B.Sc. 4th Semester (Honours) Examination, 2022 (CBCS)
Subject: Physics
Paper: CC-X

(Analog Systems and Applications)

Time: 2 Hours   **Full Marks: 40**

The figures in the margin indicate full marks.

Candidates are required to give their answers in their own word as far as practicable.

Group-A

1. Answer any *five* questions from the following: **2×5=10**

    a) What type of materials are used to construct LED and why?

    b) Mention the importance of Q point of a transistor in CE mode.

    c) Define static and dynamic resistance of a junction diode.

    d) What is Barkhausen's criterion for sustainable oscillation?

    e) Define CMRR and slew rate of an operational amplifier.

    f) Explain how barrier potential will develop in a p-n diode.

    g) Differentiate between open loop and closed loop gain of an amplifier.

    h) Explain the concept of virtual ground.

    i) In what aspects Zener diode differs from a normal p-n junction diode?

    j) Explain different classes of transistor amplifier on the basis of operating point.

Group-B

2. Answer any *two* questions from the following: **5×2=10**

    a) Explain the operation of a bridge full-wave rectifier with proper circuit diagram. What are the merits of this circuit over a normal full-wave rectifier?

    b) "Negative feedback improves the input and output impedance of a transistor amplifier"--- explain.

c) What are the characteristics of a practical operational amplifier? Design a subtractor using it.

d) Establish that voltage divider bias is more stable than fixed bias.

Group-C

3. Answer any *two* questions from the following: **10×2=20**

a) i) With proper circuit diagram derive the frequency of oscillation of   Hartley oscillator.
ii) A phase shift oscillator is to be operated in the frequency range 40 Hz to 4 kHz. The variable capacitor has a range of 10 pF to 100 pF. Find the required value of resistors.

(6+4)

b) i) Explain the operation of a R-2R ladder D/A converter with proper circuit diagram.
ii) In a differential amplifier with two inputs the output is 2.01 mV when the inputs are 0.11 mV and 0.09 mV but the output is 2 mV when inputs are 0.01 mV and -0.01mV. Find CMRR of the amplifier.

(6+4)

c) i) Draw a neat circuit diagram of a single stage CE amplifier using p-n-p transistor and its h-parameter equivalent circuit.

ii) Obtain the expression of current, voltage and power gain for the above case.

(4+6)

d) i)   Explain how we can use zener diode as a voltage regulator for varying load resistance.

ii) State the principle of a photodiode and solar cell.   (6+4)