B.SC. 4th Semester (Honours) Examination, 2019 (CBCS)

Subject : Physics

Paper : SEC-2

(Electrical Circuits and Network Skills)

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

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

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

    (a) A current of 5A exists in a 10Ω resistance for 4 minutes. How many coulombs and how many electrons pass through any section of the resistor in this time?

    (b) Why don't birds sitting on a powerline get electrocuted?

    (c) Explain 'reactance' and 'impedance'.

    (d) What is the difference between neutral, ground and earth?

    (e) Explain the working of an ammeter.

    (f) What do you mean by circuit breaker?

    (g) Briefly mention two differences between 'single phase' and 'three phase' in a motor?

    (h) Why power transmission cables and lines are loose on electric poles and transmission lines?

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

    (a) Two bulbs of 80W and 100W are first connected in series and later in parallel circuit. In each case, which bulb will glow brighter? Explain.

    (b) An electric lift is required to raise a load of 5 tonne through a height of 30m. One quarter of electrical energy supplied to the lift is lost in the motor and gearing. Calculate the energy in kWhr supplied. If the time required to raise the load is 27 minutes, find the kW rating of the motor and the current taken by the motor. The supply voltage is 230V d.c. Assume the efficiency of the motor is 90%.

    (c) What is an isolated ground? Discuss how it is implemented.

    (d) (i) A platinum coil has a resistance of 3·146Ω at 40°C and 3·767Ω at 100°C. Find the resistance at 0°C and the temp coefficient of resistance at 40°C.

           (ii) What is power factor for a LCR series circuit.   3+2=5

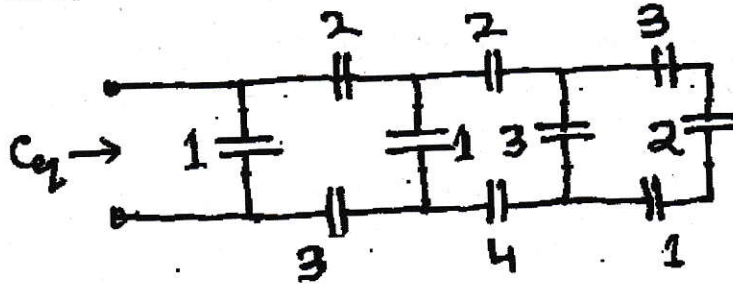   **Please Turn Over**

10×2=20

3. Answer *any two* of the following questions:

(a) (i) Briefly discuss about the $p - n$ junction diode explaining its principle of operation.

(ii) What do you mean by capacitance? Find the capacitance of the circuit shown in figure 1. All capacitances are in μF.   5+2+3=10

(b) (i) Draw the circuit diagram and explain the operation of a full wave rectifier.

(ii) The resistivity of a ferric-chromium-aluminium alloy is $51 \times 10^{-8} \Omega$m. A sheet of the material is 15cm long, 6cm wide and 0·014cm thick. Determine the resistance between the opposite ends and the opposite sides.

(iii) Two capacitors of 4μF and 12μF capacitances and each of working voltage rating of 24V are connected in series across a 24V battery. Calculate the charge and voltage across each of them.   3+3+4=10

(c) (i) What is a transformer? Discuss its principle of operation.

(ii) Briefly discuss the components and working principle of AC generator.

(iii) What is Ohm's law?   4+4+2=10

(d) (i) Draw the various electrical symbols for wire, switch and relay, ground, resistor, capacitor, inductor, power supply, meter, lamp, diode, motor and transformer.

(ii) What is ladder diagram? Why are they used? Explain giving example.   6+4=10