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Part III - STATISTICS

(English Version)

Time Allowed: 3 Hours]

[Maximum Marks: 150

PART - I

Note: i) Answer all the questions.

ii) Each question carries one mark.

Choose the best answer:

 $50 \times 1 = 50$

- 1. Probability can take values from
 - a) $-\infty$ to $+\infty$

b) -∞ to 1

c) 0 to + 1

- d) -1 to +1.
- 2. Probability of drawing a queen from a well shuffled pack of cards is
 - a) $\frac{1}{13}$

b) $\frac{1}{52}$

c) $\frac{4}{13}$

- d) 1.
- 3. Probability of getting a head or a tail, when a coin is tossed, is
 - a) $\frac{1}{2}$

b) 1

c) 0

d) $\frac{1}{4}$

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

$$\frac{P(A \cup B)}{P(B)} \qquad \qquad d) \quad \frac{P(A \cup B)}{P(A)}.$$

5. Probability that a person will not die is

> 0 a)

b)

0.5 c)

d) 0.8.

6. When a coin is tossed, the event of getting a head and a tail are

- mutually exclusive events a)
- b) non-mutually exclusive events
- independent event c)
- d) dependent event.

A coin is tossed 4 times. The number of points in the sample space is .

a) 12

16 b)

32 c)

d) 64.

 $8. \qquad \sum_{i=1}^{n} P(x_i) =$

a) 0 b)

c)

d)

9. Variance of the random variable X is

- a) $E(X^2) [E(X)]^2$
- b) $[E(X)]^2 E(X^2)$

c) $E(X^2)$

 $[E(X)]^{2}$. d)

10. Var (12X) is

a)	12	Var	(X)

b) 144 Var (X)

d) Var(X).

11. From the given random variable table, the value of a is

X = x	0	1	2
p_i	а	2a	a

a) 1

b) $\frac{1}{2}$

c) 4

d) $\frac{1}{4}$

12. Variance of the random variable x is $\frac{1}{16}$. Its standard deviation is

a) $\frac{1}{256}$

b) $\frac{1}{32}$

c) $\frac{1}{64}$

d) $\frac{1}{4}$.

13. The expected value of X, where X represents the outcome when a die is thrown,

is

a) $\frac{1}{2}$

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

c) $\frac{5}{2}$

d) $\frac{7}{2}$.

14. The value of the first central moment μ_1 is

a) 0

b) 1

c) - 1

d) 2.

15. The binomial distribution is completely determined if it is known

a) p only

b) q only

c) p and q

d) p and n.

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16.	The	e standard deviation of a binomial	distri	bution is
	a)	npq	b)	np
	c)	\sqrt{npq}	d)	0.
17.	The	mean and variance of a binomial	distr	ibution are 8 and 4 respectively. The
		X = 1) is equal to		A LOS BURNES
	a)	$\frac{1}{2^{12}}$	b)	1 2 4
	c)	$\frac{1}{2^{6}}$	d)	128.
18.	For	a Poisson distribution		2. Variance of the court or variable
	a)	mean > variance	b)	mean = variance
	c)	mean < variance	d)	mean ≤ variance.
19.	The	mean of Poisson distribution is 0	49. T	Then its standard deviation is
	a)	0.49	b)	0.07
	c)	0.7	d)	4.9.
20.	Nor	mal distribution has		
	a)	no mode	b)	only one mode
	c)	two modes	d)	many modes.
21.		probability that a random variab	le X	lies in the interval (μ – 2σ , μ + 2σ
	is			

b) 0.6826

d) 0.0027.

a) 0.9544

c) 0.9973

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

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.

28. Test Statistic for difference between two means is

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

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.

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33.	Stan	dard er	ror of the sample mea	n in t	esti	ng the difference between population
	mea	n and sa	ample mean under t-st	atistic	c is	serio geometral michigani.
	a)	$\frac{\sigma^2}{\sqrt{n}}$		1	b)	$\frac{S}{\sqrt{n}}$ $\frac{S}{n}$
	c)			100	d)	$\frac{S}{n}$.
34.	Deg	rees of f	freedom for chi-square	in ca	ase	of contingency table of order (3×3)
	are					el insulator nol
	a)	4		(4	b)	6
	c)	8			d)	9.
35.	The	calcula	ted value of χ ² is			the Divisions of overview describents
	a)	always	s positive	- (6	b)	always negative
	c)	zero			d)	
36.	Wh	en obse	rved and expected free	quenc	ies	completely coincide, χ² will be
	a)	- 1			b)	+ 1 eatest with to tremodition add
	c)	> 1			d)	o. Secular trend .0
37.	Wh	nich of th	he following tests is als	so kno	own	as the variance ratio test?
	a)	z			b)	13. If the slope of the frend line is the
	c)	χ2			d)	F. Desert public to
38.	A	random	sample of size 20 f	rom a	a po	opulation gives the sample standard
	de	viation 2	2. If the population sta	ndard	de de	viation is 4, then the test statistic is
	a)	5	three components		b)	10
	c)	12			d)	20.

				3			
39.	In	the case of two-way classific	cation v	with	5 rows and 4 columns	, the d	egrees o
		eedom for error are				DEER ST	inem
	a)	20	10	b)	12		
				UJ	12		
	c)	9		d)	8.		
40.	In	the case of one-way classific	ation w	ith i	t treatments, the mean	sum of	squares
		treatment is					
	a)	$\frac{SST}{N-1}$		b)	$\frac{SST}{t-1}$		
		$\frac{SST}{N-t}$					
	C)	$\overline{N-t}$		d)	$\frac{SST}{t}$.		
41.	In	the case of one-way classifica	tion, th	ne to	otal variation (TSS), eq	uals	
	a)	SST× SSE					
	ay	331 × 33E		b)	SST - SSE		
	c)	SST + SSE		d)	SST / SSE.		
42 .	The	sales of a departmental sto	ore on	any	important festival is a	ssociate	ed with
		component of time series,					
	a)	Secular trend		b)	Seasonal variation		
	c)	Irregular variation		d)	All of these.		
13.	If th	ne slope of the trend line is p	ositive,	it s	shows		
	a)	Rising trend		b)	Declining trend		
	c)	Stagnation		.			
	C,	Stagriation	dod a	a)	none of these.	rander	
4.	A tin	me series consists			2, if the population are		
	a)	two components	(4)	b)	three components		

d)

five components.

four components

c)

45.	If ()	$(AB) > \frac{(A)(B)}{N}$ then the attrib	outes A	and B are
	a)	independent	b)	positively associated
	c)	negatively associated	d)	no conclusion.
46.	Mea	sures of association is usually	dealt wi	th
	a)	attributes	b)	quantitative factors
	c)	variables	d)	numbers.
47.	In c	case of two attributes A and E	3, if the	class frequency (AB) = 0, then the
	valu	ne of Q is		
	a)	1	b)	-1
	c)	0	d)	
48.	The	criterion which selects the ac	ction for	which maximum pay-off is lowest is
	kno	own as		
	a)	Maximin criterion	b)	Minimax criterion
	c)	Maximax criterion	d)	none of these.
49.	Dec	cision making situations are		
	a)	certainty and uncertainty	b)	certainty and risk
	c)	uncertainty and risk	d)	certainty, uncertainty and risk.
50.	Ma	ximin return, maximax return a	nd min	imax regret are the criteria that
	a)	lead to the same optional dec	ision	in the termination and was will W. S.
	b)	cannot be used with probabil	ities	
	c)	both (a) and (b)	Inc. dar	The engineering and the state of
	d)	none of these.		i. Dollas Fatatisuc.

PART - II

- Note: i) Answer any fifteen questions.
 - ii) Each question carries two marks.

 $15 \times 2 = 30$

- 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 $P(B \mid A)$.
- 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 trails 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:

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

- 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)	1/3	1/6	16	$\frac{1}{3}$

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?

- 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,
 - i) what percentage of the accounts is over Rs. 1,500 ?
 - ii) 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:

Fathers	Intelligent Boys	Not intelligent Boys	Total
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:

Year	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984
Production in (tonnes)	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:

13

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: 1) Answer any four questions.

ii) Each question carries ten marks. $4 \times 10 = 40$

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 ?

- 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				
П	68	70	66	74	74				
m 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	Proba	bility	Return from Sales			
Demand	A	В	A	В		
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?

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produces in the following table.

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Companied an appropriate decision with white decision should the company