(6 pages)

S.No. 7248 **P 20 MCAE 4**

(For candidates admitted from 2020-2021 onwards)

M.C.A. DEGREE EXAMINATION, NOVEMBER 2023.

Computer Applications — Elective

PROBABILITY AND STATISTICS

Time : Three hours Maximum : 75 marks

PART A — (10 × 2 = 20)

Answer ALL questions.

1. State Baye's theorem on probability.

2. Define discrete random variable.

3. Final the M.G.F. of a Bionomial distribution.

4. Find λ, if X follows poisson distribution such that $P(X = 2) = 3P(X = 3)$.

5. What are the types of correlation?

6. State the applications of chi-square test.

7. Mention the various steps involved in testing of hypothesis.

8. The variance of a population is 2. The size of sample collected from the population is 169. What is the standard error of mean?

9. What do the letters in the symbolic representation $(a \mid b \mid c) : (d \mid c)$ of a queueing model represents?

10. State various discipline in queuing model.

PART B — (5 × 5 = 25)

Answer ALL questions, choosing either (a) or (b) in each.

11. (a) A bag contains 10 white ball 6 red balls, 4 black balls, 7 blue balls, 5 balls drawn at random, what is the probability that two of them are red and 1 is black.

Or

(b) Let $P(X = x) = \left(\frac{3}{4}\right)\left(\frac{1}{4}\right)^{x-1}$, $x = 1, 2, 3, \ldots$ be the probability mass function of the R.V. X, compute

(i) $P(X > 4)$

(ii) $P(X > 4 \mid X > 2)$

(iii) $E(X)$

(iv) $\text{var}(X)$

12. (a) In a large consignment of electric bulbs 10 percent are defective. A random sample of 20 is taken for inspection. Find the probability that (i) are good bulbs (ii) atmost there are 3 defective bulbs and (iii) exactly there are 3 defective bulbs.

Or

(b) If X has a uniform distribution in [0, 1], find the distribution of $Y = -2 \log X$.

13. (a) The two regression lines are $4x - 5y + 33 = 0$ and $20x - 9y = 107$ and various of $x = 25$. Find

(i) the means of $\underline{x}$ and y

(ii) the value of r

(iii) σ_y

Or

(b) Determine the regression equation which best fit to the following data.

x	10	12	13	16	17	20	25
y	10	22	24	27	29	33	37

14. (a) Determine a 95% confidence interval for the mean of normal distribution with variance 0.25, using a sample of size 100 values with mean 212.3.

Or

(b) Before an increase in excise duty on tee, 800 people out of a sample of 1000 were consumers of tee. After the increase in duty, 800 people were consumers of tee in a sample of 1200 persons. Find whether there is significant decrease in the consumption of tee after the increase in duty.

15. (a) A duplicating machine maintained for office use is operated by an office assistant who earn Rs. 5/hr. The time to complete each job varies according to an exponential distribution with mean 6 min. Assume a poisson input with an average arrival rate of 5 jobs/hr. If an 8-h day is used as a base determine.

(i) the percentage idle time of machine

(ii) the average time a job in the system and

(iii) the average earning per day of the assistant.

Or

(b) A TV repairmen finds that the time spent on his jobs has an exponential distribution with mean 30 minutes. If he repairs sets in the order in which they came in, and if the arrival of sets is approximately poisson with an average rate of 10 per 8-hour day.

(i) What is the repairman's expected idle time in each day?

(ii) How many jobs and ahead of average set just brought in?

PART C — (3 × 10 = 30)

Answer any THREE questions.

16. A continuous random variable has the probability density function $f(x) = \begin{cases} kxe^{-\lambda x}, & for\ x \geq 0,\ \lambda > 0 \\ 0 & , otherwise \end{cases}$

Determine

(a) k

(b) mean

(c) variance

17. A taxi cab company has 12 Ambassadors and 8 fiats. If 5 of these taxi cabs are in the workshop for repairs and are ambassador is as likely to be in for repairs as a fiat, what is the probability that

(a) 3 of them are ambassadors and 2 are fiats,

(b) atleast 3 of them are ambassadors and

(c) all the 5 are of the same make?

18. Determine the regression equation which best fit of the following data.

x	10	12	13	16	17	20	25
y	10	22	24	27	29	33	37

19. If the population is 3, 6, 9, 15, 27

(a) List all possible sample of size 3 that can be taken without replacement from finite population.

(b) Calculate the mean of each of the sampling distributions of means.

(c) Find the standard deviation of sampling distributions of means.

20. A petrol pump station has 2 pumps. The service times follows the exponential distribution with a mean of 4 minutes and cars arrive for service in a poisson process at the rate of 10 cars per hour. Find the probability that a customer has to want for service. What proportion of time the pumps remain idle?

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