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INDIAN SCHOOL SOHAR
SECOND TERM EXAM- 2017
PHYSICS – THEORY

CLASS: XII **MARKS:70**
DATE:16 /11/2017 **TIME: 3 Hrs**

General Instructions:

1. All questions are compulsory.

2. There are 26 questions in all .Questions 1 to 5 carry one mark each, questions 6 to 10 carry two marks each, questions 11 to 22 carry three marks each. Question 23 is a value based question carrying four marks and questions 24 to 26 carry five marks each.

3. There is no overall choice. However, internal choice has been provided in one question of two marks, one question of three marks and all three questions of five marks each.

4. You have to attempt only one of the given choices in such questions.

5. Use of calculator is not permitted.

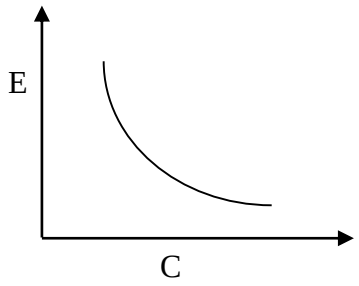
6. You may use the following physical constants wherever necessary

$C = 3X\ 10^{8}\ m/s$ $h = 6.626\ X10^{-34}\ Js$ $e = 1.6X\ 10^{-19}\ c$

$\frac{1}{4\pi\varepsilon o} = 9\ X\ 10^{9}\ Nm^2/c^2$ $\mu o = 4\pi\ X\ 10^{-7}\ T\ m\ A^{-1}$. $N_A = 6.023\ X10^{23}/mol$

SECTION-A

1. The graph shows the variation of total energy in a capacitor with the value of capacitance itself. Which of two- the charge on capacitor or potential used to charge it – is kept constant for this graph?



2. At what angle of incidence should the light beam strikes glass slab of refractive index 3,such that reflected and refracted rays are perpendicular to each other

3. The instantaneous current and voltage of an A.C circuit is given by I= 10 sin 314 t A and V= 50 sin 314 t V. What is the power dissipation in the circuit?

4. Two wires of equal lengths are bent in the form of two loops. One of loops is a square shaped where as other is circular. These are suspended in a uniform magnetic field and same current is passed through them. Which will experience greater torque? Why?

5. The given inputs A, B are fed to two inputs of NOR Gate. Draw the output waveform of gate.

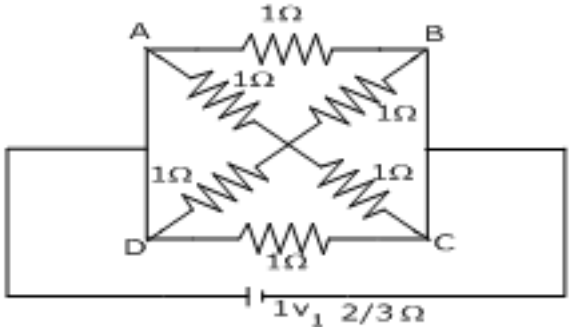
SECTION-B

6. State the reason, why Ga As is most commonly used in making of a solar cell.

7. Two charges 5×10^{-8}C and -3×10^{-8}C are placed at points A and B ,16cm apart. At what points on the line joining the two charges is the electric potential zero? Take potential at infinity to be zero.

8. Two large parallel thin metallic plates are placed close to each other. The plates have surface charge densities of opposite signs and of magnitude 20×10^{-12} C/m^2 . Calculate the electric field intensity (i) in the outer region of the plates and (ii) in the interior region between the plates.

9. Find the current drawn from a cell of emf IV and internal resistance 2/3Ω connected to the network



10. Draw a block diagram of a simple amplitude modulation. Explain briefly how amplitude modulation is achieved.

OR

10. Draw a block diagram of a detector of A.M. signal and briefly explain how the original signal is obtained from the modulated wave.

SECTION-C

11. In a series LCR circuit, define Q-factor at resonance? Derive an expression for it.

12.(a)Write any two characteristics of electromagnetic waves.
Identify the following electromagnetic radiations as per the wavelengths given below. Write one application of each. (i) 1 mm (ii) 1 nm.

13. State and explain Huygen's principle. Prove the law of refraction on the basis of Huygen's wave theory.

14. In a series LCR circuit connected to a variable frequency 230 V source. L = 5.0 H, C = 80μF, R= 40Ω.
(a) Determine the source frequency which drives the circuit in resonance.
(b) Obtain the impedance of the circuit and the amplitude of current at the resonating frequency.
(c) Determine the rms potential drops across the elements L and C of the circuit. Show that the potential drop across the LC combination is zero at the resonating frequency.

15. State Gauss theorem in electrostatics. Apply Gauss theorem to find the electric field strength near an infinite plane sheet of charge.

16. (a) Define the term ' specific resistance'
(b) Explain briefly about variation of resistance of metal and a semiconductor with temperature.

17. (a) Derive an expression for the magnetic field of a toroid.
(b) A toroid of 4000 turns has outer radius of 26cm and inner radius of 25 cm. If the current in the wire is 10 A, calculate the magnetic field of the toroid.

18. Draw the block diagram of line communication. Explain the function of each element.

19. On charging a parallel plate capacitor to a potential V, the spacing between the plates is halved, and a dielectric medium of $\varepsilon_r = 10$ is introduced between the plates, without disconnecting the d.c.source. Explain ,using suitable expressions,how the (i) capacitance (ii) electric field and (iii) energy density of the capacitor change.

20.A parallel beam of monochromatic light of wavelength 500 nm falls normally on a narrow slit and the resulting diffraction pattern is obtained on a screen 1m away. It is observed that the first minimum is at a distance of 2.5 mm from the centre of the screen. Find (a) the width of the slit.
(b) the distance of the second maximum from the centre of the screen .
(c) the width of the central maximum.

21.How is Huygens principle used to obtain the diffraction pattern due to a single slit ? Show the plot of variation of intensity with angle and state the reason for the reduction in intensity of secondary maxima compared to central maximum.

OR

21.What is an unpolarised light? Explain with the help of suitable ray diagram how an unpolarized light can be polarized by reflection from a transparent medium. Write the expression for Brewster angle in terms of the refractive index of denser medium.

22.(a) Draw the ray diagram for the formation of image by a compound microscope.
(b) A compound microscope consists of a objective lens of focal length 2.0 cm and an eyepiece of focal length 6.25 cm separated by a distance of 15 cm. How far from the objective should an object be placed in order to obtain the final image at (a) the least distance of distinct vision and
(b) What is the magnifying power of the microscope ?

SECTION -D

23. Some students in a lab were playing with bar magnets. They were throwning these magnets on the floor time and again and a few students were heating this magnets on the flame.Anil,the student of the same class objected the action of these students.When teacher came to know about action of students , he warned them not to repeat such a thing in future.
A) Why magnets are not thrown on the floor and not heated? Justify.
B) Comment on the attitude of the students playing with magnets.
C) What value are shown by Anil?

SECTION -E

24. Draw the graph showing the variation of angle of deviation
(a) D with variation of angle of incidence 'I' for a mono chromatic ray of light passing through a prism of refracting angle A.

(b) Derive the relation, $n = \dfrac{\sin(\frac{A+D}{2})}{\sin(A/2)}$

(c) A right angled isosceles glass prism has refractive index 1.5. Show that the ray of light incident normally on.
(i) One side of this prism, is deviated through 90^0.
(ii) Hypotenuse of this prism, is deviated through 180^0

OR

(a) Deduce the lens formula for a convex lens with the help of ray diagrams.
(b) The radii of curvature of the faces of a double convex lens are 10cm and 15cm. If focal length of the lens is 12 cm, find the refractive index of the material of the lens.

25 (a) Explain the terms diffusion and drift current.
(b) Explain how a P.N Junction diode can be used as half wave and a full wave rectifier?

OR

25. With proper circuit diagram, show the biasing of a NPN transistor. Explain the movement of charge carriers in this transistor. Explain briefly the function of junction transistor as an oscillator.

26. a)State the principle on which AC generator works.Draw a labeled diagram and explain its working .
b) A conducting rod held horizontally along east – west direction is dropped from rest from a certain height near the earth' s surface.Why should there be an induced emf across the ends of the rod ?Draw a plot showing the instantaneous variation of emf as a function of time from the instant it begins to fall.

OR

26.a) State the principle of step – up Transformer .
b) Describe briefly any two energy losses , giving the reasons for their occurrence in actual transformers.
c) A small town with a demand of 800 kW of electric power at 220V is situated 15 km away from an electric plant generating power at 440 V. The resistance of the two wire line carrying power is 0.5 ohms per km. The town gets power from the line through a 4000-220 V step-down transformer at a sub-station in the town.
(i) Estimate the line power loss in the form of heat.
(ii) How much power must the plant supply, assumimg there is negligible power loss due to leakage?