



MAULANA ABUL KALAM AZAD UNIVERSITY OF TECHNOLOGY, WEST BENGAL

CS/B.TECH(N)/ODD/SEM-3/3489/2023-2024/1008

Paper Code : ES-ECE301 Basic Electronics Engineering

UPID : 003489

Time Allotted : 3 Hours

Full Marks : 70

The Figures in the margin indicate full marks.  
Candidate are required to give their answers in their own words as far as practicable

Group-A (Very Short Answer Type Question)

1. Answer any ten of the following :

[ 1 x 10 = 10 ]

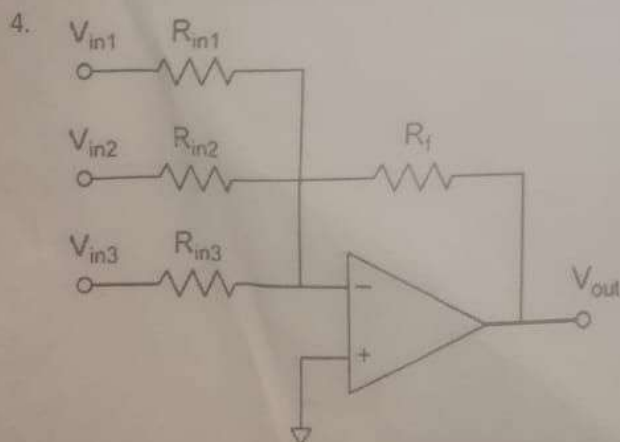
- (i) What is modulation index ( $m$ ) for over modulation in AM wave?
- (ii) Which type of code is used in K-map?
- (iii) What principle the Oscillators operates?
- (iv) Holes are the majority carriers in
  - (a) n-type
  - (b) p-type
  - (c) intrinsic semiconductor
  - (d) none of these
- (v) How many pins are there in IC 741 OPAMP?
- (vi) Compute the voltage gain for an OPAMP inverting amplifier if feedback resistance  $R_F = 3 \text{ K}\Omega$  and input resistance  $R_i = 1 \text{ K}\Omega$ .
- (vii) What is the function of the input transducer in a communication system?
- (viii) What is the CMRR Value of an OPAMP?
- (ix) Which combinational circuit can be used as universal gate?
- (x) How many flip-flops are required to design MOD 5 ripple counter?
- (xi) If the temperature of a transistor is increased, the transistor gets destroyed because of
- (xii) In a Wien-bridge oscillator, if the resistances in the positive feedback circuit are increased, then the frequency\_\_\_\_\_.

Group-B (Short Answer Type Question)

Answer any three of the following :

[ 5 x 3 = 15 ]

1. Compare between analog and digital signals.
2. Write down difference between half wave and full wave rectifier.



Compute the output voltage  $V_{out}$  of the three-input summing amplifier circuit given above.

Here,  $R_f = 500 \Omega$ ,  $R_{in1} = 1 \text{ k}\Omega$ ,  $R_{in2} = 200 \Omega$ ,  $R_{in3} = 400 \Omega$  and  $V_{in1} = -5 \text{ V}$ ,  $V_{in2} = +3 \text{ V}$ ,  $V_{in3} = +4 \text{ V}$ .

3. Write down difference between Amplitude modulation and Frequency modulation.
6. The carrier amplitude after AM varies between 4 volts and 1 volt. Calculate depth of modulation in percentage.

7. (a) What do you mean by modulation index? Draw the diagram of over, under and critical modulated waveform. [2+3]
- (b) A modulating signal  $10 \sin(2\pi \times 10^3 t)$  is used to modulate a carrier signal  $20 \sin(2\pi \times 10^4 t)$ . Determine the modulation index, and frequency of the sideband components. [5]
8. (a) Write down the advantages and disadvantages of amplitude modulation (AM). [5]
- (a) Define a noninverting amplifier. Write the difference between inverting and noninverting amplifiers. [2+3]
- (b) Write a short note on OPAMP as an integrator. [5]
- (c) Mention the key difference between OPAMP integrator and differentiator circuits. Write down the application of OPAMP as a unity gain buffer. [3+2]
9. (a) With a neat circuit diagram explain the operation of a diode in forward and reverse bias. [5]
- (b) Draw and explain voltage regulator circuit based on IC of 78XX series. [5]
- (c) What do you mean by ripple factor? What is the significance of PIV of a diode? [5]
10. (a) Design a full adder circuit using 3 to 8 line decoder. [5]
- (b) Explain the operation of Serial In Serial Out (SISO) shift register. [5]
- (c) Compare between microprocessor and microcontroller. [5]
11. (a) Draw the circuit diagram of a Monostable Multivibrator using IC 555 timer and explain its operation. [4+4]
- (b) Determine the value of frequency of oscillation for a 555 timer in a Monostable mode with  $R_A = 2k\Omega$  and  $C = 0.01\mu F$ . [4]
- (c) Write down applications of IC 555. [3]

\*\*\* END OF PAPER \*\*\*

$$m = \frac{a-b}{a+b}$$

$$\frac{m+1}{m-1} = \frac{a-b+a+b}{a-b-a-b} = -\frac{a}{b}$$