



BRAINWARE UNIVERSITY

Course –BSc(HN)

Basic Electronics II: Analog Electronics (BHNG201)

(Semester – 2)

Time allotted: 3 Hours

Full Marks: 70

[The figure in the margin indicates full marks. Candidates are required to give their answers in their own words as far as practicable.]

Group –A

(Multiple Choice Type Question)

10 x 1 = 10

Answer any ten of the following

1. i) The two input terminals of an operational amplifier are called as

- | | |
|--------------------------------------|--------------------------------|
| a) differential and non-differential | b) inverting and non-inverting |
| c) positive and negative | d) high and low |

ii) For OPAMP, the maximum rate of change of output voltage per unit time is called

- | | | | |
|--------------|---------|-------------------|-----------------------------------|
| a) slew rate | b) CMRR | c) offset voltage | d) supply voltage rejection ratio |
|--------------|---------|-------------------|-----------------------------------|

iii) In order to work as a linear amplifier, a transistor must operate in

- | | | | |
|------------------|----------------------|---------------------|------------------|
| a) active region | b) saturation region | c) breakdown region | d) none of these |
|------------------|----------------------|---------------------|------------------|

iv) The number of pins of the IC741 op-amp is

- | | | | |
|------|-------|-------|-------|
| a) 8 | b) 10 | c) 12 | d) 14 |
|------|-------|-------|-------|

v) For proper operation of the transistor, its collector should have

- | | | | |
|------------------------|------------------------|--------------------|----------------------|
| a) proper forward bias | b) proper reverse bias | c) very small size | d) none of the above |
|------------------------|------------------------|--------------------|----------------------|

vi) The point of intersection of d.c. and a.c. load lines represent

- | | | | |
|--------------------|-----------------|-----------------|------------------|
| a) operating point | b) current gain | c) voltage gain | d) none of these |
|--------------------|-----------------|-----------------|------------------|

vii) The number of h parameters of a transistor is

- a) two b) four c) three d) none of these

viii) When the two input terminals of a practical difference amplifier are grounded then

- a) the dc output voltage is zero b) the ac output voltage is zero
c) there exists output offset voltage d) none of these

ix) The dimensions of h_{oe} parameter is

- a) mho b) ohm c) farad d) none of these

x) The bias of gate of a FET is

- a) reverse b) forward c) reverse as well as forward d) none of these

xi) An ideal OPAMP has

- a) infinite input impedance b) zero output impedance c) infinite voltage gain d) all of these

xii) A JFET can be called transistor of the type

- a) unipolar b) bipolar c) unijunction d) none of these

Group – B

(Short Answer Type Question)

3 x 5 = 15

Answer any three of the following

2. Establish the relation $\mu = r_d g_m$, where the notations have their usual meanings. [5]
3. Compare between a FET and BJT. Why is BJT called the current controlled device? [4+1=5]
4. State the characteristics of an ideal OPAMP. [5]
5. Draw the common-source drain characteristics of a JFET and explain its nature. Illustrate also the transfer characteristics. [3+2]
6. Describe the use of an OPAMP as summing amplifier. [5]

Group – C

(Long Answer Type Question)

3 x 15 = 45

Answer any three of the following

7. a) Develop the theory of action of an OPAMP as an integrator. Draw the circuit diagram of practical integrator. [5+2]
- b) The charging current of a 150pF capacitor is 100 μ A. What is the slew rate of the operational amplifier? [3]
- c) Write short notes on CMRR and input offset voltage. [3+2]
8. a) Explain the term “transistor biasing”. [3]
- b) Draw the circuit diagram for fixed bias, considering an n-p-n transistor in the CE configuration. Derive the expressions for its stability factors. [1+4]
- c) An n-p-n transistor is used as a CE amplifier and has the collector to base bias arrangement. Given $\beta = 99$, $V_{BE} = 0.7V$, $V_{CC} = 12V$, $R_L = 2K\Omega$ and $R_B = 100K\Omega$. Find the stability factors S , S' & S'' [7]
9. a) Develop the theory of action of an OPAMP as a differentiator. [5]
- b) Write a short note on Schmitt Trigger and also find the width of hysteresis loop. [5+2]
- c) Calculate the common mode gain of an operational amplifier from the following parameters: The differential voltage gain $A_d = 10^4$ and $CMRR = 2000$. [3]
- 10.a) Draw the equivalent circuit of a small signal single-stage low frequency transistor amplifier in CE mode. Using h- parameters, find expressions for current gain, input impedance, voltage gain and output impedance. [10]
- b) Draw the circuit diagram of an emitter follower. Why is it called an emitter follower? [5]
11. a) Explain with a circuit diagram the action of a Wien bridge oscillator. Find an expression for the frequency of oscillation. [5]
- b) Prove that the gain of the amplifier used in a Wien-bridge oscillator must be greater than 3 for sustained oscillations. [5]
- c) A Wien-bridge oscillator has a frequency of 1000 Hz and a capacitance of 100 pF. Find the resistance. If the amplifier gain is 10, obtain the ratio of the resistances in the other arms. [5]