

3 & 5 SEM TDC ECNS (CBCS) SEC 3.1/5.1

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(Held in January/February, 2022)

PHYSICS

(Skill Enhancement Course)

Paper : SEC-3.1/5.1

(**Electrical Circuits and Network Skill**)

Full Marks : 40

Pass Marks : 16

Time : 2 hours

*The figures in the margin indicate full marks
for the questions*

1. Choose the correct answer : 1×4=4

(a) The number of electrons passing through a section of wire per second, when the wire carries a current of 1 A is ($e = 1.6 \times 10^{-19} \text{C}$)

(i) 0.625×10^{-19}

(ii) 1.6×10^{-19}

(iii) 1.6×10^{19}

(iv) 0.625×10^{19}

- (b) Which of the following should be used under no load conditions?
- (i) Isolator
 - (ii) Rewireable fuse
 - (iii) Circuit breaker
 - (iv) Air-break switch
- (c) In our home, the electrical appliances are connected
- (i) in parallel with source only if it is a high power appliance
 - (ii) in series with the source
 - (iii) some in series and some in parallel with the source
 - (iv) in parallel with the source
- (d) In a transformer, the number of turns in the primary is 500 and that of secondary is 5000. If the input voltage is 20V and frequency is 50 Hz, then at the output, we get
- (i) 200 V, 500 Hz
 - (ii) 200 V, 50 Hz
 - (iii) 10 V, 50 Hz
 - (iv) 10 V, 500 Hz

2. Answer the following (any four) : $2 \times 4 = 8$

(a) Two electric bulbs of 50 W and 100 W are given. Which one of the bulbs will be brighter when they are connected to DC main (i) in series and (ii) in parallel?

(b) Draw the electrical drawing symbols for (i) fuse and (ii) transformer.

(c) Discuss about the main functions of surge absorbers.

(d) What is the difference between solid and stranded cables? Mention their advantages over the other.

(e) What is motor? On what principle a DC motor works?

3. What do you mean by non-ohmic conductors? Draw the V-I graphs for two types of different non-ohmic conductors.

$1+2=3$

4. What is ladder diagram? Draw a ladder diagram showing a DC powered lamp that is controlled by a hand switch.

$1+2=3$

5. Discuss briefly about principle, construction and working of AC generator with schematic diagram.

3

6. Write down the differences between overhead system and underground system used in electrical transmission.

3

Or

Draw the schematics of star connection and delta connection used in three-phase domestic AC power supply.

7. On what principle an AC motor works? Write down briefly about its construction and working.

1+2=3

Or

Two resistances $12\ \Omega$ and $24\ \Omega$ are connected in parallel. The combination is connected in series to a third resistance of $6\ \Omega$ and a $20\ \text{V}$ battery with internal resistance of $1\ \Omega$. Find—

- (a) the current passing through the circuit;
(b) the potential drop across the parallel combination.

1½+1½=3

8. Deduce the transformer ratio. Discuss briefly about long distance transmission of AC by transformer.

2+2=4

Or

What is fuse? Discuss briefly about different types of fuse.

1+3=4

9. Discuss about the growth and decay of current in a circuit containing resistance and inductance. 2+2=4

Or

What do you mean by r.m.s. value or virtual value of AC? Derive its relationship with the peak value of AC. Express P_{av} in terms of E_v and I_v for an AC circuit containing pure resistance. 1+2+1=4

10. What is diode? What is the main function of $p-n$ diode? Explain the working of a full-wave rectifier with necessary circuit diagrams. 1+1+3=5
