G.R. No. [   ]

DECEMBER 2018 / END-SEM

F. Y. M. TECH. (Computer Engineering) (SEMESTER - I)

COURSE NAME: MATHEMATICAL FOUNDATION OF COMPUTER SCIENCE

COURSE CODE: CSPA11181　　　　　　　　P118-131(ESE)

(PATTERN 2018)

Time: [3 Hour]　　　　　　　　　　　　　　　　[Max. Marks: 50]

(*) Instructions to candidates:

1) Answer Q.1, Q.2, Q.3, Q.4 OR Q.5, Q.6 OR Q.7, Q.8 OR Q.9
2) Figures to the right indicate full marks.
3) Use of scientific calculator is allowed
4) Use suitable data where ever required

Q1) a) Show that if G is a graph with n vertices, then no more than $n/2$ edges can be coloured the same in an edge colouring of G. [3]

OR

　　b) What is the value of each of these prefix expressions? [3]
　　　　a) $- * 2 / 8 4 3$
　　　　b) $\uparrow - * 3 3 * 4 2 5$
　　　　c) $+ - \uparrow 3 2 \uparrow 2 3 / 6 - 4 2$

Q2) a) A person has undertaken a construction job. The probabilities are 0.65 that there will be strike, 0.80 that the construction job will be completed on time if there is no strike, and 0.32 that the construction job will be completed on time if there is a strike. Determine the probability that the construction job will be completed on time [3]

OR

　　b) Let X denote the width in mm of metal pipes from an automated production line. If X has the probability density function [3]

　　　f (x) = 10e $^{-10(x-5.5)}$ for x ≥ 5.5, f (x) = 0 for x < 5.5.
　　　Determine: P(X < 5.7)

Q3) a) Let X={1,2} be the discrete random variable and probability mass function given below. Find third central moment [2]

$$p_X(x) = \begin{cases} 3/4 & \text{if } x = 1 \\ 1/4 & \text{if } x = 2 \\ 0 & \text{otherwise} \end{cases}$$

OR

b) Explain the significance with mathematical formula for first [2] and second moment of a discrete random variable

Q4) a) The height of a child is measured at different ages as follows. [14]

T(yrs)	0	5	8	12	16	18
H(in)	20	36.2	52	60	69.2	70

Estimate the height of the child as an adult of 30 years of age using the growth model,

$$H = \frac{a}{1 + be^{-ct}}$$

OR

Q5) Given a data for E-commerce sales and online advertising [14]

Online Store	Monthly E-commerce Sales Rs (in 1000 s)	Online Advertising Rs (1000 s)
1	368	1.7
2	340	1.5
3	665	2.8
4	954	5
5	331	1.3
6	556	2.2
7	376	1.3

Determine
   a. Whether there is correlation between monthly e-

commerce sales and online advertising costs.
b. Least square curve fitting
c. Find the predicted value $\hat{y}$ corresponding to x
d. Find the predicted sales for advertising expenses Rs (thousand) 2.8, 1.3 and 2.2 based on the regression model.
e. Residual error

Q6) a) A Coin is flipped 20 times Let $\{X_n, n = 1, 2, \cdots 20\}$ be a sequence of independent random variables with $S_{X_n} = \{0, 1\}$, $P[X_n = 0] = 2 / 3$, $P[X_n = 1] = 1/3$. Let $Y_n = \sum_{i=1}^{n} X_i$. [14]

(a) Find the 1st order pmf of Y_n.
(b) Find mean $m_Y(n)$
(c) Autocorrelation $R_Y(10, 11)$
(d) Covariance $C_Y(10,11)$.

OR

Q7) In a city, during the first 3 months of a year [14]

Weather on one day		Weather on next day	
		Dry	Wet
	Dry	57	12
	Wet	12	8

a. Find the probability that it will be dry two days after a wet day
b. Find the probability that it will be dry 9 days after a wet day

Q8) Consider a continuous-time Markov chain X(t) with the jump chain shown in Figure Assume $\lambda_1=2$, $\lambda_2=3$ and $\lambda_3=4$. [14]
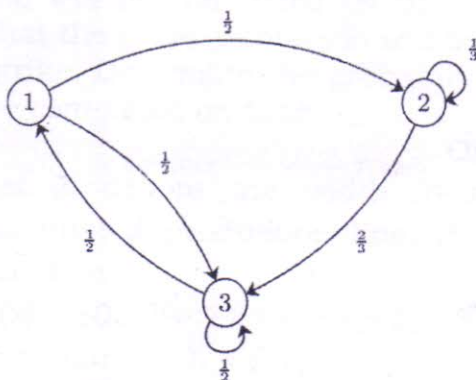
a. Find the stationary distribution of the jump chain
b. Using the stationary distribution of the jump chain, find the stationary distribution for X(t).

OR

Q9) Consider a continuous-time Markov chain X(t) that has the **[14]** jump chain shown in Figure below. Assume the holding time parameters are given by $\lambda_1=2$, , $\lambda_2=1$, and $\lambda_3=3$. Find the limiting distribution for X(t).

1

1 → 2

$\frac{1}{2}$

$\frac{1}{2}$

1

3