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B.Tech DEGREE EXAMINATION, MAY 2024

Fifth Semester

18MAB301T - PROBABILITY AND STATISTICS

(For the candidates admitted during the academic year 2018 - 2019 to 2021 - 2022)

(Statistical tables to be provided)

Note:

i. **Part - A** should be answered in OMR sheet within first 40 minutes and OMR sheet should be handed over to hall invigilator at the end of 40th minute.

ii. **Part - B** and **Part - C** should be answered in answer booklet.

Time: 3 Hours **Max. Marks: 100**

PART - A (20 × 1 = 20 Marks)

Answer **all** Questions

		Marks	BL	CO
1.	Two persons A and B appear in an interview for two vacancies for the same post. The probability of A selection is 1/7 and that of B selection is 1/5. What is the probability that both of them will be selected? (A) 2/35 (B) 12/35 (C) 1/35 (D) 0	1	1	1
2.	var(2x+3) is (A) 4 var(x)+3 (B) 2 var(x) (C) 4 var(x) (D) 2 var(x) + 3	1	1	1
3.	The probability of the impossible event is (A) 2 (B) 1 (C) 3 (D) 0	1	1	1
4.	If c is a constant (non-random variable), then E(c) is (A) c (B) 0 (C) 1 (D) E(c)	1	1	1
5.	The standard normal distribution is represented by (A) N(0, 1) (B) N(1, 1) (C) N(1, 0) (D) N(0, 0)	1	1	2
6.	Poisson distribution is limiting case of (A) Geometric distribution (B) Normal distribution (C) Binomial distribution (D) Exponential distribution	1	1	2
7.	If X is exponential distributed with parameter λ, then for any two positive integers s and t $P(X > s + t / X > s) =$ (A) $P(X > t)$ (B) $P(X < t)$ (C) $P(X > s)$ (D) $P(X < s)$	1	1	2
8.	The Mean of Geometric distribution is (A) q/p^2 (B) 1/q (C) 1/q2 (D) 1/p	1	1	2
9.	Type II error is also called as (A) producer risk (B) consumer risk (C) labour risk (D) management risk	1	1	3
10.	The degree of freedom for t-test based on n observations is (A) (n -1) (B) (n -2) (C) (2n -1) (D) 2(n -1)	1	1	3

11.	Z test is used for _____ test (A) large sample (B) small sample (C) both samples (D) chi square	1	1	3
12.	The chi square test is not very effective if the sample is (A) irregular (B) heterogeneous (C) large (D) small	1	1	3
13.	The range of simple correlation coefficient is (A) 0 to 1 (B) 0 to ∞ (C) $-\infty$ to ∞ (D) -1 to 1	1	1	4
14.	If the correlation between the two variables is unity, there is (A) Perfect correlation (B) Perfect positive correlation (C) Perfect negative correlation (D) No correlation	1	1	4
15.	In a two-way ANOVA if h denotes number of columns and k denotes number of rows, then how many degrees of freedom are used for the error term (A) h - 1 (B) k - 1 (C) (h – 1) (k – 1) (D) hk	1	1	4
16.	If two lines of regression are $x + 2y - 5 = 0, 2x + 3y - 8 = 0$ respectively, then the mean of x and mean of y are respectively (A) 1, 2 (B) -3, 4 (C) 2, 1 (D) 3, 4	1	1	4
17.	If the calculated value of lower control limit is negative, we take it as (A) positive (B) negative (C) zero (D) 1	1	1	5
18.	The control chart for fraction of defective is (A) np chart (B) c chart (C) p chart (D) R chart	1	1	5
19.	A typical control chart consists of ___ horizontal lines. (A) 4 (B) 3 (C) 2 (D) 1	1	1	5
20.	The distribution of measurable data can be studied by using (A) $\overline{X}$ chart (B) np chart (C) p chart (D) c chart	1	1	5

PART - B (5 × 4 = 20 Marks)

Answer **any 5** Questions

		Marks	BL	CO
21.	The probability that a company director will travel by train is 1/5 and by bus is 2/3. What is the probability of his travelling by train or bus?	4	2	1
22.	A continuous random variable X has a probability density function $f(x) = 3x^2, 0 \leq x \leq 1$. Find a and b such that (i) $P(X \leq a) = P(X > a)$ (ii) $P(X > b) = 0.05$	4	3	1
23.	In a large consignment of electric bulbs 10% are defective. A random sample of 20 is taken for inspection. Find the probability that at most there are 3 defective bulbs.	4	1	2
24.	If the probability that an applicant for a drivers license will pass the road test on any given trial is 0.8. What is the probability that he will finally pass the test (i) On the fourth trial (ii) In less than 4 trials?	4	2	2
25.	The mean value of a random sample of 60 items was found to be 145 with a S.D. of 40. Find the 95% confidence limits for the population mean.	4	3	3
26.	Two lines of regression are $8x - 10y + 66 = 0, 40x - 18y = 214$. Find (i) The mean values of X and Y. (ii) The coefficient of correlation between X and Y.	4	3	4

27. Find the LCL and UCL for c chart if $\bar{c} = 11$. | 4 | 2 | 5

PART - C (5 × 12 = 60 Marks) | **Marks** | **BL** | **CO**

Answer **all** Questions

28. (a) | 12 | 3 | 1

A discrete random variable X has the following probability distribution

x	0	1	2	3	4	5	6	7	8
$p(x)$	k	$3k$	$5k$	$7k$	$9k$	$11k$	$13k$	$15k$	$17k$

(i) Find the value of k (ii) $P(X < 3)$ (iii) $P(0 < X < 3)$ (iv) Find the distribution function of X.

(OR)

(b) (i).

The probability distribution function of a random variable X is $F(x) = 1 - (1 + x)e^{-x}$, $x \geq 0$. Find the density function and mean of X.

(ii).

The first four moments of a distribution about $x = 4$ are 1, 4, 10, 45. Show that the mean is 5, variance is 3, $\mu_3 = 0$, $\mu_4 = 26$.

29. (a) The number of monthly breakdown of a computer is a random variable having a Poisson distribution with mean equal to 1.8. Find the probability that this computer will function for a month (i) Without a breakdown (ii) With only 1 breakdown (iii) With at least 1 breakdown. | 12 | 2 | 2

(OR)

(b)

If X is normally distributed and the mean X is 12 and the SD is 4. Find out the following

(i) $P(X \geq 20)$ (ii) $P(X \leq 20)$ (iii) $P(0 \leq X \leq 12)$

30. (a) Theory predicts that the proportion of beans in 4 groups A, B, C, D should be 9 : 3 : 3 : 1. In and experiment among 1600 beans, the numbers in the 4 groups were 882, 313, 287 and 118. Does the experiment support the theory? | 12 | 3 | 3

(OR)

(b) Two horses A and B were tested according to the time (in seconds) to run a particular track with the following

Horse A	28	30	32	33	33	29	34
Horse B	29	30	30	24	27	29	-

Test whether the two horses have the same running capacity.

31. (a) Find the correlation coefficient and obtain the lines of regression from the data given below. | 12 | 2 | 4

X	65	67	66	71	67	70	68	69
Y	67	68	68	70	64	67	72	70

(OR)

(b) Four doctors each test four treatments for a certain disease and observe the number of days each patient takes to recover. The results are as follows (recovery time in days). Discuss the difference between doctors and treatments using two way ANOVA table test.

Doctor	Treatment			
	1	2	3	4
A	10	14	19	20
B	11	15	17	21
C	9	12	16	19
D	8	13	17	20

32. (a) The following are the sample means $\bar{X}$ and sample ranges R for 10 samples, each of size 5. Construct the control chart for mean and range and comment on the state of control. 12 3 5

Sample	1	2	3	4	5	6	7	8	9	10
Mean ($\bar{X}$)	12.8	13.1	13.5	12.9	13.2	14.1	12.1	15.5	13.9	14.2
Range (R)	2.1	3.1	3.9	2.1	1.9	3.0	2.5	2.8	2.5	2.0

(OR)

(b) The data given below are the number of defectives in 10 samples of 100 items each. Construct a p – chart and np – chart and comment on the results.

Sample	1	2	3	4	5	6	7	8	9	10
np	6	16	7	3	8	12	7	11	11	4

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