[25101]
SPECIAL DRIVE - DECEMBER - 2022
M.C.A. DEGREE EXAMINATIONS
SECOND SEMESTER
Paper - I : PROBABILITY, STATISTICS AND QUEUING THEORY
(2016-17 and 2017-18 Admitted Batches)

Time : 3 Hours **Maximum Marks: 75**

SECTION - A

Answer ALL questions. **(4×15=60)**

1. a) From vessel containing 3 white and 5 black balls, 4 balls are transferred into an empty vessel. From this vessel a ball is drawn and is found to be white . What is the probability that out of four balls transferred 3 are white and 1 is black.

b) If X is continuous write random variable with probability density function.

$$f(x)=\begin{cases}\frac{Sin\ x}{2} & for\ 0\le x\le\pi\\ 0 & elsewhere\end{cases}$$

Find the mean, mode median of the distribution.

(OR)

c) If A and B are two events and the probability $P(B)\neq 1$, Prove that $p\left(A|\overline{B}\right)=\frac{\left[p(A)-p(A\cap B)\right]}{1-P(B)}$ and hence deduce that $p(A\cap B)\geq p(A)+p(B)-1$.

d) Let X be a continuous random variable having probability density function.

$$f(x)=\begin{cases}2e^{-2x} & for\ x>0\\ 0 & elsewhere\end{cases}$$

Find Moment Generating Function and obtain E(x) and E(x^2) by differentiating the Moment Generating Function.

2. a) Derive mean and variance of binomial distribution.

b) Let X be normally distributed with mean $\mu = 10$ and standard deviation $\sigma = 2$. Find

i) $P(9 < X < 13)$ ii) $P(X<12)$ iii) $P(X>12)$ and $P(X<10)$

(OR)

c) Briefly explain about t-test, F-test and χ^2 -tests.

d) Calculate the coefficient of correlation and the two lines of regression for the following data.

Price (X)	:	14	16	17	18	19	20	21	22	23
Demand (Y)	:	84	78	70	75	66	67	62	58	60

3. a) A die was thrown 9000 times and of these 3220 yielded a 3 or 4. Is this consistent with the hypothesis that the die was unbiased?

b) Explain most important desirable properties of good estimate.

(OR)

c) Let p be the probability that a coin will fall head in a single toss in order to test H_0:p=½ against H_1:p= ¾. The coin is tossed 5 times and H_0 is rejected if more than 3 heads are obtained. Find the probability of type-I error and power of the test.

d) Write about formulations of Null hypothesis.

4. a) To compare two kinds of bumper guards, 6 of each kind were mounted on a car and then the car has run into a concrete wall. The following are the costs of repairs:

Guard 1	107	148	123	165	102	119
Guard 2	134	115	112	151	133	129

Use the 0.01 level of significance to test whether the difference between two sample means is significant.

b) Explain (M/M): (FCFS) queuing model and find the expected line length E(Ls).

(OR)

c) In a given $M / M / 1$ queue, the arrival rate $\lambda = 7$ customers/hour and service rate h=10 customer/hour. Find $P(X \geq 5)$, where X is the number of customers in the system.

d) Explain Kendall's notation of a queuing system.

SECTION - B

Answer any FIVE questions. **(5×3=15)**

5. a) If $P(A)=\frac{7}{3}$, $P(B)=\frac{9}{13}$ and $P(A \cap B)=\frac{4}{13}$, find $P\left(\frac{A}{B}\right)$.

b) State Bayesian rule for conditional probability.

c) A continuous random variable X has $a.d.f.f(x)=3x^2$, $0 \leq x \leq 1$. Find 'a' such that $p(X \leq a)= p(X > a)$

d) The mean and variance of binomial distribution are 4 and 3 respectively. Find $p(x \geq 1)$.

e) What is Unbiased estimator.

f) What are the advantages Multiple regression?

g) Write the characteristics of queuing theory.

h) Define M/M/2 queueing model.

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