

8. Write short notes on the following.

- (a) Sampling distribution
 - (b) Test for independence.
 - (c) Joint probability distribution.
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25/10/21

[51227]

III M.C.A. DEGREE EXAMINATION.

Second Semester

PROBABILITY, STATISTICS AND QUEUING THEORY

(Effective from the admitted batch of 2016-2017)

Time : Three hours

Maximum : 70 marks

First Question is compulsory.

Answer any FOUR from the remaining and all questions carry equal marks.

Answer all parts of any question at one place.

1. Answer the following :

- (a) Conditional probability.
- (b) Probability density function.
- (c) Standard error.
- (d) Moment generating function.
- (e) Geometric probability.
- (f) Calling population in queue.
- (g) What is the significance of Regression coefficient?

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2. (a) State and prove Baye's theorem.
- (b) If A and B be events with $P(A) = 1/2$, $P(B) = 1/3$ and $P(A \text{ intersection } B) = 1/4$. Find (i) $P(A/B)$ (ii) $P(B/A)$ (iii) $P(A \cup B)$ (iv) $P(\bar{A}/\bar{B})$.
3. (a) Derive the moment generating function of a binomial distribution. Also derive the moments from the moment generating functions.
- (b) In a distribution, exactly normal 7% of the items are under 35 and 89% are under 63. What are the mean and standard deviations of the classifications?
4. (a) If X has an exponential distribution with mean 2, find $P[X < 1 / X < 2]$.
- (b) If X follows an exponential distribution with parameter 1, find the distribution of $Y = X/(1 + X)$.
5. (a) Find the maximum likelihood estimator for random sampling from a normal population for population mean when the population variance is unknown.

- (b) Find the correlation coefficient for the following data

X:	1	2	3	4	5	6	7	8	9	10
Y:	10	12	16	28	25	36	41	49	40	50

6. (a) The mean life of sample of 10 electric bulbs was found to be 1,456 hours with standard deviation of 423 hours. A second sample of 17 bulbs chosen from a different batch showed a mean life of 1280 hours with standard deviation of 398 hours. Is there a significant difference between the means of the two batches?
- (b) Derive the waiting time distribution in the queue for M/M/1 model.
7. (a) A die was thrown 500 times and six resulted 100 times. Do the data justify the hypothesis of an unbiased die?
- (b) At a one man barbour shop, customer arrive according to the Poisson distribution with a mean arrival rate of 4 per hour and his hair cutting time was exponentially distributed with an average hair cut taking 12 minutes. There is no restriction in queue length. Calculate the following
- (i) Fluctuations of he queue length.
- (ii) Probability that there is at least 5 customers in the system.

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I/II M.C.A. DEGREE EXAMINATION.

Second Semester

**PROBABILITY, STATISTICS AND QUEUEING
THEORY**

(Effective from the admitted batch of 2013–2014)

Time : Three hours

Maximum : 70 marks

First question is compulsory.

**Answer any FOUR from the remaining and
All questions carry equal marks.**

Answer all parts of any question at one place.

1. (a) Define conditional probability of an event.
State the multiplication theorem of Probability.
- (b) State the exponential distribution. What do you mean by memory loss property of this distribution?
- (c) Distinguish between correlation and regression.

(b) Fit a Poisson distribution for the following distribution and hence find the expected frequencies :

x	0	1	2	3	4	5	6
f	314	335	204	86	29	9	3

5. (a) The two lines of regression based on 100 items were calculated as $20X - 9Y - 106 = 0$ and $4X - 5Y + 30 = 0$.

Determine :

- (i) the coefficient of correlation
 (ii) the standard errors of the estimates of Y and X , given that the standard deviation of X is 3.

(b) The following data is collected on two characters. Based on this test whether there is any relation between literacy and smoking at 5% LOS.

Characters	Smokers	Non-Smokers
Literates	83	57
Illiterates	45	68

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6. (a) Construct and obtain the 95% confidence limits for the proportion of successes in binomial population.

(b) A random sample of 100 days data on the average number of fatal accidents per day revealed the following data. Assuming the data to be normally distributed, find a point estimate of the mean number of a accidents per day

Number of accidents	0	1	2	3	4	5
No. of days	8	21	30	20	15	6

7. (a) A certain stimulus administered to each of the 12 patients resulted in the following increase of blood pressure 5, 2, 8, -1, 3, 0, -2, 1, 5, 0, 4, 6. Can it be concluded that the stimulus will in general be accompanied by an increase in blood pressure?

(b) A random sample of 1000 workers from South India shows that their mean wages are Rs.470 per day with a S.D. of Rs.28. A random sample of 1500 workers from North India shows a mean wage of Rs.490 per day with a S.D. of Rs.40. Is there any significant difference between the mean level of wages of the two groups of workers? (Test at 5% LOS).

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- (d) What is meant by Sampling distribution of Define Standard error.
- (e) Define Null hypothesis and alternative hypothesis. State the relation between type I value and LOS
- (f) State the F-distribution and its properties.
- (g) Distinguish between transient state and steady state queuing system. Give an example.
2. (a) A problem is given to three students whose chances of solving it are $\frac{1}{2}$, $\frac{1}{4}$ and $\frac{1}{8}$. Find the probability that
- only one of them solves the problem.
 - the problem is solved.
- (b) The probability that a doctor A will be cured of disease X correctly is 60%. The probability that a patient will die by his treatment when correct diagnosis is 40% and the probability of death by wrong diagnosis is 70%. A patient of doctor A who had disease X died. What is the probability that his disease was diagnosed correctly.

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3. (a) The joint p.d.f. of the random variable (X, Y) is given by $f(x, y) = K(x^3y + xy^3)$, $0 \leq x \leq 2$, $0 \leq y \leq 2$. Find :
- the value of k
 - marginal densities and conditional densities of X and Y .
- (b) From an urn containing 3 red and 2 black balls, a man is to draw 2 balls at random without replacement. If he is promised Rs.20 for each red ball he draws and Rs.10 for each black ball he draws, find his expectation.
4. (a) The marks obtained by the students in Mathematics, Physics and Chemistry in an examination are normally distributed with means 52, 50 and 48 and with standard deviations 10, 8 and 6 respectively. Find the probability that a student selected at random has secured a total of :
- 180 or above
 - 135 or less.

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8. A Super market has two girls attending to sales at the counters. If the service time to each customer is exponential with mean 4 minutes and if people arrive in Poisson fashion at the rate of 10 per hour :
- (a) What is the probability that a customer has to wait for service?
 - (b) What is the expected percentage of idle time for each girl?
 - (c) If the customer has to wait in the queue, what is the expected length of his waiting time?
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