma_2^2}{n_2}}}$

d) $\frac{p_1 - p_2}{\sqrt{\hat{P}\hat{Q}\left(\frac{1}{n_1} + \frac{1}{n_2}\right)}}$

29. Statistic $Z = \frac{p_1 - p_2}{\sqrt{\hat{P}\hat{Q}\left(\frac{1}{n_1} + \frac{1}{n_2}\right)}}$ is used to test the null hypothesis

a) $H_0 : p_1 + p_2 = 0$

b) $H_0 : p_1 - p_2 = 0$

c) $H_0 : p = p_0$ (a constant)

d) none of these.

30. If $\hat{P} = \frac{2}{3}$, then \hat{Q} is equal to

a) 0.7

b) 0.3

c) 0.5

d) 0.8.

31. Standard error of the observed sample proportion P is

a) P

b) nP

c) PQ

d) $\sqrt{\frac{PQ}{n}}$

32. Paired t -test is applicable when the observations in the two samples are

a) paired

b) correlated

c) equal in number

d) all of these.

45. If $(AB) > \frac{(A)(B)}{N}$ then the attributes A and B are
- a) independent
 - b) positively associated
 - c) negatively associated
 - d) no conclusion.
46. Measures of association is usually dealt with
- a) attributes
 - b) quantitative factors
 - c) variables
 - d) numbers.
47. In case of two attributes A and B, if the class frequency $(AB) = 0$, then the value of Q is
- a) 1
 - b) -1
 - c) 0
 - d) $-1 \leq Q \leq 1$.
48. The criterion which selects the action for which maximum pay-off is lowest is known as
- a) Maximin criterion
 - b) Minimax criterion
 - c) Maximax criterion
 - d) none of these.
49. Decision making situations are
- a) certainty and uncertainty
 - b) certainty and risk
 - c) uncertainty and risk
 - d) certainty, uncertainty and risk.
50. Maximin return, maximax return and minimax regret are the criteria that
- a) lead to the same optional decision
 - b) cannot be used with probabilities
 - c) both (a) and (b)
 - d) none of these.

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PART - II

Note : i) Answer any *fifteen* questions.

ii) Each question carries *two* marks.

15 × 2 = 30

51. Define Mathematical probability.
52. If A and B are non-mutually exclusive events, and $P(A) = \frac{1}{4}$, $P(B) = \frac{2}{5}$, $P(A \cup B) = \frac{1}{2}$, then find $P(B/A)$.
53. Write the properties of distribution function.
54. What is probability mass function ?
55. The probability density function of a continuous random variable X is given by $f(x) = \frac{x}{2}$ for $0 < x < 2$. Find its mean.
56. Find mean and variance of the binomial distribution if the probability of occurrence of an event is $\frac{1}{5}$ and the total number of trials is 100.
57. Write any two properties of normal distribution.
58. Explain Poisson distribution.
59. Define sampling distribution.
60. What do you mean by level of significance ?
61. Write the variance of difference between two proportions.
62. Write any two properties of t -distribution.
63. State any two applications of χ^2 distribution.
64. Define F -statistic.

65. Name the different methods of measuring trend.
66. What are the components of time series ?
67. Examine the consistency of the given data :

$$N = 60, \quad (A) = 51, \quad (B) = 32, \quad (AB) = 25.$$

68. Write briefly about association of attributes.
69. Write any two advantages of decision tree.
70. What is Pay-off matrix ?

PART - III

Note : i) Answer any six questions.

ii) Each question carries five marks.

$$6 \times 5 = 30$$

71. A problem in statistics is given to two students A and B. The probability that A solves the problem is $\frac{1}{2}$ and that of B's to solve it is $\frac{2}{3}$. Find the probability that the problem is solved.

72. A random variable X has the following distribution :

x	- 1	0	1	2
$P(x)$	$\frac{1}{3}$	$\frac{1}{6}$	$\frac{1}{6}$	$\frac{1}{3}$

Find $E(x)$, $E(x^2)$ and $Var(x)$.

73. Four coins are tossed simultaneously. What is the probability of getting
(i) 2 heads and 2 tails, (ii) at least one head ?

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74. The customer accounts of a certain store have an average balance of Rs. 1,200 as a standard deviation of Rs. 400. Assuming that the account balances are normally distributed,
- what percentage of the accounts is over Rs. 1,500 ?
 - what percentage of the accounts is below Rs. 1,500 ?
75. A company producing light bulbs finds that mean life span of the population of bulbs is 1200 hrs with a standard deviation of 125 hrs. A sample of 100 bulbs produced in a lot is found to have a mean life span of 1150 hrs. Test whether the difference between the population and sample means is statistically significant at 5% level of significance.
76. You are given the following :

<i>Fathers</i>	<i>Intelligent Boys</i>	<i>Not intelligent Boys</i>	<i>Total</i>
Skilled Father	24	12	36
Unskilled Father	32	32	64
Total	56	44	100

Do these figures support the hypothesis that skilled fathers have intelligent boys ?

77. Calculate the three yearly average of the following data :

<i>Year</i>	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984
<i>Production in (tonnes)</i>	50	36	43	45	39	38	33	42	41	34

78. Investigate the association between darkness of eye colour in father and son from the following data :

Fathers with dark eyes and sons with dark eyes	:	50
Fathers with dark eyes and sons with no dark eyes	:	79
Fathers with no dark eyes and sons with dark eyes	:	89
Neither son nor father having dark eyes	:	782

79. Suppose that a decision maker faced with three decision alternatives and two states of nature. Apply (i) maximin and (ii) minimax regret approach to the following Pay-off table to recommend the decisions :

States of nature → Act ↓	S_1	S_2
A_1	10	15
A_2	20	12
A_3	30	11

PART - IV

Note : i) Answer any four questions.

ii) Each question carries ten marks. 4 × 10 = 40

80. In a bolt factory machines A_1 , A_2 , A_3 manufacture respectively 25%, 35% and 40% of the total output. Of these, 5%, 4% and 2% are defective bolts. A bolt is drawn at random from the product and is found to be defective. What is the probability that it was manufactured by machine A_2 ?

[Turn over

81. One fifth per cent of the blades produced by a blade manufacturing factory turns out to be a defective. The blades are supplied in boxes of 10. Use Poisson distribution to calculate the approximate number of boxes containing (i) no defective, (ii) one defective and (iii) two defective blades respectively in a consignment of 1,00,000 boxes.
82. In a sample of 600 students of a certain college, 400 are found to use blue ink. In another college from a sample of 900 students 450 are found to use blue ink. Test whether the two colleges are significantly different with respect to the habit of using blue ink.
83. Two types of batteries are tested for their length of life and the following data are obtained :

	No. of samples	Mean life (in hrs)	Variance
Type A	9	600	121
Type B	8	640	144

Is there a significant difference in the two means ?

84. A test was given to five students taken at random from the fifth class of three schools of a town. The individual scores are

School I	9	7	6	5	8
School II	7	4	5	4	5
School III	6	5	6	7	6

Carry out the analysis of variance.

85. Calculate the seasonal indices from the following data using simple average method :

Quarter	Year				
	1974	1975	1976	1977	1978
I	72	76	74	76	74
II	68	70	66	74	74
III	80	82	84	84	86
IV	70	74	80	78	82

86. A manufacturing company has to select one of the two products A or B for manufacturing. Product A requires investment of Rs. 20,000 and product B Rs. 40,000. Market research survey shows high, medium and low demands with corresponding probabilities and returns from sales in Rs. 1,000 for the two products in the following table :

Market Demand	Probability		Return from Sales	
	A	B	A	B
High	0.4	0.3	50	80
Medium	0.3	0.5	30	60
Low	0.3	0.2	10	50

Construct an appropriate decision tree. What decision should the company take ?

13. Calculate the seasonal index for the following data using simple average method.

Quarter	Year			
	1975	1976	1977	1978
I	72	78	74	76
II	88	80	82	84
III	84	86	88	90
IV	90	82	84	86

14. A manufacturing company has to select one of the two products A or B for manufacturing. Product A requires investment of Rs. 20,000 and product B Rs. 40,000. Market research survey shows high, medium and low demands with corresponding probabilities and returns from sales for Rs. 1,000 for the two products in the following table.

Market Demand	Probability		Return from sales
	A	B	
High	0.2	0.3	80
Medium	0.3	0.4	60
Low	0.5	0.3	20

Comment on appropriate decision. What decision should the company take?