Indian Maritime University

(A Central University, Govt of India)

End Semester Examinations – December 2025

Programme Name: B Tech (ME)

Semester: I

Subject Code: UG11T5106

Subject Name: BASIC ELECTRONICS

Date: 18.12.2025	Max Marks: 70
Duration: 03 Hrs	Pass Marks: 35

General Instructions

(i) All Sections (A, B & C) are to be attempted.
(ii) Options, if any, are specified in respective section.

Section A

10 MCQs -1 Mark each. Choose the correct answer as applicable.

1. A semiconductor has..... temperature coefficient of resistance.
   a) Positive
   b) Negative
   c) Zero
   d) None of the above

2. Why the Zener diode is used in voltage regulation?
   a) It can handle high current
   b) It can operate over a wide range of frequencies
   c) It maintains a constant output voltage despite variations in input voltage or load
   d) None of the above

3. The base of transistor is .....doped
   a) Heavily
   b) Moderately
   c) lightly
   d) None of the above

4. The following relationships between α and β are correct **EXCEPT**
   a) $1-\alpha=\frac{1}{1+\beta}$
   b) $\alpha=\frac{\beta}{1+\beta}$
   c) $\beta=\frac{\alpha}{1-\alpha}$

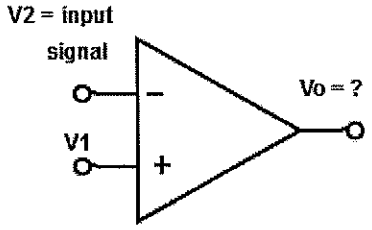
d) $\alpha = \frac{\beta}{1-\beta}$

5. Which gate will a NAND gate be equivalent to when two inputs of NAND gates are shorted?
   a) AND gate
   b) OR gate
   c) NAND gate
   d) NOT gate

6. One of De-Morgan's theorems states that $\overline{X.Y} = \bar{X} + \bar{Y}$ simply stated, this means that logically there is no difference between:
   a) a NOR and an AND gate with inverted inputs
   b) a NAND and an OR gate with inverted inputs
   c) an AND and a NOR gate with inverted inputs
   d) a NOR and a NAND gate with inverted inputs

7. Which of the following electrical characteristics is not exhibited by an ideal op-amp?
   a) Infinite voltage gain
   b) Infinite bandwidth
   c) Infinite output resistance
   d) Infinite input impedance

8. The following circuit is a



   a) Comparator
   b) Inverting amplifier
   c) Summing Amplifier
   d) Integrating Amplifier

9. What is the primary purpose of a MODEM in a communication system?
   a) To amplify the signal before transmission.
   b) To filter out noise and unwanted frequencies.
   c) To convert digital data to analog signals and vice versa.
   d) To generate the carrier wave for modulation.

10. Which of the following is a typical marine application of RADAR system?
   a) Finding range between two objects.
   b) Detecting the shape of the object.
   c) Navigating in low visibility.
   d) All of the above.

Section B

Five Questions of 02 Marks each

11. A Half wave rectifier uses transformer of turns ratio 2:1. The Load resistance is 500 Ω. If the primary voltage (R.M.S.) is 240V, Find (i) DC output voltage (ii) Peak Inverse Voltage.

12. Draw the equivalent circuit of an ideal diode and a practical diode in forward bias

13. What are the characteristics of ideal op-amp?

14 Why are junction transistors are called bipolar devices?

15. Draw and explain the block diagram of a basic communication system.

Section C

Seven Questions of 10 Marks each of which any 05 questions to be answered.

16. a) Explain how a depletion region is formed in PN junction? (5 Marks)

b) Find the static and the dynamic resistance of P-N junction Ge diode, if temperature is 270°C and I_s= 1μA for applied forward bias of 0.2V. (5 Marks)

17. a) Explain the working of Zener voltage regulator with circuit diagram. (5 Marks)

b) Draw input and output characteristics of a NPN transistor in a Common Emitter configuration and give relationship between α and β. (5 Marks)

18. a) With suitable circuit diagram draw and explain the input and the output V-I characteristics of NPN transistor connected in common emitter mode. (5 Marks)

b) A 12V zener diode is acting as a voltage regulator. A series resistance is connected across a 50V supply. Calculate minimum value of the resistance required if maximum zener current is 44mA. (5 Marks)

19. a) State & Prove De-Morgan's theorem. (5 Marks)

b) Simplify the following using K map.

f (A, B, C, D) = Σ m (7,8,9) + Σ d (10,11,12,13,14,15). (5 Marks)

20. a) Draw various transistor configuration modes (CB, CE and CC modes) along with their respective input and output characteristics. (5 Marks)

b) Explain the construction and operation of MOSFET (Enhancement MOSFET/ Depletion MOSET) (5 Marks)

21. a) Draw the circuit diagram of an integrator using OPAMP and also derive its output. (5 Marks)

b) What are the characteristics of an ideal OPAMP? Why it is necessary to adjust/compensate the Offset in an OPAMP. (5 Marks)

22. Draw the block schematics of a RADAR system, explain the functions of its major components, write the expression for range and give at least two marine applications of RADAR. (10 Marks)