NOTE: Attempt all questions of Section-A by filling the corresponding bubble on the MCQ ANSWER SHEET and return it to the Superintendent within given time, even if you have not attempted any question.
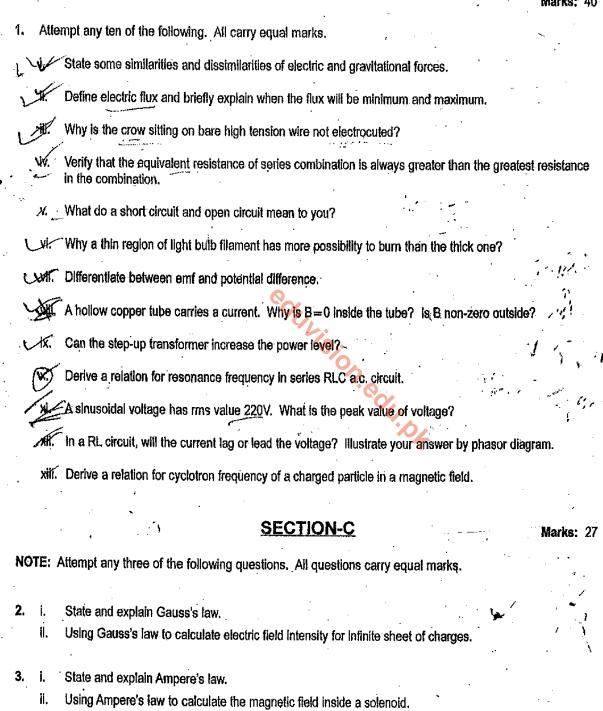
Time: 20 Minutes   **SECTION-A**   Marks: 18

1. Some charge is being given to conductor. Then it's potential .... A) is maximum at surface, B) is maximum at centre, C) remains same throughout the conductor, D) is maximum somewhere between surface and centre

2. Electric potential of earth is taken to be zero because the earth is good .... A) semiconductors, B) conductors, C) insulators, D) dielectric

3. When proton is accelerated by a potential difference of 1KV, kinetic energy will be .... KeV. A) 1840, B) 1/1840, C) 1, D) 920

4. A one microfarad capacitor is subjected to 4000V potential difference. The energy stored in it is .... A) 8 j, B) 16 j, C) 4×10^{-3}, D) 2×10^{-3}

5. 10^6 electrons are moving through a wire per second. The current developed is .... A) 1.6×10^{-19}A, B) 1.6×10^{-13}A, C) 10^6A, D) 1A

6. When a wire is stretched and its radius becomes r/2 then its resistance will be .... A) 16R, B) 4R, C) 2R, D) 0

7. A photon while passing through a magnetic field is deflected towards .... A) north pole, B) south pole, C) are ionized, D) none of these

8. The torque in the coil can be increased by increasing .... A) number of turns, B) current and magnetic field, C) area of coil, D) all of these

9. One weber is equal to .... A) N.A^2/m, B) N.m^2/A, C) N.A/m, D) N.m/A

10. The force on a charge particle moving parallel to magnetic field is .... A) maximum, B) minimum, C) zero, D) none

11. Ampere's law is applicable to .... A) circular path, B) rectangular path, C) to any path, D) none

12. The unit of permeability of free space is .... A) T.m/A, B) T.m^2/A, C) T.m/A^2, D) none

13. What is the coefficient of mutual inductance when the magnetic flux changes by 2×10^{-2} wb and change in current is 0.01A? A) 2H, B) 3H, C) 0.5H, D) zero

14. The induced emf in a coil is proportional to .... A) magnetic flux through the coil, B) rate of change of magnetic flux through the coil, C) area of the coil, D) product of magnetic flux and area of the coil

15. Eddy current is produced when .... A) a metal is kept in varying magnetic field, B) a metal is kept in steady magnetic field, C) a circular coil is placed in a steady magnetic field, D) a current is passed through a circular coil

16. Thermocouple is an arrangement of two different metals to convert .... A) heat energy into electrical energy, B) chemical energy into electrical energy, C) mechanical energy into electrical energy, D) electrical energy into heat energy

17. By twicing the frequency, the capacitive reactance will become .... A) same, B) double, C) half, D) none

18. Weber per second is equal to .... A) joule, B) volt, C) tesla, D) none of these

$$\frac{wb}{6} = \frac{T \cdot m^2}{t} = \frac{N \cdot m^2}{} = \frac{Nm}{} = J \quad \therefore \, 0 \perp$$

Time: 2 Hours 40 Minutes

SECTION-B

Marks: 40

1. Attempt any ten of the following. All carry equal marks.

i. State some similarities and dissimilarities of electric and gravitational forces.

ii. Define electric flux and briefly explain when the flux will be minimum and maximum.

iii. Why is the crow sitting on bare high tension wire not electrocuted?

iv. Verify that the equivalent resistance of series combination is always greater than the greatest resistance in the combination.

v. What do a short circuit and open circuit mean to you?

vi. Why a thin region of light bulb filament has more possibility to burn than the thick one?

vii. Differentiate between emf and potential difference.

viii. A hollow copper tube carries a current. Why is B=0 inside the tube? Is B non-zero outside?

ix. Can the step-up transformer increase the power level?

x. Derive a relation for resonance frequency in series RLC a.c. circuit.

xi. A sinusoidal voltage has rms value 220V. What is the peak value of voltage?

xii. In a RL circuit, will the current lag or lead the voltage? Illustrate your answer by phasor diagram.

xiii. Derive a relation for cyclotron frequency of a charged particle in a magnetic field.

SECTION-C

Marks: 27

NOTE: Attempt any three of the following questions. All questions carry equal marks.

2. i. State and explain Gauss's law.
   ii. Using Gauss's law to calculate electric field intensity for infinite sheet of charges.

3. i. State and explain Ampere's law.
   ii. Using Ampere's law to calculate the magnetic field inside a solenoid.

4. i. Explain the phenomenon of self-induction. State the factors which determine the value of self-induction.
   ii. Find the self-inductance of a 30cm long solenoid of radius 0.08cm and 500 loops if it is air filled.

5. Write notes on any two of the following:
   i. Kirchhoff's law   ii. Transformer   iii. Energy stored in an inductor