APJ ABDULKALAM TECHNOLOGICAL UNIVERSITY
08 PALAKKAD CLUSTER

Q. P. Code : CSP0818111-P **(Pages: 3)** **Name: ....**

Reg. No:..............................

FIRST SEMESTER M.TECH. DEGREE EXAMINATION DEC 2018

Specialisation:ECE

08EC 6211/6511 MATHEMATICS FOR COMMUNICATION ENGINEERING

(COMMON FOR ECE &CESP)

Time:3 hours **Max.marks: 60**

Answer all six questions.

Modules 1 to 6: Part 'a' of each question is compulsory and answer either part 'b' or part 'c' of each question.

Q.no.	Module 1	Marks
1.a	Determine whether the vectors (1,3,2,-2),(4,1,-1,3) ,(1,1,2,0)and (0,0,0,1) are linearly independent or not .	3
	Answer b or c	
b	Consider the following two bases of R^3 ;S={(1,1,1),(0,2,3),(0,2,-1)} and T={(1,1,0),(1,-1,0),(0,0,1)}.Find the coordinate vector of x=(3,5,-2) relative to S and T.	6
c	Using Gram Schmidt orthogonalization process find an orthonormal basis for the subspace spanned by the vectors (1, 1,1) (-1 ,0, -1)(-1,2, 3)of R^3	6

Q.no.	Module 2	Marks
2.a	Show that the map $T : R^2 \rightarrow R^3$ defined by $T(x_1, x_2) = (2x_1 - x_2, x_1 + x_2, -x_1 + 3x_2)$ is a linear Transformation	3
	Answer b or c	
b	Find the eigen values and eigen vectors of the matrix $\begin{bmatrix} 2 & 2 & 1 \\ 1 & 3 & 1 \\ 1 & 2 & 2 \end{bmatrix}$	6
c	Find a basis for the range of the linear transformation $T:R^3 \rightarrow R^3$ defined by $T(x_1,x_2,x_3) = (x_1+x_2+2x_3, x_1+2x_2, 5x_1, 3x_2+4x_3)$	6

Q.no.	Module 3	Marks
3.a	Let X be a random variable with m.g.f$M_x(t)$ then show that $M_{ax+b}(t) = e^{bt}M_X(at)$	3
	Answer b or c	
b	The random variables X and Y have joint distribution function f(x,y) = $\begin{cases} x^2 + \frac{xy}{3} & ,0 < x < 1, 0 < y < 2 \\ 0, elsewhere \end{cases}$ Find 1) Marginal density function of X and Y 2) Are X and Y independent?	6
c	Let the random variable X has pdf f(x) = $\frac{1}{2}e^{-\frac{x}{2}}, x > 0$.Find MGF and hence find mean and variance.	6

Q.no.	Module 4	Marks
4.a	A student study habits are as follows.If he studies one night,he is 70% sure not to study next night.On the other hand,theprob.that he does not study 2 nights in succession is .6.In the long run ,how often does he study?	3
	Answer b or c	
b	A Markov chain on state space {1,2,3} has initial distribution $p(X_0=i)=1/3$ and TPM = [.1 .5 .4 .6 .2 .2 .3 .4 .3] Find a) $P(X_2= 3)$ b) $P(X_4=2/X_2=1)$ c) $P(X_1=1,X_2=2.X_3=3)$	6
c	If the TPM of a chain is $\begin{bmatrix} 0 & 1 \\ 1/2 & 1/2 \end{bmatrix}$ Find the steady state distribution of the chain.	6

Q.no.	Module 5	Marks
5.a	Two boys B_1 and B_2 and two girls G_1 and G_2 are throwing a ball from one to the other .each boys throws the ball to the other boy with probability ½ and to each girl with probability ¼ on the other hand each girl throws the ball to each boy with probability ½ and never to the other girl. Find the TPM.	4
	Answer b or c	
b	A man either drives a car or catches a train to go to office each day. He never goes 2 days in a raw by train but if he drives one day .then the next day he is just as likely to drive again as he is to travel by train . Now suppose that on the first day of the week the man tossed a fair die and drone to work if 6 appeared .Find (i) The probability that he takes a train on the 3rd day. (ii) The probability that he drives to work in the long run.	8
c	If people arrive at a book stall in accordance with a Poisson Process with a mean rate of 3 per minute,find the probability that the interval betweentwo consecutive arrivals is 1)more than 1 minute 2)between 1 min and 2 min 3) 4 min or less.	8

Q.no.	Module 6	Marks
6.a	Show that the random process $x(t) = A\cos(w_o t+\theta)$ is not stationary if A and w_o are constants and θ is uniformly distributed random variable in (0,π)	4
	Answer b or c	
b	For a random process X(t)=y sin wt, y is a uniform random variable in the interval -1 to 1 .Check whether the process is WSS or not	8
c	Given a random variable y with characteristic function $\phi(\omega) = E[e^{i\omega y}]$ and random process defined by $X(t) = \cos(\lambda t + y)$ .Show that $X(t)$ is a stationary in wide sense of $\phi(1) = \phi(2) = 0$.	8