

3rd Semester Examination-2019
Stream-IMCA
Subject-PROBABILITY STATISTICS

Time-3 hours

Full Marks-70

Answer all the questions

1. (a) Show that If A and B are two independent events then A^c and B^c are also independent.
- (b) Show that If $Y=a+bX$ where X and Y are two random variables then $\rho_{x,y} = 1$ when $b>0$ and $\rho_{x,y} = -1$ when $b<0$. [7×2]

OR

- (c) State and prove Baye's theorems
- (d) If one card is lost from the pack of 52 cards the find the probabilities of drawing two hearts from the rest of the cards .

2. (a) Show that $\int_{-\infty}^{\infty} f(x)dx = 1$ where $f(x) = \frac{e^{\left(\frac{-1}{2}\left(\frac{x-\mu}{\sigma}\right)\right)^2}}{\sigma\sqrt{2\pi}}$ [7×2]

- (b) Find $E(g(X))$ if the weekly demand of a drink , in thousand liters, at a chain of convenience stores is continuous random variable with $g(X)=X^2+X-2$, and

$$f(x) = \begin{cases} 2(x-1), & 1 < x < 2 \\ 0, & \text{otherwise} \end{cases}$$

OR

- (c) Show that for a continuous random variable X $\sigma^2 = E(X^2) - (E(X))^2$.
- (d) State and prove Chebyshev inequality
3. (a) Show that mean and variance of Poisson Distributions are same then Find the point of maxima/mode in case of Normal Distribution [7×2]
- (b) Show that Poisson Distributions is a special case of Binomial Distribution, then find variance for normal distribution

OR

- (c) Find the probability of getting at least 3 heads by tossing a coin for 20 times ?
- (d) If probability of service time is expected to be 0.65, In ticket counter 3 person can get service and rest has to wait the find the probability of waiting time?
4. (a) A machine is producing medical Instruments it is assumed that standard deviations of length is 10 cm a sample of 1000 is considered and it's mean found out to be 100 find a 99% confidence interval for population mean . [7×2]
- (b) A sample 100 bulbs from company-1 has average life 1500hrs and standard deviations 100hrs similarly a sample of 100 bulbs from company-2 has average life of 1200 hrs standard deviations 110 hrs .Find 95% confidence limits on the difference of average life times of the populations of bulbs produce by two companies. $z_{\alpha/2} = \pm 1.96$

OR

- (c) Discuss t-test for single sample mean estimations and explain how it is different from Normal Distribution.
- (d) The manufacturer of a certain maker of LED bulbs has mean life of 20 months random testing of 7 bulbs gave the following values 19,21,25,16,17,14,21 can you regard the manufacturer's claims for 1% degree of significance $t(0.01,6)=3.707$.
5. (a) A random sample of size 15 has 50 as mean, sum of the squares of deviations taken from the mean is 130. Can this sample be regarded as taken from the population has 53 as mean then obtain a 95% and 99% confidence interval for the mean with $t(0.01,14)=2.277, t(0.05,14)=2.145$. [7×2]
- (b) Explain χ^2 -test for goodness of fit.

OR

- (c) A dice is roll for 20 times and the outcomes are recorded given in the following tables With $(\chi_{0.05}^2, 5)=11.7$ test whether the dice is fair or not

Dice face	1	2	3	4	5	6
f_0	30	25	18	10	22	15

(d) Explain contingency table for χ^2 -test , Then verify significance of the question local option selling of liquor depends upon individual drinks with $(\chi_{0.05}^2, 1) = 3.841$

With two question survey?

(1) Do you drink?

(2) Are you in favor of local option on sale of liquor ?are tabulated below

	YES	NO	TOTAL;
YES	56	31	80
NOI	18	6	24
TOTAL	74	37	111