

KATHMANDU UNIVERSITY
End Semester Examination [C]
June/July 2024

Marks Scored:

Level : B.E./B.Sc./B.Tech.
Year : II

Course : MATH 208
Semester : II

Exam Roll No. : Time: 30 mins.

F. M. : 20

Registration No.:

Date 05 JUL 2024

SECTION "A"
[10Q. \times 1 = 10 marks]

Fill in the blank space(s) by writing the most appropriate word(s) or symbol(s).

1. If the frequency curve as well as histogram of a data distribution stretches longer on the right side, then it is said to be _____ skewed.
2. Extremely high and low values in a set of data which affect average values and variation severely are called _____.
3. A bag contains 10 red and 8 blue colored marbles. Out of 10 red marbles 3 are spotted and rest are swirled. Similarly, out of 8 blue balls 3 are spotted and rest are swirled. If a red ball is drawn, the probability that it is swirled is _____.
4. If $V(X) = 4$ and $Y = 2X + 3$, then $V(Y) =$ _____.
5. If $X \sim B(12, 0.7)$, then $E(X) =$ _____.
6. The points of inflection of random variable having $N(15, 9)$ distribution lie at _____ and at _____.
7. _____ distribution is defined as the probability distribution of sum of square of standard normal distributions.
8. It is intended to test whether resistance of electric wire can be reduced by alloying. If μ_1 and μ_2 denote actual average resistances of unalloyed and alloyed wires respectively, then the alternative hypothesis of the test is $H_1:$ _____.
9. In a production process, the variation in items resulted from minor causes which are beyond the control and which cannot be eliminated completely are called _____ cause of variation.
10. Blood pressure of a person depends on weight. Here 'weight' is called _____ variable.

19. The lower control line of an R-chart, when process standard deviation is not known is given by: _____
- a. $LCL = D_3 \bar{R}$ b. $LCL = B_3 \bar{R}$ c. $LCL = D_4 \bar{R}$ d. $LCL = B_4 \bar{R}$
20. If the value of correlation coefficient between two variables is observed to be - 0.07, then it indicates _____
- a. weak positive correlation b. strong positive correlation
c. weak negative correlation d. strong negative correlation

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Level : B.E./B.Sc./B.Tech.
Year : II
Time : 2 hrs. 30mins.

Course : MATH 208
Semester : II
F. M. : 55

05 JUL 2024

SECTION "C"
[3 Q. × 7 = 21 marks]

1. The number of defective raw materials produced in a large manufacturing process are recorded for 40 consecutive days with following result-
27, 17, 25, 20, 27, 41, 31, 32, 36, 37, 24, 27, 35, 34, 24, 29, 33, 27, 29, 38, 30, 35, 34, 35, 24, 22, 31, 31, 33, 33, 31, 23, 37, 35, 41, 33, 41, 34, 40, 31
- a. Create a branched stem-and-leaf plot of given data with symbol " - " in stem for digits 0, 1, 2, 3 and 4 in leaf and with symbol " + " in stem for digits 5, 6, 7, 8 and 9 in leaf. [1]
- b. Use the plot in part (a) to create frequency distribution with classes 15 – 20, 20 – 25, , 40 – 45. [1]
- c. Use the result in part (b) to create histogram of given data. [1]
- d. Use the result in part (b) to find mean number of defective units produced per day along with variance. [3]
- e. Assuming that the number of defective raw materials produced daily follows normal distribution with the mean and variance obtained in part (d) find probability that on a particular day, there will be less than 35 defective raw material produced. [1]
2. A chemical company, wishing to study the effect of extraction time on the efficiency of an extraction operation, obtained the data shown below:

Extraction time (min.)/ X	27	45	41	19	35	39	19	49	15	31
Extraction Efficiency (%)/ Y	57	64	80	46	62	72	52	77	57	68

- a. Draw scatter plot showing that it is appropriate to fit a straight line to the data.
- b. Fit a straight line to above data by the principle of least square.
- c. Predict the extraction efficiency one can expect when extraction time is 35 min.
- d. Find Pearson's correlation coefficient between extraction time and extraction efficiency.

P.T.O.

3. The following are the number of sales which a sample of 9 salespersons of industrial chemicals in Biratnagar and a sample of 6 salespersons of industrial chemicals in Bhairahawa made over a certain fixed period of time:

Biratnagar	59	68	44	71	63	46	69	54	48
Bhairahawa	50	36	62	52	70	41			

Assuming that the populations sampled can be approximated closely with normal distributions having the same variance

- Construct 95% confidence interval for difference in means of sales in two cities.
- Stating required hypotheses appropriately test whether the mean number of sales in two cities are same at $\alpha = 0.05$ level of significance.

OR

A course in office procedure was given to 10 assistants for performance improvement. They were examined on the basis of a similar test before and after the course. Results are produced below:

Assistant No.	Score before the course	Score after the course
1	45	36
2	73	60
3	46	44
4	124	119
5	33	35
6	57	51
7	83	77
8	34	29
9	26	24
10	17	11

Setting $\alpha = 0.05$, use paired t-test to observe whether there is any effect of the course on their performance. Also find 95% confidence interval for difference in means of scores before and after the course.

SECTION "D"

[6 Q. \times 4 = 24 marks]

4. Four technicians regularly make repairs when breakdowns occur on an automated production line. Krishna, who services 20% of the breakdowns, makes an incomplete repair 1 time in 20; Gopal, who services 60% of the breakdowns, makes an incomplete repair 1 time in 10; Sabindra, who services 15% of the breakdowns, makes an incomplete repair 1 time in 10; and Raghu, who services 5% of the breakdowns, makes an incomplete repair 1 time in 20. For the next problem with the production line diagnosed as being due to an initial repair that was incomplete, what is the probability that this initial repair was made by Krishna?

5. If X is a continuous random variable with the probability density function

$$f(x) = k \cdot e^{-3x}; x > 0$$
 Find k and $P(0.5 \leq x \leq 1)$.
6. The mean of random variable X having binomial distribution is 6 and variance is 4. Determine the number of trials and probability of success of X and then find $P(X \leq 1)$.
7. Assume that the chance of an individual coal miner being killed in a mine accident during a year is $1/1400$. Use the Poisson distribution to calculate the probability that in a mine employing 350 miners, there will be at least one fatal accident (i) in a year (ii) in two years.
8. The loss in weight of 16 grinding balls after a certain length of time in mill slurry is normally distributed with mean of 3.42 and a standard deviation of 0.68 gram. Construct 99% confidence interval for true mean weight loss of such grinding balls.

9. Data on 30 days for number of late flights out of 240 takeoffs daily are presented below-

26	19	26	22	24	19	19	20	18	18	17	9	13	10	12
14	14	13	9	10	12	15	14	15	16	18	17	16	18	17

Construct p-chart of given data.

SECTION "E"

[5Q. \times 2 = 10 marks]

10. The delay times for cutting 6 parts on an engine lathe are 0.6, 1.2, 0.9, 1.0, 0.6 and 0.8 minutes. Calculate the coefficient of variation.
11. A box contains 8 balls. Three of them are red and the remaining 5 are blue. Two balls are drawn successively, at random and without replacement. Find the probability that, the first draw results in red, and the second draw results in blue.
12. In a call center, the number of phone calls received each by each of the 12 receptionists is normally distributed with 63 calls on average on each day with standard deviation of 3. Find the probability that on a particular day the number of phone calls received by the receptionists is more than 70.
13. Find (i) $Z_{0.95}$ (ii) $\chi^2_{0.05, 2}$ (iii) find 'c' if (a) $P(t_{10} \geq c) = 0.025$ (b) $P(\chi^2_{12} \geq c) = 0.95$.
14. A plastic manufacturer extrudes blanks for use in the manufacture of eyeglass temples. Specifications required that the thickness of these blanks have $\mu = 0.150$ and $\sigma = 0.002$ inch. Use these specifications to calculate value of central line, lower control line and upper control line.

