Reg. No. : ....

Name : ....

Sixth Semester B.Sc. Degree (C.B.C.S.S.-OBE – Regular/Supplementary/ Improvement) Examination, April 2024
(2019 to 2021 Admissions)
CORE COURSE IN PHYSICS
6B13 PHY : Electrodynamics and Circuit Theory

Time : 3 Hours
Max. Marks : 40

SECTION – A

Short answer. **Six** questions. Answer **all** questions. **Each** question carries 1 mark.

1. What is the differential form of Faradays law ?

2. Which is the extra term introduced by Maxwell in order to correct the Ampere's law ?

3. Define Poynting theorem.

4. What is super position theorem ?

5. What is transient current ?

6. A series L-C-R circuit will have unity power factor if operated at a frequency of _____

(6×1=6)

SECTION – B

Short essay. Eight questions. Answer **any six** questions. **Each** question carries 2 marks.

7. How did Maxwell fix Ampere's law ?

8. Derive the continuity equation of charges.

9. What are gauge transformations ? Write down Lorentz gauge condition.

10. Define a plane wave. Write the general expression for an electric field in free space.

11. Show that magnetic components of an electromagnetic wave satisfies wave three dimensional wave equation in free space.

P.T.O.

12. How to Thevenize a given circuit ?

13. State explain maximum power transfer theorem.

14. Show that in pure capacitive circuit A.C current leads the applied voltage by $\frac{\pi}{2}$ degree.

(6×2=12)

SECTION – C

Problems. Six questions. Answer **any four** questions. **Each** question carries 3 marks.

15. Find the energy stored in the toroidal coil with rectangular cross section inner radius a outer radius b, height h having N turns.

16. A coil of resistance 100 Ω is placed in a magnetic field of $1\,mWb$. The coil has 100 turn and a galvanometer 400 Ω resistance is connected in series with it. Find the average e.m.f. and the current if the coil is moved in $\frac{1}{10}^{th}$ second from the given field to a field of 0.2 mWb.

17. A plane polarised electromagnetic waves in air is given by $E(x, y) = 5\hat{j}e^{i(3x-4z)}$. Find the frequency and wave length of the wave.

18. A plane polarised electromagnetic wave $E(z) = 10 \cos (8z - \omega t)\hat{i}$ incident normally on plane dielectric boundary having refractive indices ($n_1 = 1.6$ and $n_2 = 1$). Show that R + T = 1.

19. Use Thevenins theorem to find the current through 5 Ω resistor in the following circuit.
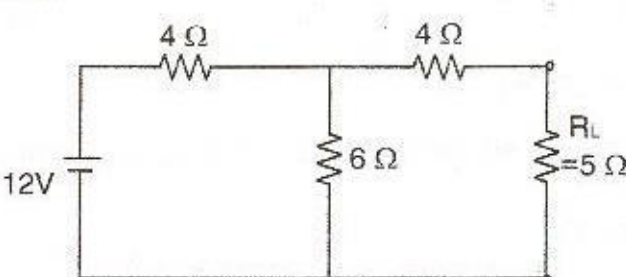
20. A coil takes a current of 6 Amp when connected to a 24-volt d.c supply. To obtain the same current with 50-Hz A.C supply, the supply voltage required was 30 V. Calculate the inductance and the power factor of the coil. (4×3=12)

SECTION – D

Long Essay. Four questions. Answer **any two** questions. **Each** question carries 5 marks.

21. State Poynting theorem. Derive its mathematical expression and calculate the average value of Poynting vector.

22. Derive the reflection (R) and transmission (T) coefficients in the case of normal incident and show that R+T = 1.

23. State Norton's Theorem. With the help of a neat diagram explain how a circuit can be Nortonized.

24. Explain A.C through pure resistive and pure inductive circuit separately, find out the relation between current and voltage in each circuit and also calculate average power per cycle in each circuit.

(2×5=10)