TECHNICAL UNIVERSITY OF MOMBASA

FACULTY OF ELECTRICAL AND ELECTRONIC ENGINEERING

ELECTRICAL AND ELCTRONICS ENGINEERING DEPARTMENT

UNIVERSITY EXAMINATION FOR:

BSC ELECTRICAL AND ELECTRONICS ENGINEERING

EEE2515 DIGITAL COMMUNICATION PRINCIPLES

SPECIAL/SUPPLEMENTARY EXAMINATION

SERIES: SEPTEMBER 2018

TIME: 2 HOURS

DATE: Sep 2018

Instructions to Candidates

You should have the following for this examination

-Answer Booklet, examination pass and student ID

This paper consists of **five** Questions; Question ONE is compulsory. In addition attempt any Other TWO Questions.

Do not write on the question paper

Question ONE

(a) (i) State the advantages of F.S.K.

(ii) With the aid of a diagrams describe the operation of F.S.K transmitter and receiver.

(iii) Derive the expression for F.S.K frequencies **(10 marks)**

(b) Show how the following parameters are determined using the eye diagram:

(i) Sensitivity to time error

(ii) Noise margin

(iii) Timing jitter

(iv) Distortion

(c) (i) State the consideration taken in selecting a line encoding scheme.

(ii) Draw line encoding waveform for the following schemes for the data 10110001101:

(I) NRZ-L
(II) RZ unipolar
(III) Bipolar RZ
(IV) Biphase M
(V) Delay modulation

(10 marks)

(d) With the aid of a diagram compare the performance in terms of band width requirement of:

(i) Doubinary
(ii) Delay modulation
(iii) Dicode NRZ
(iv) NRZ and
(v) Biphase in terms of bandwidth requirement

(4 marks)

Question TWO

(a) Describe using appropriate diagram and an appropriate message set how a code with appropriate distance properties is obtained. **(7 marks)**

(b) State the criteria for generating a (8, 2) block code hence determine an acceptable set. **(6 marks)**

(c) State the basic principles for Automatic Repeat request error control scheme and show with appropriate examples the **THREE** categories of ARQ. **(7 marks)**

Question THREE

(a) Derive the expression for base band digital waveform energy **(5 marks)**

(b)Describe using appropriate equations the principal of maximum likelihood receiver structure **(6 marks)**

(c)Derive the expression of a matched filter and show how it is realized using correlation **(9 marks)**

Question FOUR

(a) (i) Explain the difference between equalization with maximum likelihood estimation and equalization with filters.

(10 marks)

(b) (i) With the aid of a diagram and appropriate derivations describe the operation of a transversal equalizing filter.

(ii) A transversal equalizing filter has three taps. Given a received distorted set of pulse samples x(k) with voltage valves 0.1, 0.2, 0.9, -0.3, 0.1;

(I) Use a zero-forcing solution to find the weights $\{C_{-1}, Co, C1\}$ that reduce the ISI so that the equalized pulse samples {Z(k)} have the values {Z(-1) = 0, Z(o) = 1, Z(1) = 0}.

(II) Using the weights in (I), calculate ISI values of the equalized pulse at the sample times $k = \pm 2, \pm 3$ and

(III) Determine the largest and sum of all samples.

(10 marks)

Question FIVE

(a) With the aid of a diagram describe the operation of a duobinary signaling systems. **(6 marks)**

(b) Using an appropriate diagram describe the basic steps in baseband detection of a digital signal. **(4 marks)**

(c) Describe the operation of a maximum likelihood detector for PSK signal. **(10 marks)**