

MAULANA AZAD NATIONAL INSTITUTE OF TECHNOLOGY, BHOPAL
(A Deemed University)

MID TERM – SEPTEMBER 2018

M.TECH I-SEM Computer Networking/ Advanced Computing
Stochastic process and Queuing Theory (CN-511)

Time: 1 hour 30 min

[Max Marks 20]

Note: Attempt all questions. Make suitable assumptions wherever necessary.

S.No.	QUESTIONS	MARKS
Q1	<p>Out of every 100 jobs received at a server, 50 are of class 1, 30 of class 2 and 20 of class 3. A sample of 30 jobs is taken with replacement.</p> <p>(a) Find the probability that sample will contain 10 jobs of each class.</p> <p>(b) Find the probability that there will be exactly 12 jobs of class 2.</p>	4
Q2	<p>The heights of 18-year-old men are approximately normally distributed with mean 68 inches and standard deviation 3 inches.</p> <p>(a) What is the probability that a randomly selected 18-year-old man is between 67 and 69 inches tall.</p> <p>(b) If a random sample of nine 18-year-oldmen is selected, what is the probability that the mean height \bar{x} is between 67 and 69 inches?</p> <p>(c) Is the probability in (b) higher? Why would you expect this?</p>	4
Q3	<p>The amount of regular unleaded gasoline purchased every week at a gas station near UCLA follows the normal distribution with mean 50000 gallons and standard deviation 10000 gallons. The starting supply of gasoline is 74000 gallons, and there is a scheduled weekly delivery of 47000 gallons.</p> <p>(a) Find the probability that, after 11 weeks, the supply of gasoline will be below 20000 gallons.</p> <p>(b)How much should the weekly delivery be so that after 11 weeks the probability that the supply is below 20000 gallons is only 0.5%?</p>	4
Q4	<p>If Six dice are thrown 729 times, then how many times do you expect at least three dice to show a 5 or 6 ?</p>	4
Q5	<p>Let X be a continuous random variable with PDF given by $f(x)=(1/2)e^{- x }$ for all $x \in \text{Real Number}$</p> <p>If $Y=X^2$, find the CDF of Y.</p>	4

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MID TERM – September 2017

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Time: 1 hour 30 min

[Max Marks 20]

Note: Attempt all questions. Make suitable assumptions wherever necessary.

S.No.	QUESTIONS	MARKS
Q1	Customers of a certain internet service provider connect to the internet at the average rate of 3 Customers per minute. Assuming Binomial counting process with 5-second frames, a) Compute the probability of more than 10 new connections during the next 3 minutes. b) Compute the mean and the standard deviation of the number of seconds between connections.	4
✓ Q2	If Six dice are thrown 729 times, then how many times do you expect at least three dice to show a 5 or 6 ? <u>233</u>	4
Q3	The manufacturer of scarf pins knows that of his product is 10% defective. If he sells scarf pins in a box of 200 and guarantees that not more than 15 pins will be defective, what is the approximate probability that a box will fail to meet the guaranteed quality?	4
Q4	Let X be a continuous random variable with PDF given by $f(x) = (1/2)e^{- x }$, for all $x \in \text{Real Number}$ If $Y = X^2$, find the CDF of Y.	4
✓ Q5	The scoring of modern IQ tests is such that Intelligence Quotients (IQs) have Normal distribution with mean 100 and variance 15. (a) What percent of people have IQ less than 80? (b) What percent of people have IQ greater than 120? (c) Mensa International is a non-profit organization that accepts only people with IQ within the top 2%. What level of IQ qualifies one to be a member of Mensa?	4

MAULANA AZAD NATIONAL INSTITUTE OF TECHNOLOGY, BHOPAL
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END TERM – NOVEMBER 2017

M.TECH I-SEM Computer Networking

Stochastic process and Queuing Theory (CN-511)

Time: 3 hours

[Max Marks 60]

Note: Attempt all questions. Make suitable assumptions wherever necessary.

S.No.	QUESTIONS	MARKS
Q1	<p>(a) Justify the statement with mathematical proof "The binomial distribution tends toward the Poisson distribution as $n \rightarrow \infty$, $p \rightarrow 0$ and np having some finite value."</p> <p>(b) Let X be the Continuous random variable with PMF</p> $f(x) = \begin{cases} 4x^3 & 1 < x \leq 3 \\ 0 & \text{otherwise} \end{cases}$ <p>Find $P(X \leq \frac{2}{3} \mid X > \frac{1}{3})$</p>	10
Q2	<p>(a) What are the basic ideas of central limit theorem? Derive the proof of central limit theorem for the sum of iidrv's.</p> <p>(b) Proof the following statement "If you have to find area under curve $f(x)$ then you need to find another function $F(x)$ whose rate of change is $f(x)$".</p>	10
Q3	<p>(a) (i) Explain Counting process and renewable process with suitable examples. (ii) Write down the three necessary conditions for stable distributions.</p> <p>(b) Derive an expression of Chapman kolmogorov equation and master equation for transition probability of stationary and non stationary processes.</p>	10
Q4	<p>(a) The transition matrix of Markov Chain is</p> $\begin{pmatrix} 1-a & a \\ b & 1-b \end{pmatrix}$ <p>Find the stationary distribution of this Markov chain in term of a and b.</p> <p>(b) Determine $F_Z(Z)$ in terms of $F_X(x)$ and $F_Y(y)$ If $Z = X+Y$. Explain the phenomenon with the help of example.</p>	10
Q5	<p>(a) Derive expressions for basic birth and death model on stationary conditions.</p> <p>(b) Derive an expression of L_s and L_q for the $M/M/C/N/\infty$ queuing model.</p>	10
Q6	<p>In railways marshalling yard, good train arrive at the rate of 30 trains per day. Assume that the inter-arrival time follows an exponential distribution and the service time is also to be assumed as exponential with mean of 30 minutes. Calculate</p> <p>(i) The mean queue size. (ii) The Probability that queue size exceeds to 10. (iii) If the input of the train increases to an average of 33 per day, what will be the changes in (i) and (ii)</p>	10