

2022

3rd Semester Examination

PHYSICS (Honours)

Paper : SEC 1-T

[CBCS]

Full Marks : 40

Time : Two Hours

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

[Physics Workshop Skill]

Attempt Q.1, Q.2 and any *one* from the rest.

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

(i) A Zener diode has $V_z = 12$ Volt. The input voltage may vary from 22V to 40V and the load current from 20 mA to 100 mA. To hold the load voltage constant under all conditions, what should be the value of series resistance ?

(ii) What is the least count of a screw gauge if the minimum linear scale division is 0.5 mm and the circular scale markings are 200 divisions per 0.5 mm of the linear scale ?

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- (iii) Describe the use of sextant for the measurement of the height of a mountain.
- (iv) Explain the working principle of a power generation system.
- (v) Can a multimeter be used for measuring very low resistances ? What are the limitations in such measurements ?
- (vi) What are the different welding processes ?
- (vii) Write the differences between a regulated power supply and unregulated power supply.
- (viii) Write the basic principles of physics on which an electrical relay works.

2. Answer any **four** of the following :

5×4=20

- (i) A lever is used to lift 400 kg load with an effort of 40 kg. Show the positions of the effort, load and fulcrum clearly by drawing diagram. Assuming lever length of 20 meters. Which class of levers are you using ?
- (ii) Explain the different manufacturing methods : Casting, Foundry, Machining, Forming and Welding.
- (iii) Describe the advantages and disadvantages of welding over soldering. Compare the applications of both the processes.

- (iv) Explain (a) drilling process and (b) milling process. Under what circumstances would you use each of them ?
- (v) Draw the diagram and explain the operation of a relay based electronic switch.
- (vi) Describe the working of a regulated power supply with necessary circuit diagram.

Answer any **one** of the following : 10×1=10

- 3. (i) Draw a diagram and explain how a wheel is connected to a gear system.
 - (ii) State and explain five basic precautions that one should take in a workshop. What types of cloths are to be worn while working in a workshop ?
5+5
 - 4. (i) What do you understand by (a) Fixed (b) Movable and (c) Compound pulleys ? Explain with examples of each.
 - (ii) Draw the block diagram of a cathode ray oscilloscope (CRO) and explain in details the electron gun system and time base. 5+5
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OR

[Electrical Circuits and Network Skills]

Group - A

Answer any *five* of the following questions : $2 \times 5 = 10$

1. (a) Write down the relation between current and emf at primary and secondary coil of a transformer. Why primary coil is made from thick wire in case of step up transformer ?
- (b) A sinusoidal voltage of peak value 283 volt and frequency 50 Hz is applied to a series LCR circuit in which $L = 25.48 \text{ mH}$, $C = 796 \text{ } \mu\text{F}$, $R = 3 \text{ } \Omega$. Find, the power dissipated in the circuit and the power factor ?
- (c) Define Form Factor and Peak Factor of a sinusoidal alternating voltage.
- (d) Show that the current leads the emf by 90° , when an AC source is connected to a capacitor.
- (e) Write down working principle of a fuse. Which type of materials are used for fuse elements ?
- (f) What is surge protection in electrical circuit ?
- (g) What replacement is required to convert an AC generator to DC generator ?
- (h) What is active power in DC circuits, single phase and three phase AC circuits?

Group - B

Answer any *four* of the following questions : $5 \times 4 = 20$

2. (a) The plates of a $50 \mu\text{F}$ capacitor charged to $500 \mu\text{C}$ are connected through a resistance of $1.0 \text{ k}\Omega$. Find the charge remaining on the capacitor 1 sec after the connection is made. 5
- (b) An inductor ($L = 20 \text{ mH}$), a resistor $R = 100 \Omega$ and a battery of 10 Volts are connected in series. Find (i) the maximum current and (ii) the time elapsed before the current reaches 99% of the maximum value. 5
- (c) An alternating voltage $e = 200 \sin 314 t$ is applied to a device which offers an ohmic resistance of 20Ω to the flow of current in one direction, while preventing the flow of current in opposite direction. Calculate RMS value, average value and form factor for the current over one cycle. $2+2+1$
- (d) Estimate and draw the current-voltage relationship curve for a particular frequency in an AC circuit containing Inductor and external resistance in series. $3+2$
- (e) How can you increase the range of voltmeter and ammeter ? $2.5+2.5$
- (f) What do you mean by Ladder diagram ? What is a motor control circuit ? $3+2$

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Group - C

Answer any **one** of the following questions :

10×1=10

3. (a) Explain with diagram the working principle of a DC motor. Discuss its different parts. Explain with reasons which motor is better AC or DC ?

6+2+2

- (b) Write short notes on :

2.5×4

(i) Conduit

(ii) Cable Tray

(iii) Splices

(iv) Relay.
