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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. A coin is tossed 6 times. The number of points in the sample space is
 - a) 12

b) 16

c) 32

- d) 64.
- 2. Probability is expressed as
 - a) ratio

b) percentage

c) proportion

- d) all of these.
- 3. Probability of drawing a spade queen from a well-shuffled pack of cards is
 - a) $\frac{1}{13}$

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

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

d) 1.

b) $\frac{1}{216}$

c) $\frac{2}{216}$

d) $\frac{3}{216}$

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

6. If P(A) = 0.5, P(B) = 0.3 and the events A and B are independent, then $P(A \cap B)$ is

a) 0.8

b) 0.15

c) 0.08

d) 0.015.

7. The probability of not getting 2, when a die is thrown is

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

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

c) $\frac{1}{6}$

d) $\frac{5}{6}$

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

a) 0

b) 1

c) - · 1

d) ∞

9. E(2x+3) is

a) E(2x)

b) 2E(x) + 3

c) E(3)

d) 2x + 3.

10. Var(5x+2) is

a) 25 Var(x)

b) 5 Var(x)

c) 2 Var(x)

d) 25.

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

12. If f(x) is distribution function, then $F(\infty)$ is equal to

a) - 1

b) (

c) 1

d) ∞

13. If x is a discrete random variable with the probabilities p_i , then the expected value of x^2 is

a) $\sum x_i p_i$

b) $\sum x_i^2 p_i$

c) $\sum x_i^2 p_i^2$

d) $\sum x_i p_i^2$.

14. Variance of a constant a is

a) a^2

b) 0

c) 1

d) - 1.

15. Binomial distribution applies to

- a) rare events
- b) repeated alternatives
- c) three events
- d) impossible events.

16.	The mean of the Binomial distribution 15	C_x	$\left(\frac{2}{3}\right)$)*	$\left(\frac{1}{3}\right)$	15 - x	in which	$p=\frac{2}{3}$

is

a) 5

b) 10

c) 15

d) 3.

17. If for a Binomial distribution, n = 4 and also P(x = 2) = 3 P(x = 3), then the value of p is

a) $\frac{9}{11}$

b) leaps at (at) (b) 1

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

d) none of these.

18. The Binomial distribution is completely determined if is known.

a) p

b) q

c) p and q

d) n and p.

19. For a Poisson distribution

a) Mean > Variance

b) Mean = Variance

c) Mean < Variance

d) Mean ≤ Variance.

20. If the Poisson variables X and Y have parameters M_1 and M_2 , then X + Y is a Poisson variable with parameter

a) $M_1 M_2$

b) $M_1 + M_2$

c) $M_1 - M_2$

d) M_1/M_2 .

21. In a normal distribution, skewness is

a) one

b) zero

c) > 1

d) < 1.

22. The probability that a random variable X lies in the interval

$$(\mu - 2\sigma, \mu + 2\sigma)$$
 is

a) 0.9544

b) 0.6826

c) 0.9973

d) 0.0027.

23. If X is a normal variable with μ = 100 and σ^2 = 25 then P (90 < x < 120) is same as

a) P(-1 < z < 1)

b) P(-2 < z < 4)

c) P(4 < z < 4.1)

d) P(-2 < z < 3).

24. Alternative hypothesis is

- a) always left tailed
- b) always right tailed
- c) always one tailed
- d) one tailed or two tailed.

25. In the right tailed test, the critical region is

a) 0

- b) 1
- c) lies entirely in right tail
- d) lies in the left tail.

26. Area of the critical region depends on

- a) size of type I error
- b) size of type II error
- c) value of the test statistics
- d) number of observations.

27. Testing $H_0: \mu = 100 \text{ vs } H_1: \mu \neq 100 \text{ leads to}$

- a) one sided right tailed test
- b) one sided left tailed test
- c) two tailed test
- d) none of these.

28. Standard error of number of success is given by

a)
$$\sqrt{\frac{pq}{n}}$$

d)
$$\sqrt{\frac{np}{q}}$$

29. 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)
$$\frac{p_1 - p_2}{\sqrt{PQ\left(\frac{1}{n_1} + \frac{1}{n_2}\right)}}$$
.

30. Statistic $Z = \frac{\bar{X} - \bar{Y}}{\sigma \sqrt{\frac{1}{n_1} + \frac{1}{n_2}}}$ is used to test the null hypothesis

a)
$$H_0: \mu_1 + \mu_2 = 0$$

b)
$$H_0: \mu_1 - \mu_2 = 0$$

c)
$$H_0: \mu = \mu_0$$
 (a constant)

d) none of these.

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

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

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

Student's t-distribution was pioneered by

Karl Pearson a)

b) Laplace

R. A. Fisher

- William S. Gosset. d)
- The difference of two means in case of a small sample is tested by the formula

a)
$$t = \frac{\bar{x}_1 - \bar{x}_2}{S}$$

a)
$$t = \frac{\bar{x}_1 - \bar{x}_2}{S}$$
 b) $t = \frac{\bar{x}_1 - \bar{x}_2}{S} \sqrt{\frac{n_1 - n_2}{n_1 + n_2}}$

c)
$$t = \frac{\bar{x}_1 - \bar{x}_2}{S} \sqrt{\frac{n_1 n_2}{n_1 + n_2}}$$
 d) $t = \sqrt{\frac{n_1 n_2}{n_1 + n_2}}$.

d)
$$t = \sqrt{\frac{n_1 n_2}{n_1 + n_2}}$$

- Paired t-test is applicable when the observations in the two samples are
 - a) paired

correlated b)

equal in number

- all of these. d)
- 35. When observed and expected frequencies completely coincide, x^2 will be
 - a) - 1

b)

greater than 1

- d)
- 36. For v = 2, $\chi^{2}_{0.05}$ equals
 - a) 5.9

5.99

c) 5.55

- d) 5.95.
- 37. Degrees of freedom for Chi-square in case of contingency table of order (4×3) are
 - 12 a)

b) · 9

8 c)

d) 6.

38.	Equ	ality of several normal population	mean	as can be tested by	.54
	a)	Bartlet's test	b)	F-test	
	c)	χ^2 -test	d)	t-test.	
39.	In th	ne case of two-way classification, the	he to	tal variation (TSS) equals	
	a)	SSR + SSC + SSE	b)	SSR - SSC + SSE	
	c)	SSR + SSC - SSE	d)	SSR + SSC.	
40.	Anal	lysis of variance technique original	ted in	the field of	
	a)	Agriculture	b)	Industry	
	c)	Biology	d)	Genetics.	
41.	In th	he case of one-way classification	with	N observations at t treatments,	the
	erro	r degrees of freedom is			
	a)	N - 1	b)	t-1	
	c)	N-t	d)	Nt. 1 mail: record (2	
42.	A tin	me series consists of	v.	For $v=2$, χ_{out} equals	
	a)	two components	b)	three components	
	c)	four components	d)	five components.	
43.	Mov	ring average method is used to calc	culate	Degrees of freedom for Cluses.	
		Tues d values	b)	Cyclic variations	
	a)	Trend values	D)	CI 46	
	c)	Seasonal indices	d)	none of these.	

44.	The	e sales of a departmental store on	any	important festival are associated with
	the	component of time-series		a) lead to the same optimal d
	a)	Secular trend	b)	Seasonal variation
	c)	Irregular variation	d)	All of these.
45.	Mea	asures of association usually deal v	with	osesia Vigorom in
	a)	Attributes	b)	Quantitative factors
	c)	Variables	d)	none of these.
46.	Wit	h the two attributes, the total num	iber o	of class frequencies is
	a)	two	b)	four polestro com and de
	c)	eight	d)	nine. dolesko zam-zal4 (6
47.	If th	ne attributes are A and B, (AB) >	(A)	$\frac{.(B)}{N}$, then the attributes are
	a)	independent		
	b)	positively associated		
	c)	negatively associated		Note : 1
	d)	no conclusion.		
48.	Dec	ision theory is concerned with		St. Delice conditional probeviller
	a)	the amount of information that is	availa	able willows of professional and a series an
	b)	criteria for measuring the 'goodne	ess' of	f a decision
	c)	selecting optimal decisions in sequ	ıentia	al problems
	d)	all of these.		55 (*Datine Usi elsertation of a deci

- 49. Maximin return, Maximax return and Minimax regret are criteria that lead to the same optimal decision al cannot be used with probabilities b) both (a) and (b) none of these. d) 50. The criterion which selects the action for which maximum pay-off is lowest is known as Max-min criterion Min-max criterion Max-max criterion d) none of these. PART - II Note: i) Answer any fifteen questions. $15 \times 2 = 30$ ii) Each question carries two marks. 51. Define conditional probability. 52. State the axioms of probability. Define random variable.
 - 55. Define the expectation of a continuous random variable.

What is probability mass function?

54.

- 56. Comment the following:
 - "For a Binomial distribution, mean = 7 and variance = 16."
- 57. Give any two examples of Poisson distribution.
- 58. Find the probability that standard normal variate lies between Z = 0.78 and Z = 2.75.
- 59. Define null hypothesis and alternative hypothesis.
- 60. Explain clearly Type I and Type II errors.
- 61. In a test, if $Z_o \le Z_e$, what is your conclusion about the null hypothesis?
- 62. State any two assumptions of Student's t-test.
- 63. Define chi-square variate.
- 64. Write a short note on Yate's correction.
- 65. What is time series?
- 66. Write briefly about Seasonal Variation.
- 67. What do you understand by consistency of data?
- 68. Give Yule's coefficient of association.
- 69. Explain the meaning of 'Statistical decision theory'.
- 70. What is a pay-off matrix?

PART - III

Note: i) Answer any six questions.

ii) Each question carries five marks.

 $6 \times 5 = 30$

- 71. A ball is drawn at random from a box containing 5 green, 6 red and 4 yellow balls. Determine the probability that the ball drawn is (i) green, (ii) red, (iii) yellow, (iv) green or red and (v) not yellow.
- 72. Let X be a discrete random variable with the following probability distribution:

x	- 3	6	9
P(X=x)	1/6	1/2	1/3

Find the mean and variance.

- 73. Eight coins are tossed simultaneously. Find the probability of getting at least six heads.
- 74. If 3% of bulbs manufactured by a company are defective, then find the probability in a sample of 100 bulbs exactly five bulbs are defective. $\left(e^{-3} = 0.04979\right).$
- 75. A coin was tossed 400 times and the head turned up 216 times. Test the hypothesis that the coin is unbiased.
- 76. A random sample of size 20 from a population gives the sample standard deviation of 6. Test the hypothesis that the population standard deviation is 9.
- 77. Calculate 3 yearly moving average of the following data:

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

1097

78. Show that whether A and B are independent, positively or negatively associated:

$$(AB) = 128$$
, $(\alpha B) = 384$, $(A\beta) = 24$ and $(\alpha\beta) = 72$.

79. Given the following pay-off of 3 acts:

$$A_1$$
, A_2 , A_3 and their events E_1 , E_2 , E_3 :

	Acts					
States of nature	A ₁	A ₂	As			
E ₁	35	- 10	- 150			
E ₂	200	240	200			
E ₃	550	640	750			

The probabilities of the states of nature are respectively 0.3, 0.4 and 0.3. Calculate and tabulate EMV and conclude which of the acts can be chosen as the best.

PART - IV

Note: 1) Answer any four questions.

ii) Each question carries ten marks.

 $4 \times 10 = 40$

- 80. Two persons A and B appeared for an interview for a job. The probability of selection of A is $\frac{1}{3}$ and that of B is $\frac{1}{2}$. Find the probability that
 - i) both of them will be selected
 - ii) only one of them will be selected.
 - iii) none of them will be selected.

- 81. In a normal distribution 31% of the items are under 45 and 8% are over 34.

 Find the mean and variance of the distribution.
- 82. The means of two large samples 1000 and 2000 items are 67.5 cm and 68.0 cm respectively. Can the samples be regarded as drawn from the population with standard deviation 2.5 cm? Test at 5% level of significance.
- 83. Certain pesticide is packed into bags by a machine. A random sample of 10 bags is drawn and their contents are found to weigh (in kg) as follows:

Test, if the average packing can be taken to be 50 kg.

84. Three varieties of coal were analysed by four chemists and the ash-content in the varieties was found to be as under:

to the acts to	Chemists						
Varieties	1	2	3	4			
A	8	5	5	7			
В	7	6	4	4			
С	3	6	5	- 4			

Carry out an analysis of variance.

85. Fit a straight line trend by the method of least squares for the following data:

Year:	1983	1984	1985	1986	1987	1988
Sales (Rs. in lakhs)	3	8	7	9	11	14

Also estimate the sales for the year 1991.

- 86. A canteen prepares a food at a total average cost of Rs. 4 per plate and sells it at a price of Rs. 6. The food is prepared in the morning and is sold during the same day. Unsold food during the same day is spoiled and is to be thrown away. According to the past sale, number of plates prepared is not less than 50 or greater than 53. You are to formulate the
 - i) action space
 - ii) states of nature space
 - iii) pay-off table
 - iv) loss table.

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