

Reg.No.:



VIVEKANANDHA COLLEGE OF ENGINEERING FOR WOMEN
[AUTONOMOUS INSTITUTION AFFILIATED TO ANNA UNIVERSITY, CHENNAI]
Elayampalayam – 637 205, Tiruchengode, Namakkal Dt., Tamil Nadu.

Question Paper Code: 2001

B.E. / B.Tech./ .DEGREE END-SEMESTER EXAMINATIONS – MAY / JUNE 2024

Fifth Semester

Computer Science and Technology

U19MA509 – PROBABILITY, QUEUEING THEORY AND GAME THEORY

(Regulation 2019)

Time : Three Hours

Maximum : 100 Marks

Answer ALL the questions

Knowledge Levels (KL)	K1 – Remembering	K3 – Applying	K5 - Evaluating
	K2 – Understanding	K4 – Analyzing	K6 - Creating

Statistical Table is permitted.

PART – A

(10 x 2 = 20 Marks)

Q.No.	Questions	Marks	KL	CO
1.	From a bag containing 10 black and 12 white balls, a ball is drawn at random. What is the probability that it is black?	2	K2	CO1
2.	Define conditional Probability.	2	K1	CO1
3.	State the properties of normal distribution.	2	K1	CO2
4.	In a binomial distribution mean and variance is 4 and 3. Find n, p & q.	2	K2	CO2
5.	Define steady state and transient state in Queueing theory.	2	K1	CO3
6.	What is the probability that a customer has to wait more than 15 minutes to get his service completed in a M/M/1 queueing system, if $\lambda = 6$ per hour and $\mu = 10$ per hour?	2	K2	CO3
7.	Explain the term : Total and Free floats	2	K1	CO4
8.	Define Optimistic, Most likely and Pessimistic time estimates	2	K1	CO4
9.	Solve the following game $\begin{bmatrix} 1 & 2 \\ 2 & 4 \end{bmatrix}$	2	K3	CO5
10.	Define Dominance property.	2	K1	CO5

PART – B

(5 x 16 = 80 Marks)

Q.No.	Questions	Marks	KL	CO
11. a)	i. From a well shuffled deck of 52 playing cards, 4 cards are selected at random. Find the probability that the selected cards are a) 3 spades and 1 heart b) 2 kings, 1 ace and 1 queen c) All are diamonds d) there is one card of each suit.	8	K3	CO1
	ii. State and Prove Baye's Theorem.	8	K4	
	(OR)			
b)	i. Let A and B be boxes that contain 5 black, 6 white, 8 black, 4 white balls respectively. Two balls are transferred from B to A and then a ball is drawn from A. a. What is the probability that this ball is white? b. Given that the ball drawn is white, what is the probability that atleast one white ball was transferred to A?	8	K3	CO1
	ii. Of three persons the chances that a politician, a businessman, or an academician would be appointed the vice chancellor of a university are 0.5, 0.3, 0.2 respectively. Probabilities that research is promoted by these persons if they are appointed as VC are 0.3, 0.7, 0.8 respectively. a. Determine the Probability that research is promoted b. If the research is promoted, what is the Probability that the VC is an academician?	8	K3	
12. a)	i. Find mgf, mean and variance of Poisson distribution.	8	K3	CO2
	ii. The time in hours required to repair a machine is exponentially distributed with perimeter $\lambda = \frac{1}{2}$. 1. What is probability that the repair time exceeds 2 hours, 2. What is the conditional probability that a repair takes at least 10 hours given that its duration exceeds 9 hours.	8	K5	
	(OR)			
b)	i. Establish the memory less property of exponential distribution.	8	K3	CO2
	ii. Suppose that a trainee soldier shoots a target in an independent fashion. If the probability that the target is shot on any one shot is 0.8. (i) What is the probability that the target would be hit on 6 th attempt? (ii) What is the probability that it takes him less than 5 shots? (iii) What is the probability that it takes him an even number of shots?	8	K3	

13. a) i. There are 3 typists in an office. Each typist can type an average of 6 letters per hour. If letters arrive for being typed at the rate of 15 letters per hour, 8 K3 CO3
1. What fraction of the time all the typists will be busy?
 2. What is the average number of letters waiting to be typed?
 3. What is the average time a letter has to spend for waiting and for being typed?
- ii. If people arrive to purchase cinema tickets at the average rate of 6 per minute, it takes an average of 7.5 seconds to purchase a ticket. If a person arrives 2 min before the picture starts and it takes exactly 1.5 min to reach the correct seat after purchasing the ticket, 8 K3
1. Can he expect to be seated for the start of the picture?
 2. What is the probability that he will be seated for the start of the picture?

(OR)

- b) A tax – consulting firm has 3 counters in its office to receive people who have problems concerning their income, wealth and sales taxes. On the averages 48 persons arrive in an 8 hour day. Each Tax advisor spends 15 minutes on the average on an arrival. If the arrivals are Poisson distributed and service times are according to exponential distribution , find 16 K3 CO3
- i. Average number of customers in the system.
 - ii. Average number of customers waiting to be serviced.
 - iii. Average time a customer spends in the system.
 - iv. Average waiting time for a customer in the queue.
 - v. The number of hours each week a tax advisor spends performing his job.
 - vi. The expected number of idle tax advisors at any specified time.
 - vii. The probability that a customer has to wait before he gets service.
14. a) A project schedule has the following characteristics.

Activity	1-2	1-3	2-4	3-4	3-5	4-9
Time(days)	4	1	1	1	6	5

5-6	5-7	6-8	7-8	8-10	9-10
4	8	1	2	5	7

From the above information,

1. Construct a network diagram.
2. Compute the earliest event time and latest event time.
3. Determine the critical path and total project duration.
4. Compute total and free float for each activity.

(OR)

- b) A small project is composed of seven activities, whose time estimates are listed in the table as follows:

16 K3 CO4

Activity		1-2	1-3	2-4	2-5	3-5	4-6	5-6
Estimated duration (weeks)	a	1	1	2	1	2	2	3
	m	1	4	2	1	5	5	6
	b	7	7	8	1	14	8	15

1. Draw the project network.
2. Find the expected duration and variance of each activity.
3. Calculate the earliest and latest occurrence for each event and the expected project length.
4. Calculate the variance and standard deviation of project length.
5. What is the probability that the project will be completed,
 - a. 4 weeks earlier than expected
 - b. Not more than 4 weeks later than expected?
 - c. If the project's due date is 19 weeks, what is the probability of meeting the due date?

15. a) i. solve the following 2X4 game by graphically

10 K4 CO5

	Player B			
	1	0	4	-1
Player A	-1	1	-2	5

- ii. In a game of matching coins with two players, suppose A wins one unit of value, when there are two heads. Wins nothing when there are two tails and loses half unit of value when there are one head and one tail. Construct the pay-off matrix, the best strategies for each player and the value of the game to A.

6 K3

Player A		A1	A2	A3	A4	A5
Player B	B1	1	5	-7	-4	2
	B2	2	4	9	-3	1

(OR)

- b) Solve the following game using Linear programming.

16 K3 CO5

	Player B		
Player A	9	1	4
	0	6	3
	5	2	8