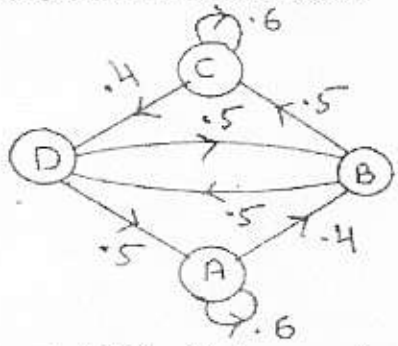
CONTINUOUS INTERNAL EVALUATION- 1

Dept: EC	Sem / Div: V	Sub: Information Theory and Coding	S Code: 18EC54
Date: 20/10/2020	Time: 2:30-4:00pm	Max Marks: 50	Elective: N

Note: Answer any 2 full questions, choosing one full question from each part.

Q N	Questions	Marks	RBT	COs
	PART A			
1 a	Derive an expression for average information content of symbols in long independent sequence.	3	L1	CO1
b	Consider the state diagram of a Markov source:  Determine: i) State probabilities; ii) Entropy of each state; iii) Entropy of source.	9	L3	CO1
c	Show that the entropy of n^{th} extension of a zero memory source 'S' is $H(S^n) = nH(S)$.	6	L2	CO1
d	Consider an alphabets x_1, x_2,x_3,x_4 with their respective probabilities ½, ¼, 1/8, 1/8, determine the entropy of the source and show that for the 2^{nd} extension of the source $H(S^2)= 2H(S)$ by listing all the 2^{nd} extension symbols and their respective probabilities.	7	L2	CO1
	OR			
2 a	Find the minimum number of symbols, 'r' in the coding alphabet for devising an instantaneous code such that W: {0, 5, 5, 1, 5}. device such a code. (Where 'W' represent set of code words of length: 1, 2,....)	6	L2	CO2
b	State Kraft McMillan Inequality property.	5	L1	CO2
c	Consider the following source with probabilities: S = {A, B,C,D,E,F} P = {0.4,0.2,0.2,0.1, 0.08, 0.02} Find the code words using Shannon-fano algorithm and also find its efficiency.	6	L2	CO2
d	Apply shannon's encoding algorithm and generate binary codes for the set of messages given below. Also find variance, code efficiency and redundancy.	8	L2	CO2

M_1	M_2	M_3	M_4	M_5
1/8	1/16	3/16	1/4	3/8

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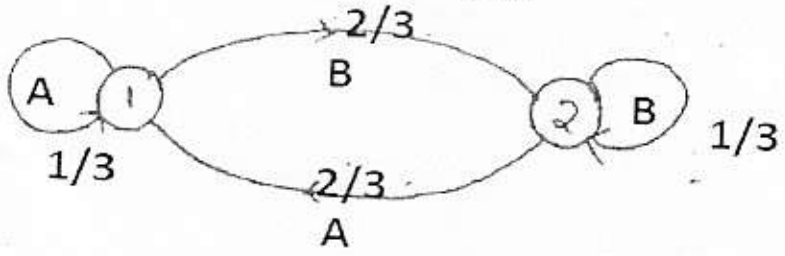
PART B

3 a	For the Markov source shown below, Find i) the stationary distribution ii) state entropies iii) source entropy iv) G_1, G_2 and show that G1 > G2 > H(s).  	10	L3	CO1
b	Mention different properties of entropy and prove extremal property.	8	L2	CO1
c	The international Morse code uses a sequence of symbols of dots and dashes to transmit letters of English alphabet. The dash is represented by a current pulse of duration 2ms and dot of 1ms. The probability of dash is half as that of dot. Consider 1ms duration of gap is given in between the symbols. Calculate i) Self information of a dot and dash. ii) Average information content of a dot-dash code. iii) Average rate of information.	7	L2	CO1
	OR			
4 a	Derive Noiseless coding theorem and How codewords designed for any symbols?	8	L2	CO2
b	Given the messages x_1, x_2, x_3, x_4 x_5 with respective probabilities {0.5, 0.25, 0.125, 0.0625, 0.0625} Construct a binary code by applying Shannon-Fano encoding procedure. Determine the code efficiency and redundancy.	7	L3	CO2
c	Apply Shannon encoding algorithm and generate binary codes for the set of symbols given in table below. Also find efficiency.	10	L3	CO2

Sym	A	B	C	D	E
P	0.55	0.15	0.15	0.1	0.05

Note: Write internals in A4 sheets and in every page write your name, USN, subject name with your signture. After exam arrange all pages of answer script in single PDF file and Send the answer script to the mail id: **nc.vcet@gmail.com**

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