30. a.i. Before an increase in excise duty on tea, 800 people out of a sample of 1000 were consumers of tea. After the increase in duty, 800 people were consumers of tea in a sample of 2000 persons. Find whether there is significant decreases in the consumption of tea after the increase in duty. 6 1 3 2

ii. In a random sample of sizes 500, the mean is found to be 20. In another independent sample of size 400 the mean is 15. Could the samples have been drawn from the same population with SD 4? 6 1 3 2

(OR)

b. The following table shows the distribution of digits in number chosen at random from a telephone directory. 12 2 3 2

Digit	0	1	2	3	4	5	6	7	8	9
Frequency	1020	1107	997	966	1075	933	1107	972	964	853

Test whether the digits may be taken to occur equally frequently in the directory?

31. a. Marks obtained by 10 students in mathematics (x) and statistics (y) are given below. 12 2 4 2

x:	60	34	40	50	45	40	22	43	42	64
y:	75	32	33	40	45	33	12	30	34	51

Find two regression lines. Also find y when x=55.

(OR)

b. A completely randomized design experiment with 10 plots and 3 treatments gave the following results. 12 2 4 2

Plot No:	1	2	3	4	5	6	7	8	9	10
Treatment :	A	B	C	A	C	C	A	B	A	B
Yield :	5	4	3	7	5	1	3	4	1	7

Analyze the results for treatment effects?

32. a. The values of sample mean $\bar{x}$ and sample standard deviation s for 15 samples, each of size 4, drawn from a production process are given below. Draw the appropriate control charts for the process average and process variability. Comment on the state of control. 12 2 5 2

Sample no:	1	2	3	4	5	6	7	8	9	10
Mean :	15	10	12.5	13	12.5	13	13.5	11.5	13.5	13
SD:	3.1	2.4	3.6	2.3	5.2	5.4	6.2	4.3	3.4	4.1

Sample no:	11	12	13	14	15
Mean :	14.5	9.5	12	10.5	11.5
SD:	3.9	5.1	4.7	3.3	3.3

(OR)

b. From the output of a process that produces several thousand electric tubes daily, samples of 100 tubes are drawn randomly, sample items are inspected for quality and defective tubes are rejected. The results of 15 samples are shown below. Construct a p-chart and a np-chart and comment on the results. 12 2 5 2

Sample no:	1	2	3	4	5	6	7	8	9	10	11
No. of defectives tubes :	8	10	13	10	14	6	9	8	10	13	18

Sample no:	12	13	14	15
No. of defectives tubes :	9	14	12	15

* * * * *

Reg. No.														

B.Tech. DEGREE EXAMINATION, JUNE 2023

Fifth Semester

18MAB301T – PROBABILITY AND STATISTICS

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

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 & 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	PO

1. Any subset of the sample space S is defined as 1 1 1 1
   (A) Trial (B) Finite sample space
   (C) Event (D) Experiment

2. The probability of getting a number greater than 2 or an even number in a single throw of a fair die is 1 1 1 2
   (A) 1/5 (B) 2/5
   (C) 5/6 (D) 1

3. If X is a random variable and Var(X)=2 then calculate Var(2X+3) is 1 1 1 2
   (A) 2 (B) 6
   (C) 8 (D) 3

4. The first two moments about 3 are 1 and 8 then the mean is 1 1 1 2
   (A) 0 (B) 2
   (C) 4 (D) 3

5. The mean of Poisson distribution is 1 2 2 2
   (A) λ (B) $\frac{\lambda}{\lambda - t}$
   (C) $\frac{1}{\lambda^2}$ (D) $\frac{1}{\lambda}$

6. The variance of geometric distribution is 1 1 2 2
   (A) q/p^2 (B) $1/q$
   (C) $1/q^2$ (D) $1/p$

7. The mean of a uniform distribution is 1 1 2 1
   (A) $\frac{(a+b)^2}{12}$ (B) $\frac{(b-a)^2}{12}$
   (C) $\frac{(b-a)}{12}$ (D) $\frac{(a+b)}{2}$

8. A coin is tossed 300 times, then the mean of the binomial distribution is 1 1 2 2
   (A) 100 (B) 75
   (C) 300 (D) 150

9. In testing of hypothesis, the collection of individuals is called — 1 1 3 1
   (A) Sample (B) Population
   (C) Data (D) Collection

10. If $H_1 : \bar{x} > \mu$ then it is — 1 1 3 2
   (A) Two tailed test (B) Right tailed test
   (C) Left tailed test (D) Three tailed test

11. The chi-square goodness of fit test can be used to test — 1 1 3 1
   (A) Significance of sample statistics (B) Difference between the population means
   (C) Normality (D) Probability

12. A failing student is passed by an examiner it is an example of — 1 1 3 1
   (A) Type I error (B) Type II error
   (C) Type III error (D) No error

13. If *r=0* then the two variables X and Y are _____ — 1 1 4 1
   (A) Correlated (B) Uncorrelated
   (C) 0 to 1 (D) –1 to +1

14. Regression coefficient is independent of the change of — 1 1 4 1
   (A) Scale (B) Origin
   (C) Both origin and scale (D) Neither origin nor scale

15. If $b_{xy} > 1$ then b_{yx} is — 1 1 4 2
   (A) Less than 1 (B) Greater than 1
   (C) Equal to 1 (D) Equal to 0

16. In two way classification the data are classified according to _____different factor. — 1 1 4 2
   (A) Two (B) One
   (C) Five (D) Six

17. SQC is a productivity enhancing and regulatory technique with three factors- management, methods and _____ — 1 1 5 1
   (A) Mathematics (B) Chemistry
   (C) Physics (D) Biology

18. In the control chart, CL denotes the — 1 1 5 1
   (A) Last line (B) Central line
   (C) Double line (D) First line

19. A typical control chart consists of _____horizontal lines. — 1 1 5 1
   (A) One (B) Two
   (C) Three (D) Four

20. If the total number of defects in 20 pieces of cloths is 220 then UCL is — 1 1 5 1
   (A) 11.25 (B) 20.95
   (C) 1.05 (D) –1.05

PART – B (5 × 4 = 20 Marks)

Answer **ANY FIVE** Questions

	Marks	BL	CO	PO

21. Let X be a random variable with pdf $f(x)=\begin{cases}\frac{1}{3}e^{-x/3}, & x>0\\ 0, & otherwise\end{cases}$. Find the MGF of X and the mean. — 4 1 1 2

22. If the random variable X has the following cumulative distribution function then find the (i) pdf of X (ii) P(X<1), given $F(x)=1-(1+x)e^{-x}, x\geq 0$. — 4 1 1 2

23. If X is a Poisson random variable such that $P(X=2)=9P(X=4)+90P(X=6)$ then find mean and variance. — 4 1 2 2

24. If X is uniformly distributed over (0,10) then find P(X<4) and P(2<X<5). — 4 1 2 2

25. Ten oil tins are taken from an automatic filling machine. The mean weight of the tins is 15.8 kg and standard deviation 0.50 kg. Does the sample mean differ significantly from the intended weight 16 kg? — 4 1 3 2

26. In a partially destroyed laboratory record of an analysis of a correlation data, the following results only are legible. Variance of X=9 and regression equations
$8x-10y+66=0$
$40x-18y=214$
then find the mean values of X and Y. — 4 1 4 2

27. A garment was sampled on 10 consecutive hours of production. The number of defects found per garment is given below: 5, 1, 7, 0, 2, 3, 4, 0, 3, 2. Compute the upper and lower limits for monitoring the number of defects. — 4 1 5 2

PART – C (5 × 12 = 60 Marks)

Answer **ALL** Questions

	Marks	BL	CO	PO

28. a. A bag contains 5 balls and it is not known how many of them are white. Two balls one drawn at random from the bag and they are noted to be white. What is the chance that all the balls in the bag are white? — 12 3 1 2

(OR)

b. Suppose a continuous random variable X has the probability density function — 12 4 1 2
$f(x)=\begin{cases}k(1-x^2) & for\ 0<x<1\\ 0 & otherwise\end{cases}$
Then (i) evaluate the value of k (ii) calculate the mean and variance.

29. a. Out of 800 families with 4 children each, how many families would be expected to have (a) 2 boys and 2 girls (b) atleast 1 boy (c) atmost 2 girls and (d) children of both sexes. — 12 1 2 2

(OR)

b. Fit a Poisson distribution for the following distribution. — 12 1 2 2

x	0	1	2	3	4	5	Total
f	142	156	69	27	5	1	400

and calculate the expected frequencies.