IITERM EXAMINATION : 202021

Class : XII (ISC)

Time : 3 hrs. **PHYSICS PAPER - I (THEORY)** M.M.: 70

(Condidates are allowed additional 15 minutes for only reading this paper. They must NOT start writing during this time.)

1) *All questions are compulsory.*
2) *This question paper is divided in 4 section A, B, C and D as follows:*
   - i) *Section A: Question number 1 is of twelve marks. All parts of this question are compulsory.*
   - ii) *Section B: Question number 2 to 12 carry 2 marks each with two questions having internal choice.*
   - iii) *Section C: Question numbers 13 to 19 carry 3 marks each with two questions having internal choice.*
   - v) *Section D: question numbers 20 to 22 are long answer type questions and carry 5 marks each. Each question has an internal choice.*
3) *The intended marks for questions are given in brackets [ ] .*
4) *All working, including rough work, should be done on the same sheet as and adjacent to the rest of the answer.*
5) *A list of useful physical constants is given at the end of this papers.*
6) *A simple scientific calculator without a programmable memory may be used for calculations.*

SECTION 'A'

Answer all questions

Q. 1. A) Choose the correct alternative (a), (b), (c) or (d) for each of the questions given below: [5×1=5]

i) Which of the following is true for ferromagnetic :

a) $\mu_r > 1$ b) $\mu_r >> 1$ c) $\mu_r > 1$ d) $\mu_r = 0$

ii) The Biot-savart's law in vector form is :

a) $d\vec{B} = \frac{\mu_0}{4\pi}\frac{d\ell\left(\vec{i}\times\vec{r}\right)}{r^3}$ b) $d\vec{B} = \frac{\mu_0}{4\pi}\frac{i\left(\vec{r}\times\vec{d\ell}\right)}{r^2}$

c) $d\vec{B} = \frac{\mu_0}{4\pi}\frac{i\left(\vec{d\ell}\times\vec{r}\right)}{r^3}$ d) $d\vec{B} = \frac{\mu_0}{4\pi}\frac{i\left(\vec{d\ell}\times\vec{r}\right)}{r^2}$

iii) Sensitivity of a moving coil galvanometer can be increased by :

a) increasing number of turns
b) increasing magnetic field intensity B.
c) increasing area of the coil
d) All of the above

iv) The dimensional formula for impedance is :

a) $[ML^2T^2A^2]$ b) $[ML^2T^3A^2]$
c) $[ML^2T^2A^1]$ d) $[ML^2T^2A^3]$

v) When a 100W-240V bulb is operated at 200 V the current in it is :

i) 35 A ii) 0.42 A iii) 0.50 A iv) 0.58A

B) Answer the following questions to the point and briefly : : [7×1=7]

i) Write an expression for the magnitude of the magnetic field $\vec{B}$ at the centre of a circular coil of N turns.
ii) What is the resistance of an ideal voltmeter?
iii) State the SI unit of magnetic dipole moment, indicating its direction.
iv) Define curie temperture.

v) At resonance, what is the relation between impedance of a series LCR circuit and its resistance R ?

vi) State Obm's law

vii) Find the focal length and nature of a lens whose optical power is -50.

SECTION 'B'
(Answer all questions)

Q.2. Two lenses having power +2.5D and -4D are kept in contact. What is the focal length of this combination? [2]

Q.3. State Ampere's circuital law.. [2]

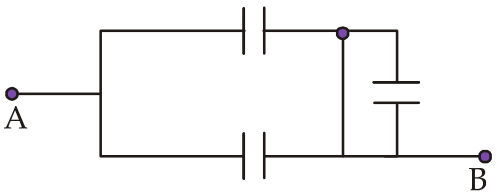
OR

Obtain magnetic flux density $\vec{B}$ at the centre of circular coil of radius R. having single turns, when a current I flow through it.

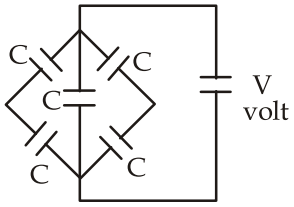
Q.4. With the help of diagram derive the mirror formula for a concave mirror. [2]

Q.5. State Ampere's circuital law . [2]

Q.6. Find equivalent capacitance between A and B. [2]



Q.7. Find total energy in the combination of capacitor. [2]



Q.8. An AC generator generates a voltage 'V' gien by V=311 sin (100πt) volt. Find the rms value of the voltage generated. [2]

Q.9. Name the part of the electromagnetic spectrum which is : [2]

i) suitable for radar systems used in aircraft navigation.

ii) produced by bombarding a metal target with high speed electrons.

Q.10. What are equipotential surfaces give any two examples.

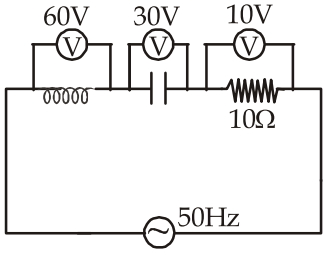
Q.11. State the factors on which the deviation produced by a prism depends. [2]

Q.12. Derive $\mu_r = 1 + \chi$ [2]

SECTION-C
Answer all questions

Q.13. Derive lens makers formula. [3]

Q.14. AC circuit has a resistance, capacitor and an inductance connected in series as shown below calculate the i_{rms} and power factor in the circuit also find i_{rms}. [3]

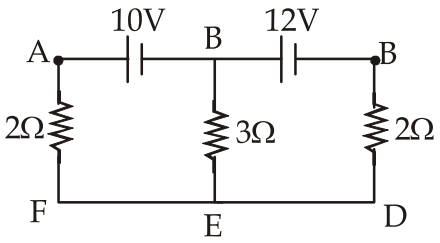


Q.15. A Helium nucleus (charge +2e) completes one round of a circle 0.8 m in 2s. Find the magnetic field at the centre of the circle. [3]

Q.16. Draw a labelled circuit diagram of potentiometer to measure internal resistance of a cell. Write the working formula. [3]

Q.17. Obtain an expression for the Torque acting on an electric dipole placed in a uniform electric field . Write also its vector form. [3]

Q.18. Find current in each branch. [3



Q.19. A 200 turn coil of self inductance 20 mH carries a current 4mA. Find the magnetic flux linked with each turn of coil. [3]

OR

State and explain faraday's law of electromagnetic induction. What is the significance of the negative sign in the first law?

SECTION-D

Answer all questions

Q.20. For any prism, show that the refractive index of its material is given by

$n = \dfrac{\sin\dfrac{(A+\delta m)}{2}}{\sin A/2}$. Draw graph showing variation of δm with 'i' . [5]

OR

A small air bubble is entraped in a sphere of radius 4 cm at a distance of 1 cm frm the centre of sphere. Where will the bubble appear when seen through the surface :

a) nearest to the bubble .

b) farthest from the bubble ? take $\mu_g = 1.5$

Q.21 Show that the magnetic field at the axis of a current carrying circular loop is

$B = \dfrac{\mu_0 NIa^2}{2(a^2+x^2)^{3/2}}$ with proper diagram. [5]

OR

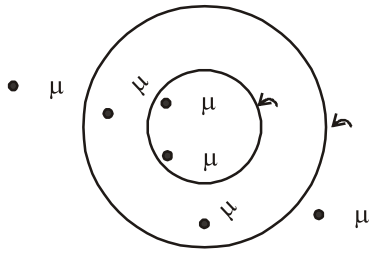
Using diagram derive the expression of motional emf developed in conductor of length ℓ moving with velocity v perpendicular to uniforms magnetic field B. Obtain the relation for mechanical power $P = \dfrac{B^2\ell^2V^2}{R}$. R is total resistance of circuit.

Q.22. a) Show that the average power dissipated per cycle in an AC circuit is given by P. $V_{rms} \times i_{rms} \times R/Z$
Where R=resistance of circuit Z= impedance [5]

b) Prove that power dissipated in the ideal resistor is connected to AC source is V^2_{eff}/R .

OR

a) State Gauss's Theorem. What is a Gaussian surface. Write the most important property of a Gaussian surface. Find ratio of flux linked with sphere s_1 and s_2 as shown in the diagram.



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