Code No. 1503 / E

FACULTY OF SCIENCE

B. Sc. III-Year Examination, March / April 2014

Subject : Physics

Paper – III : Electricity, Magnetism and Electronics

Time : 3 Hours **Max. Marks : 100**

Section – A (4 x 15 = 60 Marks)

Note: Answer all questions.

1 (a) State and prove Gauss's law in electrostatics. Apply it to calculate the electric field Intensity due to uniformly charged spherical conductor. (2+4+9)

OR

(b) Show that capacitance of parallel plate capacitor depends on geometrical parameters and permittivity. Deduce an expression for capacitance of parallel plate capacitor when a dielectric slab of thickness t and dielectric constant k is introduced between the plates. (5+10)

2 (a) Describe construction, working and theory of Lawrence cyclotron. Derive an expression for the energy of a particle accelerated by cyclotron. (6+5)

OR

(b) Explain the terms of self and mutual inductance. Show that coefficient of coupling between two coils is $M = K\sqrt{L_1 L_2}$. Explain the significance of coupling. (4+8+3)

3 (a) Give the detailed theory of LCR series circuit carrying alternate current and explain the resonance condition. (12+3)

OR

(b) What is the difference between conduction current and displacement current? Write down Maxwell's equation in integral form and convert them into differential form. (3+6+6)

4 (a) In the case of half wave rectifier, derive expressions for (5+5+5)

(i) Average and r.m.s value of output current

(ii) Efficiency (iii) Ripple factor

OR

(b) What do you mean by Feedback? Explain negative and positive feedback. Explain the Barkhausen criterion for oscillations. (4+3+3+5)

Section – B (4 x 5 = 20 Marks)

Note: Answer any **four** questions.

5 Determine mechanical stress on the surface of charged conductor.

6 Find the relation between susceptibility and dielectric constant.

7 Derive expression for force between the plates of condenser when the charge remains the same.

8 What are uses of Hysteresis curve? Why I-H curve is called hysteresis curve?

9 Write the advantages of Synchro-Cyclatron over cyclotron.

10 Deduce an expression for self induction of a toroid.

11 Find an expression for velocity of E.M. wave in a dielectric medium in terms of refractive index.

12 Explain how Zener diode acts as voltage stabilizer.

Section – C (4 x 5 = 20 Marks)

Note: Answer any **four** questions.

13. Calculate potential to which a spherical conductor of radius 1m has to be raised in order that the electro static pressure may be equal to twice the atmospheric pressure. (atmospheric pressure is 1 Pascal).
14. An iron road of length 25cm and cross sectional area 4 sq.mm is introduced into solenoid having 25 turns per cm. If solenoid carries the current of 2 ampere for which μ of iron is 400. Find the magnetic moment of iron.
15. A current of 1 amp is flowing in a circular coil of radius 10 cm 20 turns calculate the intensity of magnetic field at a distance 10 cm on the axis of coil.
16. A coil has 600 turns with a self inductance 100mH. Find the self inductance of another coil of same type which posses 500 turns.
17. A P-N diode is used in half wave rectifier with load resistance 1 KΩ. If forward resistance is 5Ω. Calculate efficiency of rectifier.
18. In a transistor base current and emitter currents are 1 mA and 9mA respectively calculate amplification factors in CB and CE configuration.
19. Voltage gain of amplifier without feedback is 60dB decreases to 40 dB with a feedback calculate the feedback factor.
20. If two parallel conductors separated by 20 cm in free space carry 20 ampere and 40 ampere currents respectively determine magnetic induction at midpoint of line joining the conductors.

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