

XXCV1399

Indian Maritime University
(A Central University, Govt of India)

Sep/Oct'25 SE
Programme Name: B Tech (ME)

Semester: I

Subject Code: UG11T5106

Subject Name: Basic Electronics

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| Date: 06.09.2025 | 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

Ten MCQs/Fill in the Blanks of 01 Mark each – Choose the correct answer as applicable.

1. Zener diode is designed to specifically work in which region without getting damaged?

- a) Active region
- b) Breakdown region
- c) Forward bias
- d) Reverse bias

2. Which of the following statement is true about FET?

- a) It has high output impedance
- b) It has high input impedance
- c) It has low input impedance
- d) It does not offer any resistance

3. During reverse bias, a small current develops known as

- a) Forward current
- b) Reverse current
- c) Reverse saturation current
- d) Active current

4. The voltage gain of the amplifier is 8 and the current gain is 7. The power gain of the amplifier is

- a) 56 dB
- b) 17.481 dB
- c) 34.963 dB

d) 1 dB

5. In an ideal op-amp, which is not true?

- a) Open loop voltage gain is infinite
- b) Input resistance is infinite
- c) Slew rate is infinite
- d) CMRR is zero

6. Which of these is incorrect for an operational amplifier?

- a) It has a high voltage gain
- b) It is a direct coupled amplifier
- c) It is only useful for amplifying AC signals
- d) It was originally designed to perform mathematical operations

7. The gate which is used to reverse the output obtained is _____

- a) NOR
- b) NAND
- c) EXOR
- d) NOT

8. The expression of an EXOR gate is _____

- a) $A'B+AB'$
- b) $AB+A'B'$
- c) $A+A.B$
- d) $A'+B'$

9. What happens when the amplitude of the modulating signal is greater than the amplitude of the carrier?

- a) Decay
- b) Distortion
- c) Amplification
- d) Attenuation

10. Convert: $(110)_2 = (_)_{10}$.

- a) 4
- b) 7
- c) 6
- d) 2

Section B

Five Questions of 02 Marks each

11. Subtract (0110) 2 from (1010) 2 using 2's complement method?
12. State the effect of V_{GS} on channel conductivity on N-channel JFET.
13. Derive the relation between current gain β (Beta) and α (Alpha)
14. Write the ideal characteristics of an opamp
15. What are the types of analog modulation?

Section C

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

16. (a) Explain working of diode as positive clamper. (05 marks)
(b) Draw the circuit diagram of an OPAMP based differentiator circuit and derive the expression of its output in terms of input and circuit components. (05 marks)
17. (a) An AM wave equation is given as, $v = 5(1 + 0.6 \sin 150t) \sin (314 \times 10^4 t)$ Volts. What are the minimum and maximum amplitudes of AM wave? What are the amplitudes and frequencies of message signal, RF carrier? (05 marks)
(b) Draw the typical frequency response curve of a CE amplifier. How do you find out the bandwidth of amplifier? (05 marks)
18. (a) What is a summing amplifier? Draw the OPAMP based circuit diagram and deduce the expression for output of a summing amplifier with N inputs V_1, V_2, \dots, V_N and output V_o . (05 marks)
(b) What is a transistor? Draw input and output characteristics of a NPN transistor in a common base configuration. (05 marks)
19. (a) Explain the forward and reverse characteristics of a diode. (05 marks)
(b) Draw the block diagram of AM super heterodyne radio receiver and state the function of each block (05 marks)

20. (a) What is rectifier? Draw diagram and explain working of Bridge type full wave rectifier? (05 marks)
(b) Reduce the Boolean expression: $A = XY + X(Y+Z) + Y(Y+Z)$ (05 marks)

21. (a) An AC supply of 230 V is applied to a half-wave rectifier circuit through a transformer of turn ratio 10: 1. Find (i) the output DC voltage and (ii) the peak inverse voltage. Assume the diode to be ideal. (05 marks)

21. (b) Why stabilization of transistor is required. Explain the different stability factors. (05 marks)

22. (a) State and prove De Morgan's theorem (05 marks)

22. (b) Draw and explain block diagram of RADAR system (05 marks)