**SWARNANDHRA COLLEGE OF ENGINEERING & TECHNOLOGY**

DEPARTMENT OF MASTER OF COMPUTR APPLICATIONS

**I SEMESTER**

SUBJECT: Probability and Statistical Applications Subject Code: 16MC1T04

Regulation: R16

**UNIT-I**

1. What do you mean by random experiment? explain any four types of events
2. Axiomatic definition of probability.
3. State and prove Baye’s theorem
4. State and prove addition theorem for two events.
5. State and prove Total probability theorem
6. If P(A) = $^{1}/\_{2},$ P(B) = $^{1}/\_{3}$ , P ( $A∩B)$ = $^{1}/\_{5}$, then find i) P$\left(A∩B\right) $ii) P($\overbar{A} ∩B) $iii) P($A∩\overbar{B})$
7. Prove if $P{(A}/{B) >P(A)}$ then $P{(B}/{A) >P(B)}$
8. If A and B be events with P(A)=1/3, P(B) =1/4 and P(AUB)=1/2, Find (i)P(A/B) , P(B/A) (iii) P(B/A) (iv) $P\left(A∩B^{c}\right), P\left(A/B^{c}\right)$
9. If P(AUB)=0.65 and P$\left(A∩B\right)=0.15$, then find P($\overbar{A}) $+ P($\overbar{B})$
10. Of three men, the chances that a politician, a business man or an academician will be appointed as a vice-chancellor (V.C) of University are 0.5, 0.3, and 0.2 respectively. Probabilities that research is promoted by these persons if they are appointed as V.C are 0.3, 0.7, 0.8 respectively.

i) Determine the probability that research is promoted

1. A can hit a target 3 times in 5 shots, B 2 times in 5 shots and C three times in 4 shots. All of them fire one shot each simultaneously at the target. What is the probability that (i) 2 shots hit (ii) at least two shots hit?(iii) find the probability of the target being hit when all of them try.
2. In a bolt factory , machine A produce 40% of the output and machine B produces 60% on the average .9 items in 1000 produced by A are defective and 1 item In 250 produced by B is defective .what is the probability that it was produced by A or B
3. A problem in Statistics is given to three students A, B, C whose chances of solving it are ½,3/4,1/4 respectively. What is the probability that the problem will solved for all of them try independently?
4. If two events A and B are independent, show that (i) A’ and B’ are independent, (ii) A’ and B are independent, (iii) A and B’ are independent.
5. A class has 10 boys and 5 girls. Three students are selected at random one after the other. Find the probability that (i) First two are boys and third is girl. (ii) First and third is same sex and second is of opposite sex.

**UNIT-II**

1. In tossing a coin two time .what is the probability of getting one tail.
2. Given the following table:

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
|  X |  -3 |  -2 |  -1 |  0 |  1 |  2 |  3 |
|  P(x) |  0.05 |  0.1  |  0.3 |  0 |  0.3 |  0.15 |  0.1 |

 Compute i) E(X) ii) E (2x$\pm 3)$ iii) E (4x+5) iv) E ($x^{2}$) v) V(X) vi) V (2X $\pm 3)$

1. If random variable has a passion distribution such that p(1)=p(2), find (i) p(4) (ii) mean (iii) variance (iv)p(X≥1) (v)p(1<X<4)
2. Define distribution function and derive its properties.
3. The mean and variance of binomial distribution are 4 and 3 respectively. Find P (X≥1).
4. Calculate expectation and variance of X , if the probability distribution of the random variable X is given by :

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| X | -1 | 0 | 1 | 2 | 3 |
| F | 0.3 | 0.1 | 0.1 | 0.3 | 0.2 |

1. A random variable X has the following probability function .determine expectation

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  X | 4 | 5 | 6 | 8 |
|  P(X) | 0.1 | 0.3 | 0.4 | 0.2 |

1. A random variable X has the following distribution:

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
|  X |  1 |  2 |  3 |  4 |  8 |  9 |
|  P(X) |  K |  3K |  5K |  7K |  9K |  11K |

1. For the discrete probability distribution Determine (i) k (ii) Mean (iii) Variance

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| X |  0 |  1  |  2 |  3 |  4  |  5 |  6 |  7 |
| P(X) |  0 |  k |  2k |  2k |  3k | $$k^{2}$$ |  2$k^{2}$ | 7$k^{2}+k$ |

1. Derive mean , variance and MGF of the binomial distribution and hence find $u\_{1}^{1},u\_{2},u\_{3},u\_{4}$
2. Derive mean, variance and MGF of the poisson distribution and hence find $u\_{1}^{1},u\_{2},u\_{3},u\_{4}$
3. If X represents the outcome, when a fair die is thrown. Find the M.G.F of X and hence find $E\left(X\right)$ and V$\left(X\right)$
4. Six dice are thrown 729 times .how many times do you expect at least three dice to show 5 or 6.
5. In 256 sets of 12 tosses of a coin, in how many cases one can expect 8 heads and 4 tails?
6. The average number of phone calls / minute coming into a switch board between 2 pm and 4 pm is 2.5. determine the probability that during one particular minute , there will be (i) 4 or fewer

(ii) More than 6 calls

**UNIT-III**

1. Define Exponential distribution and find its mean and variance
2. Find the mean and standard deviation (S,D) of normal distribution in which 7%of items are under 35 and 89% are under 63
3. If X is a normal variate, find the probability
4. to the left of Z =$ - 1.78$
5. to the right of Z = $- 1.45$
6. corresponds to $-0.80 \leq Z \leq 1.53$
7. to the left of Z = $- 2.52 and to right ofZ=1.8$
8. Prove that mean = mode =median for a normal distribution.
9. If the probability density of a random variable is given by f(x) = $\left\{\begin{array}{c}k(1-x^{2}),0\leq x\leq 1\\0.elsewhere\end{array}\right.$

Find (i) k (ii) the distribution function of the random variable.

1. Let X be a continuous random variable with p.d.f given by $\left\{\begin{array}{c}kx ,0\leq x\leq 1\\k , 1\leq x\leq 2\\-kx+3k ,2\leq x\leq 3 \\0 ,otherwise \end{array}\right.$

Determine the value k

1. The diameter of an electric cable say X is aassumed to be continuous random variable with p.d.f f(x)=6x(1-X),$0\leq x\leq 1$ (i)check that f(x) is a p.d.f (ii)determine a number b such that p(x<b)=p(X>b).
2. For the continuous probability function(x)=kx2e-x ,x$\geq 0$ find (i)k (ii) mean (iii)variance
3. In a normal distribution 7% of the items are under 35 and 89% of the items are under 63. What are the mean and standard deviation of the distribution?
4. A random variable X has the density function f(x) = $\left\{\begin{array}{c}\frac{k}{(1+x^{2})},-\infty <x<\infty \\0.otherwise\end{array}\right.$

Determine k and the distribution function

1. The mean yield for one acre plot is 662 kg with a standard deviation of 32 kg . Assuming normal distribution , how many one-acre plots in a batch of 1000 plots would be expect to have yield (i) Over 700 kg (ii) below 650 kg (iii) what is the lowest yield of the best plots?

**UNIT-IV**

1. A population consists of five numbers 2,3,6,8 and 11. Consider all possible samples of size two which can be drawn with replacement from this population. Find i) The mean of the population ii) The standard deviation of the population iii) The mean of the sampling distribution of means iv) The standard deviation of the sampling distribution of means
2. If population is 3, 6, 9, 25, 27. i) List all possible samples of size 3 which can be taken without replacement from the finite population. ii) Calculate the mean of the sampling distribution of means iii) Find the standard deviation of the sampling distribution of means.
3. A population consists of five numbers 1, 2, 3, 4, 5. Consider all possible samples of size two which can be drawn (a) with replacement (b) without replacement from this population. Find i) The mean of the population ii) The standard deviation of the population iii) The mean of the sampling distribution of means iv) The standard deviation of the sampling distribution of means
4. A population consists of four numbers 3, 7, 11, 15. Consider all possible samples of size two which can be drawn (a) with replacement (b) without replacement from this population. Find i) The mean of the population ii) The standard deviation of the population iii) The mean of the sampling distribution of means iv) The standard deviation of the sampling distribution of means.
5. Distinguish between point estimation and interval estimation.(or)

Explain about point estimation and interval estimation.

1. A random sample of size 81 was taken whose variance is 20.25 and mean is 32 construct 95% confidence interval.

7) Find the degree of confident to assert that the average salary of a school teacher is between Rs.272 and Rs.302 if a sample of 100 such teachers revealed a mean salary of Rs.287 with a standard deviation of Rs.48

8**)** If the standard deviation of a sample is 20 and the maximum error with 99% confidence is 1.72. how large the sample might be?

9) A random sample of size 81 was taken whose variance is 20.25 and mean 32. Construct 98% confidence interval.

10**)**The mean and s.d are 10785 and12585.What can one conclude at 95%confidence about the maximum error if n=55

11)Define estimation and explain varies types of estimations.

12**)**Find 95% confidence limits for the mean of normally distributed population from which the following sample was taken 15,17,10,18,16,09,07,11,14.

13**)**The mean and standard deviation of a population are 11795 and 14054 respectively then n=50,find 95% confidence limits.

14) A sample of 11 rates from a central population had an average blood viscosity of 3.92 with a s.d of 0.61.Estimate the 95% confidence limits for mean blood viscosity of the population.

**UNIT V**

1. a) An ambulance service claims that it takes on average less than 10 minutes to reach its destination in emergency calls. A sample of 36 calls has a mean of 11minutes and the variance of 16 minutes. Test at 0.05 level of significance.

b) Write about (i)Type-I and Type-II errors (ii) Level of significance

 (iii)One tailed and two tailed tests

1. a) Samples of students were drawn from two universities and from their weights in kg and standard deviations are calculated. Make a large sample test to test the significance of the difference between the means at 5%

|  |  |  |  |
| --- | --- | --- | --- |
|  | Mean | S.D | Size of the sample |
| University A | 55 | 10 | 400 |
| University B | 57 | 15 | 100 |

b) A die is thrown 9000 times and a throw of 3 or 4 is observed 3240 times. Test whether the die is unbiased or not?

1. The Blood pressure of 5 women before and after intake of a certain drug are given below

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  Before |  110 |  120 |  125 |  132 |  125 |
| After |  120 |  118 |  125  |  136 |  121 |

Test whether there is a significance change in blood pressure at 1% level of significance.

1. a) If 57 out of 150 patients suffering with certain disease is cured by allopathic medicine and 33 out of 100 patients with same disease are cured by homeopathy medicine. Is there any reason to believe that allopathic is better than homeopathy medicine at 0.05 level of significance.

 b) The lifetime of electric bulbs for a random sample of 10 from a large shipment gave the following data

|  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Item  | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |  |
| Life in 1000s of hrs | 4.2 | 4.6 | 3.9 | 4.1 | 5.2 | 3.8 | 3.9 | 4.3 | 4.4 | 5.6 |  |

Can we accept the hypothesis that the average life time of the bulb is 4000 hrs? Use a 0.05 level of significance

1. a) A large Electronic firm that hires many workers with disabilities wants to determine whether their disabilities affect such works performance. Use the level of significance of α=0.05 to decide on the basis of the following data, whether it is reasonable to maintain that the disabilities have no affect on the works performance.

|  |  |  |  |
| --- | --- | --- | --- |
|  | Above average | Average | Below average |
| Blind | 21 | 64 | 17 |
| Deaf | 16 | 49 | 14 |
| No disability | 29 | 93 | 28 |

 b) Can we conclude that the two population variances are equal for the following data of post graduates passed out from a **state** and **private** university.

 State : 8350 8260 8130 8340 8070 -

Private : 7890 8140 7900 7950 7840 7920

1. a) What is chi-square test of goodness of fit?

b) The number of automobile accidents per week in a certain community is as follows:12, 8, 20, 2,14, 10, 15,6, 9, 4. Are these frequencies in agreement with the belief that accident conditions were the same during this 10 week period.(Use chi-square test).

1. a) A random sample of 100 recorded deaths in a country showed an average life span of 71.8 years. Assuming a population standard deviation of 8.9 years ,does this seem to indicate that the mean life span today is greater than 70 years?Use0.05 level of significance

b)Of the two sales men X claims that he has made sales than Y. For the accounts examined, which were comparable for the two salesmen, the following results were obtained.

|  |  |  |
| --- | --- | --- |
|  | X | Y |
| Number of sales | 10 | 17 |
| Average size of sales | Rs.6200 | Rs.5600 |
| Standard Deviation of sales | Rs.690 | Rs.600 |

Do these two average size of sales differ significantly (5%level of significance)

1. a) A sample poll of 300 voters from district A and 200 voters from district B showed that 56% and 48%, respectively, were in favor of a given candidate .At a level of significance of 0.05, test the hypothesis that there is a difference the districts.

b) Two random samples gave the following results

|  |  |  |  |
| --- | --- | --- | --- |
| sample | size | Sample mean | Sum of squares of deviation from the mean |
| I | 10 | 15 | 90 |
| II | 12 | 14 | 108 |

 Test whether the samples could have come from the same normal population using F-test

1. In an investigation on the machine performance, the following results are obtained

|  |  |  |
| --- | --- | --- |
|  | No.of units inspected | No.of units defected |
| Machine-1 | 375 | 17 |
| Machine-2 | 450 | 22 |

Test whether there is any significant performance of two machines at α=0.05