Avinashilingam Institute for Home Science and Higher Education for Women
(Deemed to be University under Category 'A' by MHRD, Estd. u/s 3 of UGC Act 1956)
Re-accredited with 'A+' Grade by NAAC. Recognised by UGC Under Section 12B
Coimbatore - 641 043, Tamil Nadu, India

Bachelor's Degree Examination – July 2020
IV Semester

Class : II B.Sc. **Time: 3 Hours**
Major : Physics **Max. Marks: 100**

18BPHC11 Electromagnetism
Part A **10 x 1 = 10**

Choose the Correct Answer

1. Consider two parallel conductors carrying current flowing in the same direction. The conductors will experience
   a. attraction b. repulsion
   c. no mutual force d. none of the above

2. The magnetic field at the centre of a current carrying circular loop is _____
   a. $B = \frac{\mu_0 I}{2R}$ b. $B = \frac{\mu_0 I}{2\pi R}$
   c. $B = \frac{\mu_0 I}{2\pi R^2}$ d. $B = \frac{1}{2\mu\pi R}$

3. The direction of induced emf in a circuit is given by
   a. Lenz's law b. Fleming's left hand rule
   c. Faraday's law d. none of the above

4. The unit of inductance is Henry and is equal to
   a. $\frac{Weber}{metre}$ b. $\frac{Weber}{Ampere}$
   c. $\frac{Ohms}{Hz}$ d. none of the above

5. Unit of RC is
   a. Ohm b. Volt
   c. Seconds d. Ampere

6. Energy stored in a capacitor during charging is
   a. $\frac{1}{2}CV^2$ b. $\frac{1}{2}QV^2$
   c. $\frac{1}{2}C^2V$ d. $\frac{1}{2}Q^2V$

7. The series resonant frequency f_r is
   a. $\frac{1}{2\pi\sqrt{LC}}$ b. $\frac{1}{2\pi}\sqrt{\frac{L}{C}}$
   c. $\frac{\sqrt{LC}}{2\pi}$ d. $\frac{1}{\sqrt{2\pi LC}}$

8. The capacitative reactance of a coil with capacitance C and operated in ac frequency ω is
   a. $\frac{1}{\omega c}$ b. ωC
   c. $\frac{C}{\omega}$ d. $i\omega c$

9. Wave equation for electric field $\vec{E}$ states that

a. $\nabla^2\vec{E} = \frac{1}{\varepsilon_0\mu_0}\frac{\partial^2 E}{\partial t^2}$ b. $\nabla^2\vec{E} = \varepsilon_0\mu_0\frac{\partial^2 E}{\partial t^2}$

c. $\nabla^2\vec{E} = \frac{1}{\sqrt{\varepsilon_0\mu_0}}\frac{\partial^2 E}{\partial t^2}$ d. $\nabla \times \vec{E} = \varepsilon_0\mu_0\frac{\partial^2 E}{\partial t^2}$

10. The velocity with which the electromagnetic wave propagates in free space is

a. $\frac{1}{\sqrt{\varepsilon_0\mu_0}}$ b. $\sqrt{\frac{\mu_0}{\varepsilon_0}}$

c. $\sqrt{\varepsilon_0\mu_0}$ d. $\varepsilon_0\mu_0$

Part B **5 x 6 = 30**

Answer ALL questions
Each answer should not exceed 400 words or two pages

11.a. Apply Biot – Savart law to determine the magnetic field due to a long straight wire carrying current

(or)

11.b. Explain the force experienced by two conductors carrying current in the same direction.

12.a. Explain self-inductance and mutual inductance.

(or)

12.b. Explain Fleming's right hand rule of electromagnetic induction.

13.a. Derive the expression for charging of a condenser through R .

(or)

13.b. Arrive at an expression for the decay of current in $C - R$ circuit.

14.a. Differentiate between impedance and reactance in an ac circuit.

(or)

14.b. Discuss the mean and rms value of alternating current.

15.a. Briefly describe Poynting's theorem.

(or)

15.b. Explain vacuum displacement current

Part C **5 x 12 = 60**

Answer ALL questions
Each answer should not exceed 800 words or four pages

16. a. Describe briefly the principle, construction and operation of moving coil galvanometer.

(or)

16.b. Obtain an expression for the magnetic field along the axis of a circular current carrying coil and show the variation of field along the axis.

17. a. State and explain Faraday's law and Lenz's law of electromagnetic induction.

(or)

17. b. Explain what is meant by coefficient of mutual induction. Describe a method of finding it experimentally

18.a. Derive the equations for the growth and decay of current in a simple $L - R$ circuit.

(or)

18b. Describe with theory the method of measuring high resistance by the method of leakage.

19.a. Derive an expression for power in an AC circuit containing LCR compound.

(or)

19.b. An alternating voltage of 110V, 50 cycles is applied to a circuit which contains an inductance of 0.02 henry and a resistance of 10 ohm in series. Determine the current and the phase lag.

20.a. State and explain Maxwell's equations. Obtain the wave equation for electric field $\vec{E}$.

(or)

20.b. Paraffin has relative permittivity $k = 2.1$. Find the index of refraction for paraffin and also the velocity of wave in paraffin. [Hint: Paraffin is a non-ferrous material)

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