



TECHNICAL UNIVERSITY OF MOMBASA

School of Applied and Health Sciences

DEPARTMENT OF MATHEMATICS AND PHYSICS

UNIVERSITY EXAMINATIONS 2024/2025

FOR THE DEGREE OF BACHELOR OF TECHNOLOGY IN APPLIED PHYSICS IN ELECTRONIC & INSTRUMENTATION

EEE 4352: INSTRUMENTATION SYSTEMS

SPECIAL/SUPPLEMENTARY EXAMINATION

SERIES: JULY, 2025

TIME: 2 HOURS

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 attempt any other TWO questions.

Do not write on the question paper.

QUESTION ONE

- (a) (i) Define class B bias as applied in power amplifiers
(ii) Show with relevant diagrams that the efficiency of class B bias is 78.5%. (10 marks)
- (b) (i) Define modulation.
(ii) Derive an expression for the fraction of the total power carried by sidebands in amplitude modulation. (10 marks)
- (c) The unmodulated carrier in the up-lead to the aerial of a transmitter is 100 A. Determine the increase in this current which will result from the application of 80% modulation. (10 marks)

QUESTION TWO

- (a) (i) Explain the difference between frequency modulation and amplitude modulation
(ii) State THREE advantages of frequency modulation over amplitude modulation. (7 marks)
- (b) Using relevant diagrams differentiate between:
(i) Phase modulation and pulse modulation
(ii) Pulse amplitude modulation and pulse code modulation. (13 marks)

QUESTION THREE

- (a) (i) Describe a two-stage R-C coupled amplifier using transistors
(ii) State TWO advantages and TWO disadvantages of R-C coupling networks as compared to other coupling networks.

- (iii) State ONE area of application of R-C coupling networks **(15 marks)**
- (b) A single stage amplifier has a gain of 50. The collector load $R_c = 600 \Omega$ and the input impedance is $1 k\Omega$. Calculate the overall gain when two such stages are cascaded through R-C coupling. Comment on the result. **(5 marks)**

QUESTION FOUR

- (a) State THREE advantage and THREE disadvantages of using class B amplifier as compared to class A. **(6 marks)**

(b) A common emitter class A transistor power amplifier used a transistor with $\beta = 80$. The load has a resistance of 80.5Ω , which is transformer coupled to the collector circuit. If the peak values of collector voltage and collector current are 25V and 30 mA respectively and the corresponding minimum values are 4V and 1 mA respectively, determine:

- (i) Approximate value of zero signal collector current
- (ii) zero signal base current. **(14 marks)**

QUESTION FIVE

- (a) If a large signal amplifier has an efficiency of 22% and a power dissipation at device output electrode of 1.5 W, calculate the output power of the amplifier. **(4 marks)**
- (b) State and differentiate the distortions in power amplifiers. **(6 marks)**
- (c) (i) Draw Hybrid π model of CE of a transistor with a load resistance R_L connected across C and E terminals
- (ii) Using Miller's theorem derive an expression for the current gain of (a)(i) above. **(10marks)**