

I.M.C.A. SEM-VIII (2014 COURSE) CBCS : SUMMER - 2018
SUBJECT: PROBABILITY AND SIMULATION

Day : **Thursday**
Date : **03/05/2018**

Time: **10.00 AM TO 01.00 PM**
Max. Marks: **100**

S-2018-1780

N.B.:

- 1) Attempt any **FOUR** questions from Section-I and any **TWO** questions from Section-II.
- 2) Both the sections should be written in **SEPARATE** answer books.
- 3) Figures to the **RIGHT** indicate full marks.
- 4) Use of non-programmable calculator is **ALLOWED**.

SECTION-I

Q1 Explain the following terms with suitable examples. **(15)**
i) Independent and dependent events.
ii) Sample space.
iii) Probability.
iv) Mutually exclusive events.
v) Simple and compound events.

Q2 Probability that a man will be alive 25 years is 0.3 and the probability that his wife will be alive 25 years is 0.4. Find the probability that in 25 years, **(15)**
i) Both will be alive
ii) Only the man will be alive
iii) At least one of them will be alive.

Q3 a) Explain the Baye's theorem in brief. **(07)**
b) A product is manufactured by a company for which it has three machines A, B and C. Machine A produces 60%, Machine B produces 30% and Machine C produces 10% of total production. Past experience shows that Machine A produces 2% defectives, Machine B produces 3% defectives and Machine C produces 4% defectives. At the end of a day from total production 1 unit of production is selected at random and is found to be defective. What is the chance that, **(08)**
i) It is defective.
ii) If it is defective, it is of Black shade.

Q4 Find $E(X)$ and $V(X)$ for the following probability distribution of X. **(15)**

X	8	12	16	20	24
P(X)	1/8	1/6	3/8	1/4	1/12

Q5 a) What is Queuing System? Explain single channel queuing system in brief. **(07)**
b) A self-service store employs one cashier at its counter. Nine customers arrive on an average every 5 minutes, while the cashier can serve 10 customers in 5 minutes. Assuming the Poisson distribution for arrival rate and exponential distribution for service rate find. **(08)**
i) Average number of customers in the system.
ii) Average time a customer spends in the system.

P. T. O.

- Q6** In a certain factory it was found that the variance of the number of absentees is 4 workers per shift. Find the probability that on a given shift (15)
- i) At least two workers will be absent
 - ii) Exactly two workers will be absent
 - iii) Not more than two workers will be absent. Use Poisson distribution (Given: $e^{-4} = 0.0183$)

- Q7** Write short notes on Any **THREE** of the following. (15)
- i) Central Limit Theorem
 - ii) F- distribution
 - iii) Probability Mass Function
 - iv) Negative Binomial Distribution
 - v) Queue Properties

SECTION II

- Q8** A sample of 500 dry battery cells tested for finding the length of life of a battery. The following results are obtained. (20)
- Mean life of battery $\bar{X} = 12$ hours, $\sigma = 3$ hours.
- Assuming data to be normally distributed. What percentage of battery cells are expected have life,
- i) Less than 6 hours
 - ii) Between 10 and 14 hours
 - iii) Less than 10 hours

- Q9** For a single channel queuing model the data about the inter-arrival time of the workers at tool- crib for collecting the tools and the service time required by the attendant at the tool- crib is as follows. (20)

Inter arrival time		Service time	
Time(minutes)	Frequency	Time(minutes)	Frequency
2	10	1	4
4	6	2	12
6	2	3	10
8	2	4	8
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Simulate the queue for the next 5 arrivals and compute the following.

- i) Percentage of time the attendant is idle.
- ii) Average waiting time for the workers.

Use the following random numbers.

10, 21, 56, 74, 47 for Inter-arrival time.

65, 59, 02, 71, 26 for the Service time.

- Q10** Three cards drawn at the random from a pack of 52 cards. Find the probability that three cards drawn contain. (20)
- i) All three face cards.
 - ii) Two Kings and One ace.
 - iii) At least two red cards.
 - iv) At least two spade cards.

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