

**U.G. 3rd Semester Examination - 2021****PHYSICS****Course Code : BPHSCCHC303****Course Title : Analog Systems and Applications**

Full Marks : 30

Time : 2 Hours

*The figures in the right-hand margin indicate marks.**Candidates are required to give their answers in their own words as far as practicable.*

1. Answer any **ten** questions:  $1 \times 10 = 10$
- What is Q point of a transistor?
  - What do you mean by virtual ground of an operational Amplifier?
  - Write down the Barkhausen criteria of oscillation.
  - What type of semiconducting material is preferred in construction of LEDs?
  - Why the reverse saturation current of a p-n junction diode is temperature dependent?
  - Define the Pinch-off voltage of a JFET.

- Define drift velocity and mobility of a charge carrier.
- Mention two different applications of a p-n junction diode.
- Why does most of the battery voltage applied across diode terminals appear across the depletion region of a p-n junction diode?
- State two differences between Zener breakdown and Avalanche breakdown.
- Define direct band gap semiconductor with an example.
- Write the drawbacks of fixed-bias circuit as an amplifier.
- Write advantages of MOSFET over JFET.
- What do you mean by positive feedback?
- Write two properties of a practical OPAMP.

2. Answer any **five** questions:  $2 \times 5 = 10$
- Draw and explain the volt ampere characteristic of a Solar cell.
  - What is meant by class A and class B amplifier?

- c) A Wien-bridge oscillator has a frequency of 1 kHz and a capacitance of 100 pF. Find the value of the resistance.
- d) Define Fermi level. What happens to it if penta-valent doping is done to an intrinsic semiconductor?
- e) What do you mean by depletion width of a p-n junction? How it depends upon the doping concentration?
- f) In a Zener regulator, the maximum power dissipation is 450 mW with break down voltage 9V. If the supply voltage varies from 12 to 18V, find the minimum value of series resistance.
- g) Define all the h-parameters for a C-E amplifier circuit. Mention their units.
- h) For a given OP-AMP, CMRR = 180dB, differential voltage gain = 400,000. What will be the common mode voltage gain?

3. Answer any **two** questions: 5×2=10

- a) In a BJT, why the base region is made thin and doping concentration of emitter region is kept high? The value of  $\alpha$  of a transistor is

0.99. What is the value of  $\beta$  of that transistor? Obtain the relation you use.

2+1+2

- b) i) With the help of a block diagram show that the input impedance of an amplifier circuit can be increased using negative feedback network.
- ii) What is close loop gain for an amplifier with open circuit gain 100, if 10% of the output voltage is fed back in such a manner that it is 180° out of phase with the input? 3+2
- c) With the help of a neat labelled circuit diagram explain the principle of operation of a R-C phase shift oscillator. 5

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