E 7199 (Pages : 4) Reg. No.....

Name.....

B.Sc. DEGREE (C.B.C.S.S.) EXAMINATION, MARCH 2014

Fourth Semester

Core course – ELECTRICITY AND ELECTRODYNAMICS

(Common for B.Sc. Physics Model I, B.Sc. Physics Model II, B.Sc.Physics – EEM, B.Sc. Physics – Instrumentation)

(2011 Admission onwards)

Time : Three Hours Maximum Weight : 25

Part A (Objective Type Questions)

Answer **all** *questions.*

Weight 1 *for each bunch.*

Bunch I

Chose the most appropriate alternative :

1. At the critically damped growth, the charge increases in a LCR circuit without any oscillation to the maximum value _____.

   a) Rapidly. (b) Smoothly.

   (c) Immediately. (d) In a very short interval of time.

2. The power factor can be improved by connecting a _____ across the inductance in an a.c. circuit.

   (a) Capacitor. (b) Resistor.

   (c) Diode. (d) Transistor.

3. A vector problem can be reduced to a scalar problem if the _____ is determined instead of field.

   (a) Charge. (b) Potential.

   (c) Current. (d) Resistance.

4. Ballistic galvanometer is used to measure _____.

   (a) Force. (b) Current.

   (c) Charge. (d) Capacitance.

Turn over

Bunch II

5. A moving coil galvanometer can be used as a BG if :
   (a) The moment of inertia of moving system is large.
   (b) The moment of inertia of moving system is small.
   (c) There is no moment of inertia for moving system.
   (d) All of these.

6. A voltage source with infinite internal resistance is considered as ideal constant _____ source.
   (a) Voltage. (b) Current.
   (c) Both current and voltage. (d) None of these.

7. The field inside the cavity of a conductor is _____.
   (a) Static. (b) Infinite.
   (c) Ballistic. (d) Zero.

8. The average value of an alternating current becomes _____ during one complete a.c. cycle.
   (a) Infinite. (b) Less than one.
   (c) Zero. (d) Maximum.

Bunch III

9. Ballistic reduction factor of the galvanometer is known as :
   (a) Dead beat. (b) Ballistic action.
   (c) Figure of merit. (d) None of these.

10. Which of the following has a high internal resistance?
   (a) A varying source. (b) A constant voltage source.
   (c) A constant current source. (d) A varying current source.

11. Maxwell's equation predicts the propagation of _____ through free space with the velocity of light.
   (a) Matter waves. (b) Phonons.
   (c) EM waves. (d) Photons.

12. Inductors used to regulate alternating current is _____.
   (a) Choke oil. (b) Transformer.
   (c) Triac. (d) Diac.

Bunch IV

13. At resonance the resultant voltage across the inductor and capacitor becomes :

(a) High. (b) Low.

(c) Zero. (d) None of these.

14. Gauss divergence theorem is on _____.

(a) Divergence of voltage. (b) Charge density.

(c) Magnetic field. (d) Electric field.

15. The Poynting vector gives the flux of _____ flowing out through a closed surface in an EM field.

(a) Total charge. (b) Total magnetic field.

(c) Total electric field. (d) Total energy.

16. Which of the following increase with frequency?

(a) Inductive reactance. (b) Capacitive reactance.

(c) Impedance. (d) None of these.

(4 × 1 = 4)

Part B

Answer any **five** *questions.*

Weight 1 *each.*

17. Explain in resonance in LCR circuits.
18. What is the logarithmic decrement for a BG?
19. State and explain maximum power transfer theorem.
20. What is Laplace equation?
21. What is an equi potential surface? Give an example.
22. State Poynting theorem.
23. Write down the equation of a plane polarized one dimensional wave.
24. What is meant by Skin effect?

(5 × 1 = 5)

Part C

Answer any **four** *questions.*

Weight 2 *each.*

25. With what capacitance of a capacitor in series with a coil of inductance 5 mH and resistance 0.5 ohm will the circuit oscillate with frequency of 1 kHz?

26. An alternating e.m.f. of 200 V, 50 Hz is applied to a capacitor in series with a 20 V, 5 W lamp. Find the capacitance?

27. How can a voltage source be converted into equivalent current source and vice versa?

28. Two identical drops are charged to the same potential V. Find the new potential if the two drops coal ease into one drop?

29. Calculate the value of Poynting vector at the surface of sun if the power radiated by sun is 3.8×10^{26} Watts while its radius is 7×10^{8} m.

30. In a plane EM wave, the electric field oscillates with an amplitude 48 Vm^{-1} and frequency 2×10^{10} Hz. Find its wavelength and the average energy density in the magnetic field?

$(4 \times 2 = 8)$

Part D

Answer any **two** *questions.*

Weight 4 *each.*

31. Discuss peak value, r.m.s. value and average value of a.c. and obtain relation between them. Derive expression for the power in an a.c. circuit.

32. State and prove Gauss theorem. Use it to find the electric field due to a charged spherical conductor.

33. Obtain expressions for the average energy and momentum of an EM wave.

$(2 \times 4 = 8)$