Name :
Reg No :

APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY

07 THRISSUR CLUSTER

SECOND SEMESTER M.TECH. DEGREE EXAMINATION APRIL 2018

Electronics & Communication Engineering

Communication Engineering and Signal Processing

07EC6232 CODING THEORY

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

Answer all six questions. Part 'a' of each question is compulsory.

Answer either part 'b' or part 'c' of each question

Q.no.		Module 1	Marks
1a		Consider a polynomial over *GF(2).* If $\beta \in GF(2^m)$ is a root of this polynomial, prove that its conjugates are also roots of that.	**4**
		Answer b or c	
b		Define irreducible polynomial and primitive polynomial. Give example for both and verify.	**5**
c	(i)	Define subspace of a vector space.	**5**
	(ii)	Consider the vector space V_5 of all 5-tuples over GF(2). Check whether the elements (00000), (10101), (01110), (11011) of V_5 forms a sub space of V_5 .	

Q.no.		Module 2	Marks
2a	(i)	Define Hamming distance and Hamming weight. Give examples for each.	**4**
	(ii)	Prove that minimum Hamming weight of a nonzero code word in a code is equal to $d_{\min}$ of the code.	
		Answer b or c	
b		The generator matrix of (6,3) linear block code is given below. Give its code words and draw its encoder diagram	**5**

$$G = \begin{bmatrix} 0 & 1 & 1 & 1 & 0 & 0 \\ 1 & 0 & 1 & 0 & 1 & 0 \\ 1 & 1 & 0 & 0 & 0 & 1 \end{bmatrix}$$

c	Draw the decoder diagram of a (6, 3) linear block code explain.	**5**

Q.no.	**Module 3**	**Marks**
3a	Define minimal polynomial. Give any two properties of it and prove them.	**4**
	Answer b or c	
b	Using the syndrome computation circuit of (7, 4) cyclic code, find out the syndrome for the received vector ***r = (0111101)***. Find out the syndrome for the received vector shifted to the right by 3 positions. Verify the computations mathematically.	**5**
c	(i) Give the generator polynomial of (7, 4) cyclic code and find out the code word in systematic form for the message (1011). (ii) Using the encoder diagram (7, 4) cyclic code verify that the same code word is generated for the given message.	**5**

Q.no.	**Module 4**	**Marks**
4a	Write down the decoding steps of RS codes. Explain each step in detail.	**4**
	Answer b or c	
b	Find out the generator polynomial of double error correcting BCH code of length 15. Draw the encoder diagram based on this generator polynomial.	**5**
c	Find out the generator polynomial of double error correcting RS code with symbols from $GF(2^4)$. Draw the encoder diagram based on this generator polynomial.	**5**

Q.no.	**Module 5**	**Marks**
5a	(i) For the encoder shown in Figure1, write down its generator sequences. (ii) Give its rate and constraint length. (iii) Give its generator matrix in time domain for an information sequence of length 3 and using it find out the code word corresponding to the information sequence 100.	**5**

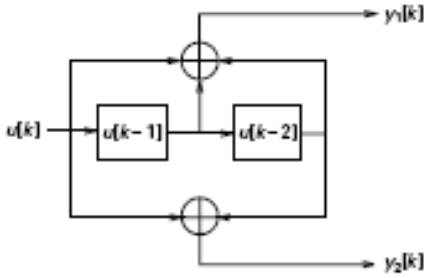

Figure 1

Answer b or c

b	(i)	For the encoder shown in Figure 1, draw its state diagram.	**7**
	(ii)	Draw its trellis diagram and tree diagram for an information sequence of length 3.	
	(iii)	On the trellis and tree diagrams, trace out the code word corresponding to the information sequence 110.	

c	Explain Stack algorithm used for sequential decoding.	**7**

Q.no.	**Module 6**	**Marks**
6a	What is the need of interleaving? Explain block interleaving.	**5**

Answer b or c

b	Explain Trellis coded modulation in detail.	**7**
c	Explain Turbo codes in detail.	**7**