THIRD INTERNAL ASSESSMENT

Sem: VI **Sub:Digital Communication** **Sub. Code: 15EC61**
Date: 18/05/2018 **Time: 11:00am-12:00pm** **Max. Marks:25**

Note: Answer two full questions, draw sketches wherever necessary.

Q. No		Discription of Question	Marks	CO	RBT LEVEL
1	a	Explain the matched filter receiver with the relevant mathematical theory.	6	C301.2	L1,L2,L3
	b	Obtain the decision rule for maximum likelihood decoding and explain the correlation reciever.	7	C301.2	L1,L2,L3
		OR			
2	a	Explain with block diagram of direct sequence spread spectrum.	6	C301.5	L1,L2,L3
	b	Consider the PN sequence 000100110101111. Demonstrate the properties of the PN sequence.	7	C301.1	L1,L2,L3
3	a	Explain the generation of PN sequence with block diagram.	6	C301.5	L1,L2,L3
	b	Draw the 4-stage linear feedback shift register with 1st and 4th stage is connected to modulo-2 adder. Output of modulo-2 is connected to 1st stage input. Find the output of PN sequence.	6	C301.5	L1,L2,L3
		OR			
4	a	Explain the properties of PN sequence with example.	6	C301.5	L1,L2,L3
	b	With neat block diagram explain the model of spread spectrum modulation technique.	6	C301.5	L1,L2,L3

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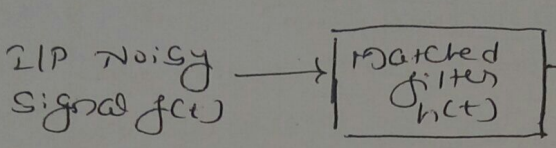
SCHEME OF EVALUATION

Sem : VI | Subject : DC | Sub Code : 15ECG | Date : 18/5/2018

Q. No.	Bit	Description	Marks	CO's	RBT LEVEL
1)	a)	**Matched filter Receiver**			
			2M		
		The o/p of the matched filter can be obtained by convolution of inpw f(t) & its impulse response h(t) i.e		C301.2	L1, L2, L3
		$r(t) = f(t) * h(t)$			
		$= \int_{-\infty}^{\infty} f(\tau)\, h(t-\tau)\, d\tau$ → 2M			
		Impulse response of matched filter is given as			
		$h(t) = \frac{2k}{N_0} s(T-t)$			
		$t = t - \tau$			
		∴ Derive the o/p of matched filter $r(T) = \frac{2k}{N_0} \int_0^T f(t) s(t) dt$ → 2M			
1)	b)	**ML Decoding:** - The average Probability of symbol error in this decision is			
		$P_e(m_i, z) = P(m_i \text{ not sent} / z)$			
		$= 1 - P(m_i \text{ sent} / z)$			
		Set $\hat{m} = m_i$ if $P(m_i \text{ sent}/z) \geq P(m_k \text{ sent}/z)$ → 3M for all $k \neq i$			
		Decide 'z' lies in region R_i, if $\ln[f_z(z/m_k)]$ is maximum for $k=i$. Vector z lies in region R_i if $\|z - s_k\|$ minimum for $k=i$			

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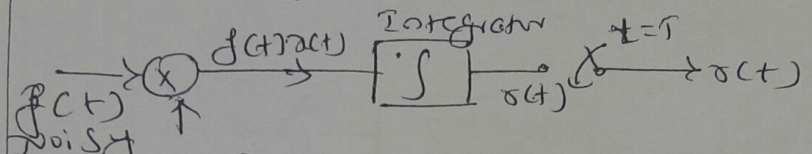
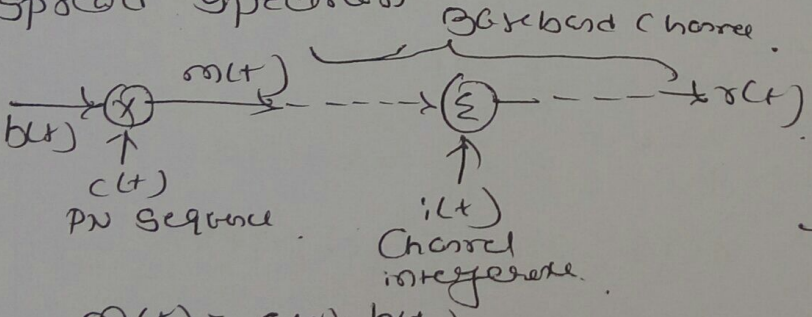
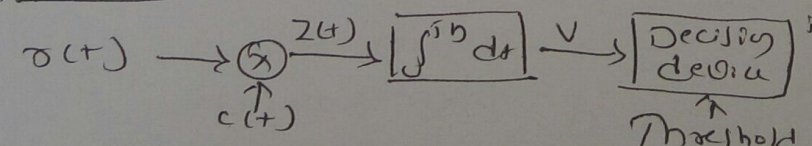
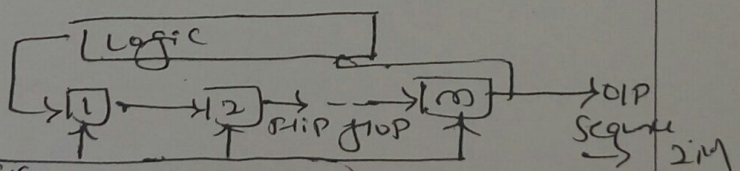
SCHEME OF EVALUATION

Sem : VI | Subject : DC | Sub Code : 15EC61 | Date : 18/5/2018

Q. No.	Bit	Description	Marks	CO's	RBT LEVEL
1)	b)	**Correlation recievers**  → 2M	C301.2	L1, L2, L3	
		o/p of correlation $r(T) = \int_0^T g(t)\, x(t)\, dt$ Explanation of above block including Coherent diagram → 2M			
2)	a)	**Block diagram of direct sequence Spread Spectrum**  → 3M	C301.5	L1, L2, L3	
		$m(t) = c(t) \cdot b(t)$ $r(t) = m(t) + i(t)$. $\therefore r(t) = c(t)\, b(t) + i(t)$.			
		Reciever:- 			
		$z(t) = c(t) \cdot r(t)$ → 3M $z(t) = c^2(t)\, b(t) + c(t)\, i(t)$ Here $c^2(t) = 1$ $\therefore z(t) = b(t) + c(t)\, i(t)$			

SCHEME OF EVALUATION

Sem : VI | Subject : DC | Sub Code : 15ECC1 | Date : 18/5/2018

Q. No.	Bit	Description	Marks	CO's	RBT LEVEL
2)	b)	$C_n = \{0001001101011111\}$ i) Balance property : There are 7 zeros and 8 ones. Thus number of ones are one more than number of zeros.	2M		
		ii) Run Property : Length of this sequence is 15. Here it is generated with m=4.	3M	C301.5	L1, L2, L3
		$\therefore 2^{m-1} = 2^3 = 8$ Runs. $\therefore C_n = \{\frac{000}{1}, \frac{1}{2}, \frac{00}{3}, \frac{11}{4}, \frac{0}{5}, \frac{1}{6}, \frac{0}{7}, \frac{1111}{8}\}$			
		iii) Correlation Property : Due to correlation of this sequence can be shown periodic & it will be binary valued.	2M		
3)	a)	Generation of PN Sequence :- 	2M		
		i) The shift register consists of m flip flops. Data is given to one flip flop at next.		C301.5	L1, L2, L3
		ii) O/P of flip flop given to logic circuit. Depending upon O/Ps of flip flop O/P of logic circuit is decided.			
		iii) PN sequence is generated as O/P of last flip flop in the shift register.	4M		

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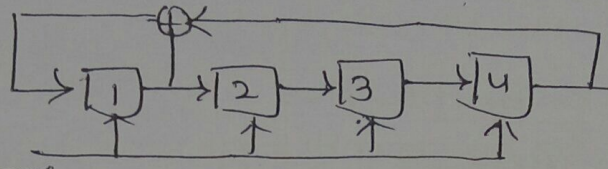
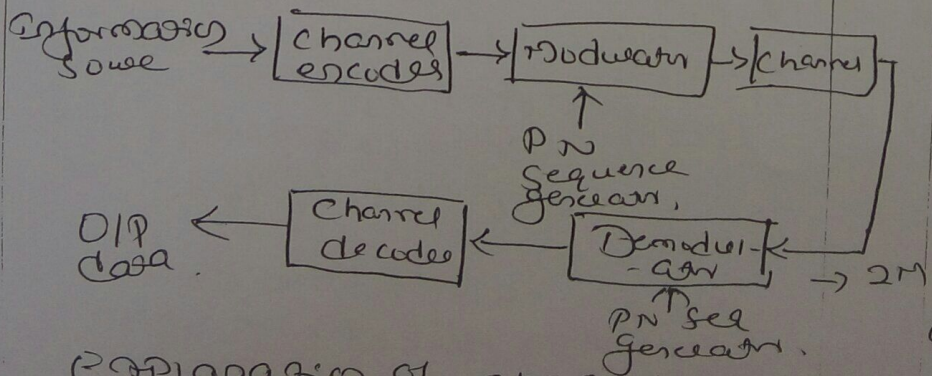
SCHEME OF EVALUATION

Sem : VI | Subject : DC | Sub Code : 15EC61 | Date : 18/5/18

Q. No.	Bit	Description	Marks	CO's	RBT LEVEL
3)	b)	 Clock.	→ 2M		
		Take four bit example (any bit) and illustrate the above diagram.	→ 4M	C301.5	L1,L2,L3
4)	a)	DS Sequence properties :- i) Balance prop ii) Run property iii) Autocorrelation property.	→ 2M	C301.5	L1,L2,L3
		Take one example of sequence & illustrate the above property	→ 4M		
4)	b)	Model of Spread spectrum Modulation technique :- 	→ 2M	C301.5	L1,L2,L3
		Explanation of above block	→ 4M		

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