



SIDDHARTH GROUP OF INSTITUTIONS :: PUTTUR
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QUESTION BANK (DESCRIPTIVE)

Subject with Code :P&S (16HS613)

Course & Branch: MCA

Year & Sem: I-MCA & I-Sem

Regulation: R16

UNIT-I (PROBABILITY)

- 1) (a). n letters are to be placed in n addressed envelopes. If the letters are placed in the envelopes at random what is the probability that at least two of the letters are not place in the right envelopes. 5M
(b). first box contains 2 Black, 3 Red, 1 White balls second box contains 1 Black, 1 Red, 2 white balls and third box contains 5 Black, 3 Red, 4 White balls. Of these a box is selected at random. From it a red ball is randomly drawn. If the ball is red, find the probability that is from second box? 5M
- 2) (a) $P(A^C)=3/8$, $P(B^C)=1/2$ and $P(A \cap B)=1/4$ then find $P(A/B)$, $P(B/A)$, $P(A^C/B^C)$ 5M
(b). There are two boxes A and B. A has 5 red 3 white marbles B has 3 red 3 white 2 black marbles. A die is thrown if 3 or 6 appears a marble is chosen from A and put into B and then marble is chosen otherwise a marble is chosen from B and put into A and then a marble is chosen. what is the probability that both are i) Red ii) White marbles. 5M
- 3) (a). a problem in statistics is given to the 3 students A, B, C whose chances of solving it are $\frac{1}{2}$, $\frac{3}{4}$ and $\frac{1}{4}$ respectively what is the probability that the problem is solved? 5M
(b) The probability density function is $f(x) = \begin{cases} k(3x^2 - 1), & \text{if } -1 \leq x \leq 2 \\ 0, & \text{otherwise} \end{cases}$
Find the value of k and evaluate $P(-1 \leq x \leq 0)$. 5M
- 4) (a).In a bolt factory machines A,B and C manufactures 20%,30%,50% of total of their output of which 6%,3% and 2% are defective. A bolt is drawn at random and found to be defective. Find the probability that is manufactured by i) Machine A ii) Machine B and III) machine C 5M
(b). Find the mean and variance of the following probability distribution function given as 5M
 $f(a) = x/15$ for $x = 1,2,3,4,5$
- 5) (a) A can hit a target once in five shots, B can hit two targets in 3 shots, C can hit one target in 4 shots. What is the probability that 2 shots hit the target? 5M
(b) State and prove the Baye's Theorem 5M

6) (a) A random variable X has the following probability function.

X	0	1	2	3	4	5	6
P(X)	K	3K	5K	7K	9K	11K	13K

(i) Find the value of K (ii) Evaluate $P(X < 4), P(3 < X \leq 6)$. 5M

(b) n letters to each of which corresponds an addressed envelope, are placed in the envelopes at random. What is the probability that all letters are placed in the right envelopes? 5M

7) (a). A random variable X has the following probability distribution function 5M

X	0	1	2	3	4	5	6	7
f(x)	0	K	2k	2k	3k	K²	2K²	7K²+k

Determine i) Value of k ii) $P(X < 6), P(X \geq 6)$ and iii) $P(0 < X < 6)$

(b). The probabilities that students A,B,C,D solve a problem are $1/3, 2/5, 1/5$ and $1/4$ respectively.

If all of them are try to solve the problem., what is the probability that the problem is solved 5M

8) (a). Is the function defined by 5M

$$F(x) = \begin{cases} 0 & ; x < 2 \\ \frac{1}{18}(2x + 3); & 2 \leq x \leq 4 \\ 0 & ; x > 4 \end{cases}$$

Is a probability density function? Find the probability that a variable having f(x) as density function will fall in the interval $2 \leq x \leq 3$

(b). A fair die is tossed. Let the random variable X denote the twice the number appearing on the die. Write the probability distribution of X. 5M

9) (a) A can hit a target once in five shots, B can hit two targets in 3 shots, C can hit one target in 4 shots. What is the probability that 2 shots hit the target? 5M

(b) State the Baye's Theorem 3M

(c) A fair die is tossed. Let the random variable X denote the twice the number appearing on the die. Write the probability distribution of X. 2M

10) (a) State and prove the addition theorem on probability 5M

(b). two aeroplanes bomb a target in succession. The probability of each correctly scoring a hit is 0.3 and 0.2 respectively. the second will bomb only if the first misses the target. Find the probability that (i). target is hit (ii). Both fails to score hits? 5M

UNIT-II (DISTRIBUTIONS)

- 1) (a) In a binomial distribution consisting of 5 independent trials. Probabilities of 1 and 2 success are 0.4096 and 0.2048 respectively. Find the parameter p of the distribution. 5M
- (b) 10 coins are thrown simultaneously. Find the probability of getting (i) at least 7 heads
(ii) 6 heads 5M
- 2) (a). a sample of 4 items is selected at random from a box containing 12 items of which 5 are defective. Find the expected number of defective items? 5M
- (b). if mean of the binomial distribution is 3 and variance is $9/4$. 5M
- Then Find i) The value of n ii) $P(X \geq 7)$ and $P(1 \leq X \leq 6)$?
- 3) (a). Using the properties of the gamma function, show that the gamma PDF integrates to 1, i.e., show that for $\alpha, \lambda > 0, \lambda > 0$, we have Using the properties of the gamma function, show that the gamma PDF integrates to 1, i.e., show that for $\alpha, \lambda > 0, \lambda > 0$, we have $\int_0^{\infty} \frac{\lambda^\alpha x^{\alpha-1} e^{-\lambda x}}{\Gamma(\alpha)} dx = 1$ 5M
- (b). in a normal distribution, 7% of the items are under 35 and 89% are under 63. Find the mean and standard deviation of the distribution? 5M
- 4) (a) Define the gamma distribution with mean and variance 5M
- (b) Two dice are thrown 120 times. Find the average number of times in which, the number on the first die exceeds the number on the second die? 5M
- 5) (a). Suppose 2% of the people on average are left handed. Find 5M
- i) The probability finding 3 or more left handed ii) The probability finding none or more left handed 5M
- (b). If X is exponential with parameter $\lambda > 0, \lambda > 0$, then X is a memory less random variable, that is $P(X > x+a | X > a) = P(X > x)$, for $a, x \geq 0$. 5M
- 6) (a) find the mean and variance of binomial distributions. 5M
- (b) in sample of 1000 cases, the mean of a certain test is 14 and standard deviation is 2.5. assuming the distribution to be normal, find 5M
- (i) How many students score between 12 and 15
- (ii) How many score above 18

7) (a) Fit a Binomial distribution for the following data and calculate the expected frequencies. 5M

x	0	1	2	3	4	5	6
f	13	25	52	58	32	16	4

(b) If a random variable has a Poisson distribution such that $P(1)=P(2)$, find mean and variance of the distribution. 5M

8) (a) The mean and variance of a binomial distribution are 4 and 3 respectively. Find n . 5M

(b) Fit a Poisson distribution for the following data and calculate the expected frequencies. 5M

x	0	1	2	3	4	5	6	7	8
f	56	156	132	92	37	22	4	0	1

9) (a) find the mean and variance of the gamma distribution 5M

(b) If the weights of 300 students are normally distributed with mean 68kgs and standard deviation 3kgs how many students have weights 5M

i) Greater than 72kgs ii) Less than or equals to 61kgs iii) Between 65kg and 71kgs

10) (a) find the expectation and variance of exponential distribution 5M

(b) a hospital switch board receives an average of 4 emergency calls in a 10 minute interval. What is the probability that (i). There are at most two emergency calls in a 10 minute interval (ii). There are exactly 3 emergency calls in a 10 minute interval?

UNIT-III (TEST OF HYPOTHESIS & SIGNIFICANCE)

- 1) (a) define the null hypothesis, alternate hypothesis 5M
 (b) Is a sample of 64 students with a mean weight of 70 kg. can be regarded as a sample from a population with mean weight 56kg and standard deviation 25kg? 5M
- 2) (a) write about working rule for test of hypothesis 5M
 (b) The mean life of a sample of 25 fluorescent lights bulbs produced by a company is computed to be 1570 Hours with a standard deviation of 120 Hours. The company claims that the average life of the bulbs produced by the company is 1600 Hours. Using the level of significance of 0.05, is the claim acceptable? 5M
- 3) (a) The means of two large samples of sizes 1000 and 2000 members are 67.5 inches and 68.0 inches respectively. Can the samples be regarded as drawn from the same population with standard deviation 2.5 inches? 5M
 (b) Pumpkins were grown under two experimental conditions. Two random samples of 11 and 9 pumpkins, show the sample standard deviation of their weights as 0.8 and 0.5 respectively. Assuming that the weight distributions are normal, test the hypothesis that the two variances are equal? 5M
- 4) (a) the mean and standard deviation of a population are 11795 and 14054 respectively. If $n=50$ find 95% confidence limits for mean 5M
 (b) a sample of 26 bulbs gives a mean life of 990 hours with a S.D of 20 hours. The manufacturer claims that the mean life of bulbs is 1000 hours. Is the sample not up to the standard. 5M
- 5) (a) Random samples of 400 men and 600 women were asked whether they would like to have a flyover near their residence. 200 men and 325 women were in favor of the proposal. Test the hypothesis that proportions of men and women in favor of the proposal are same, at 5% level. 5M
 (b) Define errors of sampling and one tail, two tail tests 5M
- 6) (a) The three samples below have been obtained from normal populations with equal variances. test the hypothesis that the sample means are equal. 5M

8	7	12
10	5	9
7	10	13
14	9	12
11	9	14

- (b) The means of two random samples of sizes 9 and 7 are 196.42 and 198.82 respectively. The sum of the squares of the deviations from the mean is 26.94 and 18.73 respectively. Can the sample be considered to have been drawn from the same normal population? 5M
- 7) (a) find the maximum difference that we can expect with probability 0.95 between the means of samples of sizes 10 and 12 from normal population if their standard deviations are found to be 2 and 3 respectively. 5M
- (b) Sample of 10 cam shafts intended for use in gasoline engines has an average eccentricity of 1.02 and a standard deviation of 0.044 inches. Assuming the data may be treated a random sample from a normal population determines a 95% confidence interval for the actual mean eccentricity of the cam shaft? 5M
- 8) (a) 20 people were attacked by a disease and only 18 survived. Will you reject the hypothesis that survival rate if attacked by this disease is 85% at 5% level of significance? 5M
- (b) the measurements of the output of two units have given the following results. Assuming that both samples have been obtained from the normal populations at 10% significant level, test whether the two populations have the same variance. 5M

Unit A	14.1	10.1	14.7	13.7	14.0
Unit B	14.0	14.5	13.7	12.7	14.1

- 9) In an investigation on the machine performance the following results are obtained 5M

	No. of Units inspected	No. of defectives
Machine 1	375	17
Machine2	450	22

Test whether there is any significant performance of two machines at 5% level.

- (b) a die is thrown 264 times with the following results. Show that the die is biased. ($\chi^2 = 11.07$ at 5 d.f & 5% L.S) 5M

Number on the die	1	2	3	4	5	6
Frequency	40	32	28	58	54	52

- 10) (a) The nicotine in milligrams of two samples of tobacco were found to be as follows. Find the standard error and confidence limits for the difference between the means at **0.05** level. 5M

<i>Sample A</i>	24	27	26	23	25	---
<i>Sample B</i>	29	30	30	31	24	36

- (b) a random sample of 25 from a normal population has the mean 47.5 and the standard deviation 8.4. does this information tend to support or refuse the claim that the mean of the population is 42.5 5M

UNIT-IV (ANOVA)

- 1) To assess the significance of possible variation in performance in a certain test between the convent schools of a city, a common test was given to a number of students taken at random from the senior 5th class of each of the four schools concerned. The results are given below, make analysis of variance of data 10M

Schools			
A	B	C	D
8	12	18	13
10	11	12	9
12	9	16	12
8	14	6	16
7	4	8	15

- 2) To study the performance of three detergents and three different water temperatures the following whiteness readings were obtained with specially designed equipment. 10M

Water temperature	Detergent-A	Detergent-B	Detergent-C
Cold water	57	55	67
Warm water	49	52	68
Hot water	54	46	58

Perform a Two-way analysis of variance using 5% I.o.s

(use coding method subtracting 50 from given numbers)

- 3) Kerala traders co.ltd, wishes to test whether its three salesmen A,B,C tend to make sales of the same size or whether they differ in selling ability as measured by the average size of their sales. The following are the weekly sales record of the three salesmen. Perform the analysis of variance and draw conclusions. 10M

A	B	C
300	600	700
400	300	300
300	300	400
500	400	600
0	-	500

4) Perform a Two-way ANOVA on the data given below

10M

Plot of lands	Treatment			
	A	B	C	D
I	38	40	41	39
II	45	42	49	36
III	40	38	42	42

Use coding method subtracting 40 from given numbers

5) To assess the significance of possible variation in performance in a certain test between the convent schools of a city, a common test was given to a number of students taken at random from the senior 5th class of each of the four schools concerned. The results are given below, make analysis of variance of data

10M

Schools			
A	B	C	D
8	12	18	13
10	11	12	9
12	9	16	12
8	14	6	16
7	4	8	15

6) Explain the one-way classification of ANOVA

10M

7) The following data shows the lives of four batches of electric lamps

10M

Batches	Life of bulbs in hours							
	1	1600	1610	1650	1680	1700	1720	1800
2	1580	1640	1640	1700	1750	-	-	-
3	1460	1550	1600	1620	1640	1660	1740	1820
4	1510	1520	1530	1570	1600	1680	-	-

Perform an ANOVA of these data and show that a significance test does not reject their homogeneity.

- 8) To study the performance of three detergents and three different water temperatures the following Whiteness readings were obtained with specially designed equipment. 10M

Water temperature	Detergent-A	Detergent-B	Detergent-C
Cold water	57	55	67
Warm water	49	52	68
Hot water	54	46	58

Perform a Two-way analysis of variance using 5% level of significance.
(use coding method subtracting 50 from given numbers)

- 9) Three different methods of analysis M1, M2, M3 are used to determine in parts per million the amount of a certain constituent in the sample. Each method is used by five analysts, and the results are given in table 10M

Analyst	Method		
	M1	M2	M3
1	7.5	7.0	7.1
2	7.4	7.2	6.7
3	7.3	7.0	6.9
4	7.6	7.2	6.8
5	7.4	7.1	6.9

Do these results indicate a significant variation either between the methods or between the analysts?

10) Write short notes on

A). give the ANOVA table for two way classification 5M

B). uses of ANOVA in different fields. 5M

UNIT-V (CONTROL CHARTS)

- 1) (a). discuss briefly SQC need and utility in industry. 5M
 (b). 20 Tape recorders were examined for quality control test. The number of defects for each tape recorder are given below 2,4,3,1,1,2,5,3,6,7,3,1,4,2,3,1,6,1,1,1. Prepare a C-chart. What conclusion do you draw from it? 5M
- 2) The following data shows the values of sample mean and range for 10 samples for size 6 each. Calculate the central limits for mean chart and R- chart and draw the control charts and comment on the state of control. 10M

Sample no.	1	2	3	4	5	6	7	8	9	10
Mean (\bar{x})	43	49	37	44	45	37	51	46	43	47
Range (R)	5	6	5	7	7	4	8	6	4	6

- 3) (a) Explain variations in Quality. 5M
 (b) Construct \bar{X} chart for the following data 5M

Sample number	1	2	3	4	5	6	7	8
observations	32	28	39	50	42	50	44	22
	36	32	52	42	45	29	52	35
	42	40	28	31	34	21	35	44

Also determine whether the process is in control.

- 4) (a) Write the construction of C- chart. 5M
 (b) Assume that 20 half liter milk bottles are selected at random from a process. The number of air bubbles observed from the bottles is given in the table 5M

Bottle number	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
defects	4	5	7	3	3	5	6	2	4	8	3	5	4	3	4	5	3	7	6	13

Draw the control chart for the above data.

- 5) (a) Write about control charts. 5M

(b) A machine is set to deliver packets of a given weight. 10 samples of size 5 each were recorded

Sample no.	1	2	3	4	5	6	7	8	9	10
Range	7	7	4	9	8	7	12	4	11	5

Draw R-chart and comment on its state of control.

5M

6) (a). 10 pieces of cloths out of different rolls of equal length contained the following number of defects 1,3,5,0,6,0,9,4,4,3. Draw a control chart for the number of defects and state whether the process is in a state of statistical control.

5M

(b). The following figures give the number of defectives in 20 samples containing 2000 items. 425,430,216,341,225,322,280,306,337,305,356,402,216,264,126,409,193,280,326,389.

Calculate the values for central line and the control limits for P-chart.

5M

7) The following data gives readings for 10 samples of size 6 each in the production of a certain component. Draw the control charts for \bar{X} -R. Can one assume that all the samples are from homogeneous lot.

10M

Sample	1	2	3	4	5	6	7	8	9	10
Mean \bar{X}	383	508	505	582	557	337	514	614	707	753
Range	95	128	100	91	68	65	148	28	37	80

(Given for $n = 6$, $A_2 = 0.483$, $D_3 = 0$, $D_4 = 2.004$)

8) The following table gives the inspection data on completed spark plugs

10M

(2000 spark plugs in 20 lots of 100 each)

Lot number	No. of defectives	Fraction defective	Lot number	No. of defectives	Fraction defective
1	5	0.050	11	4	0.040
2	10	0.100	12	7	0.070
3	12	0.120	13	8	0.080
4	8	0.080	14	2	0.020
5	6	0.060	15	3	0.030
6	5	0.050	16	4	0.040
7	6	0.060	17	5	0.050
8	3	0.030	18	8	0.080
9	3	0.030	19	6	0.060
10	5	0.050	20	10	0.100

- 9) The following are mean lengths and ranges of lengths of a finished product from 10 samples each of size 5. Construct \bar{X} and R charts. 10M

Sample	1	2	3	4	5	6	7	8	9	10
Mean \bar{X}	201	198	202	200	203	204	199	196	199	201
Range	5	0	7	3	4	7	2	8	5	6

(Given for $n = 5$, $A_2 = 0.577$, $D_3 = 0$, $D_4 = 2.115$)

- 10) (a) Write the construction of C- chart. 5M

- (b) Assume that 20 half liter milk bottles are selected at random from a process. The number of air bubbles observed from the bottles is given in the table 5M

Bottle number	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
defects	4	5	7	3	3	5	6	2	4	8	3	5	4	3	4	5	3	7	6	13

Draw the control chart for the above data.