

SECOND TERMINAL EXAMINATION

STD XII

PHYSICS

TIME : 3h

(Maximum marks : 70)

SECTION A

Answer all questions

Q1A (choose the correct option from the bracket) (5x1)

(i) P, Q, R & S are resistances of a Wheat stone's bridge 4 ohm, 6 ohm, 8 ohm and 20 ohm respectively. What should be added to S to balance the bridge.

- (a) 40 ohm in parallel (b) 30 ohm in series
(c) 30 ohm in parallel (d) 40 ohm in series

(ii) The maximum work done by an electric dipole is

- (a) $w = PE$ (b) $w = 2PE$ (c) $w = P/E$ (d) $w = E/P$

(iii) A fish which is at a depth of 12cm in water ($n=4/3$) is viewed by an observer on the bank of a lake. Its apparent depth as observed by the observer is

- (a) 3cm (b) 9cm (c) 12cm (d) 16cm

(iv) Einstein's photoelectric equation is

- (a) $E_{\max} = h\lambda - Q_0$ (b) $E_{\max} = h\nu - Q_0$ (c) $E_{\max} = hc/\lambda + Q_0$ (d) $E_{\max} = h\nu + Q_0$

(v) The half life of a radioactive substance is 4min. What fraction of initial substance is decayed after 20min?

- (a) $1/32$ (b) $1/16$ (c) $15/16$ (d) $31/32$

Q1B (Answer the following) (7x1)

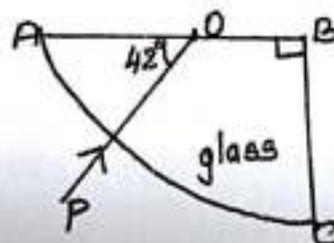
(i) Write Biot-Savart's law in the vector form

(ii) When do we call an ac circuit in resonance ?

(iii) A point charge of $10\mu\text{C}$ is placed at a height of 5cm above the centre of a square of edge 10cm. Calculate the electric flux emanating.

(iv) A proton moving with a speed of $4 \times 10^7 \text{ m/s}$ enters a magnetic field of 2T in a direction perpendicular to the field. Calculate the force experienced by the proton

(v) Complete the ray diagram.



(critical angle for glass air pair is 42°)

(vi) Name the phenomenon of light which illustrates the transverse nature of light.

(vii) What is the use of moderator in a nuclear reactor?

SECTION B

Answer all questions

Q 2

What are eddy currents? Write two methods to minimise this.

(2)

Q 3

(a) Derive the expression for capacitance of a parallel plate capacitor.

(2)

OR

(b) Using the equation $V = IR$, for ohmic conductors, derive the vector form of Ohm's law

(2)

Q 4

State Curie law for a paramagnetic material.

A rectangular coil having 50 turns and area 0.5m^2 is held at right angles to a uniform magnetic field of intensity $5 \times 10^{-5}\text{T}$. Calculate the magnetic flux passing through it.

(2)

Q 5

What do you mean by back emf of a motor? On what factor does it depend.

(2)

Q 6 (i) What do you mean by displacement current?

(ii) Name the electromagnetic radiation used for aircraft navigation.

(2)

Q 7 A biconvex lens of refractive index ($n=3/2$) having radii of curvature 20cm and 30cm is dipped in a liquid of refractive index $8/5$. Calculate its focal length.

(2)

Q 8 (i) What kind of source emits spherical wavefronts?

(ii) State any one difference between interference and diffraction of light.

(2)

Q 9 (i) Name an experiment or a phenomenon which proves the wave nature of particles.

(ii) State how de-Broglie wavelength of a moving particle varies with its linear momentum.

(2)

Q 10 (i) State the postulate of Bohr theory regarding the angular momentum of an electron.

(ii) The total energy of an orbiting electron around the nucleus of an atom is always negative. What is the significance of this?

(2)

Q 11 (a) (i) Write balanced equations for nuclear fission and nuclear fusion.

(ii) Draw a graph showing the variation of mass of a radioactive substance with time.

(2)

OR

(b) (i) Define mass defect and binding energy of a nucleus.

(ii) Draw a graph showing the variation of binding energy per nucleon with mass number.

Q 12 (i) What is meant by modulation? (ii) Name any two types of modulation.

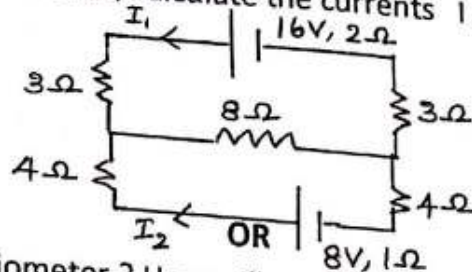
(2)

(2)

SECTION C

Answer all questions

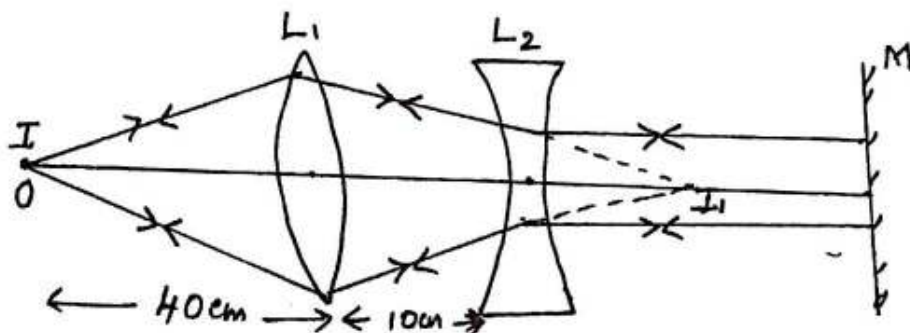
- Q 13 What is motional emf? State two factors on which it depends. (3)
- Q 14 Obtain the expression for motional emf. (3)
- Q 15 Derive the expression for the electric field intensity on the end on position of an electric dipole. (3)
- Q 15 Two batteries having emf 8v and 16V and internal resistances 1 ohm and 2 ohm respectively are connected as shown. Using Kirchoff's Laws of electrical networks, calculate the currents I_1 and I_2 (3)



- (b) What is a potentiometer? How will you use a potentiometer to find the internal resistance of a cell. Draw a neat circuit diagram (3)
- Q16 (a) For a regular prism prove that $n = \frac{\sin(A + \delta_m)/2}{\sin A/2}$, the terms have their usual meaning. (3)

OR

- (c) In the given figure are shown the positions of object O, image I, two lenses and a plane mirror. The focal length of convex lens is 20cm. Calculate the focal length of the other lens. (3)



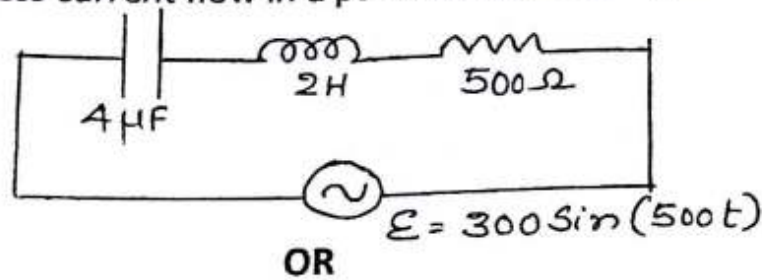
- Q17 (i) Show that at the polarising angle, the reflected and refracted rays are perpendicular to each other. (3)
- (ii) In single slit diffraction experiment, first minimum for wavelength 660nm coincides with first maximum of some other wavelength λ' . Find the value of λ' . (3)
- Q18 (i) Name the spectral series of hydrogen atom lie in the visible region (3)
- (ii) Calculate the longest wavelength of this series. (3)
- Q19 Draw the circuit diagram of a full wave rectifier. Explain its working and show the input and the output waveforms. (3)

SECTION D

Answer all questions

- Q 20 (a) (i) Using the given figure, find the phase difference between current and voltage. (3)
- (ii) State whether the current is leading or lagging behind the supply voltage. (3)

- (iii) Obtain the expression for resonant frequency.
 (iv) Why power less current flow in a pure inductive and pure capacitive circuit. (



OR

- (b) State Gauss's law? What is a Gaussian surface?

Using Gauss's law derive the expression for electric field intensity at a point due to an infinitely long line charge. (Diagram necessary)

Show graphically the variation of electric field intensity with distance from the line charge.

- Q21 (a) (i) Draw a labelled ray diagram of an image formed by a refracting telescope for normal use. Derive an expression for its magnifying power.

(ii) What is meant by resolving power of a telescope?

(ii) State any one method to increase the resolving power of an astronomical telescope.

OR

- (b) (i) State Huygen's wave theory.

(ii) Using this theory derive Snell's law of refraction.

(iii) In Young's double slit experiment how is the fringe width affected if the

1. Slits are brought closer.

2. Experimental set up is immersed under water.

- Q22 (a) (i) Differentiate between P-type and N-type semiconductors.

(ii) Explain forward and reverse biasing of a p-n junction.

(iii) Draw the V-I characteristics of p-n junction.

OR

- (c) (i) Draw a labelled circuit diagram of CE amplifier.

(ii) Show graphically how the output voltage vary with time when a sinusoid voltage is given in the input.

(iii) With the help of a diagram show how can you use several NANDgates to obtain an OR gate.