



THE MOMBASA POLYTECHNIC UNIVERSITY COLLEGE

(A Constituent College of Jkuat)

Faculty of Engineering and Technology

DEPARTMENT OF ELECTRICAL AND ELECTRONIC ENGINEERING

HDEAE 3

EEE 3307: TELEMETRY & NETWORKING I

SPECIAL/SUPPLEMENTARY EXAMINATION

SERIES: OCTOBER 2011

TIME: 2 HOURS

Instructions to Candidates:

You should have the following for this examination

- *Answer booklet*

This paper consists of **FIVE** questions. Answer question **ONE (COMPULSORY)** and any other **TWO** questions

Maximum marks for each part of a question are clearly shown.

This paper consists of **THREE** printed pages

SECTION A (COMPULSORY)

Question 1

- a) (i) State **TWO** advantages and **TWO** disadvantages of synchros.
(ii) Describe the construction and operation of the following synchros:
- I. Synchro Transmitter
 - II. Synchro Receiver
 - III. Differential Synchro
 - IV. Control Transformer Synchro
- (10 marks)
- b) (i) State **THREE** applications of synchros.
(ii) Describe the construction and operation of the following transducers:
- I. Variable Resistor Transducer
 - II. LVDT
 - III. Capacitive Transducer
- (10 marks)

SECTION B (Answer any TWO questions from this section - 20 marks each)

Question 2

- a) (i) Distinguish between a flexible coaxial cable and rigid coaxial cable as types of transmission lines (4 marks)
- (ii) Derive from first principles the equation for the characteristic impedance of a two wire Transmission line of infinite length. (8 marks)
- b) A 200km two-wire transmission line is used to transmit a signal with a potential difference of 5V with a frequency of 3KHz. The line has a shunt admittance of $1.5 \times 10^{-6} \text{ S/KM}$, resistance Ω of 0.5 /Km . Calculate the attenuation and phase factors of the line. The shunt conductance is negligible. (8 marks)

Question 3

- a) State **TWO** advantages for each of the following list sources as applied in fiber optics.
- i) LED
 - ii) LASER
- (4 marks)
- b) An optic fibre core has a core refractive index of 1,61 and a cladding refractive index of 1.6. Calculate:
- (8 marks)
- i. The number of modes that can be propagated if core diameter is $7 \frac{\mu}{\lambda}$ m
 - ii. The maximum core diameter for monomode propagation (Take $\mu = 0.82$ m)
 - iii. State **THREE** demerits of optical fiber technology

- c) (i) With the aid of a diagram show how a 2 x 2 coupler can be obtained (2 marks)
(ii) State and explain **THREE** losses that occur in fiber optics (6 marks)

Question 4

- a) (i) Define the following terms (2 marks)
Modulation
Modulation Index

(iii) An FM Signal is given by $12 \sin (48 \pi \times 10^6 t - 0.02 \cos 22 \pi \times 10^3 t)$
Calculate (10 marks)

- i. Carrier voltage
- ii. Modulating frequency
- iii. Carrier frequency
- iv. Modulating Index
- v. Carrier's frequency deviation

- b) With the aid of waveforms describe the following modulations (8 marks)

- i. Frequency Modulation
- ii. Amplitude Modulation

Question 5

- a) (i) Define quantization
(ii) Using a block diagram, describe the operation of a PCM encoder and decoder
(iii) State **THREE** advantages and **THREE** disadvantages of PCM (12 marks)

- b) (i) State **TWO** factors to consider when selecting a multiplexing method.
(ii) Using AND and OR gates draw a sketch and derive an operation table for a 4 channel:

- i. Digital Multiplexer
- ii. Digital Demultiplexer (8 marks)