SUMMER FIELDS . (SA-I)

Series.	K I	R II	M III	GIV

Roll No.								

Code No.-1/1/2

Candidate must write the Code No. on the title page of the answer book.

PHYSICS.

- Please check that this question paper contains...4... printed pages.
- Code number given on the right hand side of the question paper should be written on the title page of the answer-book by the candidate.
- Please check that this question paper contains 26 questions.
- Please write down the Serial Number of the question before attempting it.

FIRST TERM EXAMINATION 2015-16

SUBJECT CODE-042

Time Allowed: 3 hrs **Maximum Marks: 70**

General Instruction:

(i) There are 26 questions in all.All questions are compulsory.
(ii) This question paper has five sections ;Section A, Section B, Section C, Section D and Section E.
*(iii) Section **A** contains **five** questions of **one** mark each, Section **B** contains **five** questions of **two** marks each,*
*Section **C** contains **twelve** questions of **three** marks each, Section **D** contains **one** value based question of **four** marks and section **E** contains **three** questions of **five** marks each.*
(iv) There is no overall choice. However, an internal choice has been provided in one question of two marks, one question of three marks and all the three questions of five marks weightage.You have to attempt only one of the choices in each questions.
(v)You may use the following physical constants wherever necessary:

$c = 3X\ 10^{8}$ m/s Mass of electron $=9.1X\ 10^{-31}$kg
$h = 6.6 \times 10^{-34}$ Js Mass of neutron $=1.67 \times 10^{-27}$kg
$e = 1.6 \times 10^{-19}$ C Boltzmann's constant $= 1.38 \times 10^{-23}$ J/K
$\mu_0 = 4\Pi \times 10^{-7}$ TmA^{-1} Avogadro Number $=6.023 \times 10^{23}$ /mol

Section A

1. How does light move through an optical fiber?
2. Write any two applications of gamma rays.
3. A carbon resistor is marked in coloured bands of yellow, black, orange and gold. What is the resistance and tolerance value of the resistor?
4. A certain region has cylindrical symmetry of electric field. Name the charge distribution producing such a field.
5. What is the angle between the directions of the electric field at any (i) axial point and (ii) equatorial point due to an electric dipole?

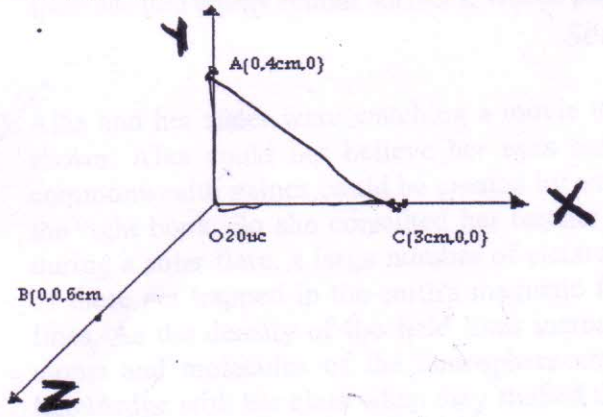
Section B

6. A ray of a light is incident normally on one face of prism. The angle of prism is 30^0 and refractive index is $\sqrt{2}$. What will be the angle of deviation?
7. Compare dia, para and ferromagnetic materials on the basis of any three properties of these materials.
8. Which direction would a dip circle point to, if located right on the geomagnetic north or south pole?

OR

A cylindrical bar magnet is kept along the axis of a circular coil. Will there be a current induced in the coil if the magnet is rotated about its axis? Give reason.

9. Define resistivity and give its SI units. Show graphically the variation of resistivity with temperature for nichrome.
10. A charge of 10 μC is brought from point A (0,4 cm,0) to C (3 cm,0,0) via point B (0,0,6 cm) in vacuum. Calculate the work done if the charge at origin is 20 μc.



Section C

11. Find the position of an object, which when placed in front of a concave mirror of focal length 20cm, produces a virtual image which is twice the size of the object.
12. A concave lens has the same radii of curvature for both sides and has a refractive index 1.6 in air. In the second case, it is immersed in a liquid of refractive index 1.4. Calculate the ratio of the focal lengths of the lenses in two cases.

13. Draw a ray diagram of a reflecting type telescope. What are the advantages and disadvantages of reflecting type telescope over refracting telescope?

14. Suppose that the electric field amplitude of an electromagnetic wave is E_0= 120N/c and that its frequency is 50 MHz. Determine w, k and wavelength.

15. What are eddy currents? Give one advantage and one disadvantage of it.

16. What is the power dissipated by an ideal inductor in an AC circuit? Explain.

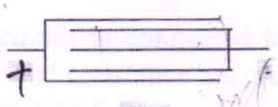
17. Distinguish between resistance, reactance and impedance for an A.C. circuit. Draw graphs showing variation of reactance of capacitor and inductor with frequency of applied voltage.

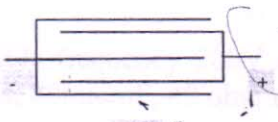
18. The horizontal component of earth's magnetic field is 0.2 G and total magnetic field is 0.4 G. Find the angle of dip.

19. N number of identical resistors each of resistance R is combined to get the maximum and minimum resistances, what is the ratio of the maximum to minimum resistance.

20. Derive an expression for work done in rotating an electric dipole in an electric field.

21. Calculate the capacitance of a system having five equally spaced plates, if the area of each plate is 0.02 m^2 and the separation between the neighboring are 3 mm. in case (a) and (b).





22. Two point charges 4 μC and 2 μC are separated by a distances 1 m in air. At what point on the line joining the two charges is the electric field intensity zero?

OR

An infinite plane sheet of charge density 10^{-8} C/m^2 is held in air. In this situation how far apart are two equipotential surfaces, whose potential difference is 5V?

Section D

23. Alka and her sister were watching a movie in which the phenomena of aurora borealis was shown. Alka could not believe her eyes that such a colorful display like the one during commonwealth games could be created by nature. She went to the library, but could not find the right book. So she consulted her teacher who guided her. Hence, Alka understood that during a solar flare, a large number of electrons and protons are ejected from the sun. Some of these get trapped in the earth's magnetic field and move in a helical path along the field lines. As the density of the field lines increases near the poles, these particles collide with atoms and molecules of the atmosphere emitting green and pink light. Alka shared this knowledge with her class when they studied the chapter of moving charges in magnetic field.

(i) What values did Alka have?

(ii) What is the radius of the path of an electron moving at a speed of 3 x 10^7 m / sec in a magnetic field of 6 Gauss perpendicular to it? What is its frequency? Calculate its energy in kilo electron volt.

Section E

24. (a) Draw a ray diagram to show the formation of the real image of a point object due to a convex spherical refractive medium, when the light is travelling from a rarer medium of refractive index n_1 to a denser medium of refractive index n_2.

(b) Using the diagram derive the relation between object distance, image distance, radius of curvature of spherical surface. Also write the sign convention and assumptions.

(OR)

(a) With the help of a suitable ray diagram, derive the mirror formula for a concave mirror.

(b) A small bulb is placed at the bottom of a tank containing water to a depth of 80 cm. What is the area of the surface of water through which light from the bulb can emerge out? refractive index of water is 1.33 (consider the bulb to be a point source)

25. (a) Explain, with the help of a neat diagram, the principle, construction and working of a transformer.

(b) When a voltage of 120V is given to the primary of a transformer the current in the primary is 1.85mA. Find the voltage across the secondary when it gives a current of 150mA. The efficiency of the transformer is 95%

OR

The series LCR circuit is connected to a variable frequency 200V supply. The values of inductor, capacitor and resistance are given 50mH, 80microF, 40 ohm respectively.

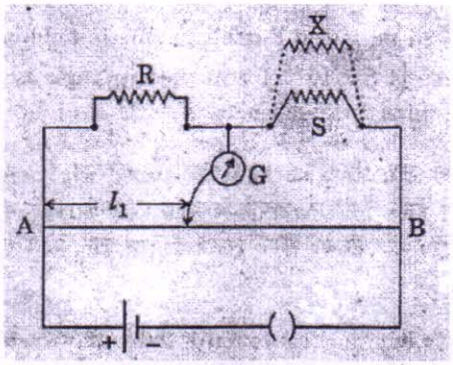
(a) Determine resonating frequency

(b) rms voltage across each component.

(c) Impedance at resonance

26. (i) State the principle of working of a meter bridge.

(ii) In a meter bridge balance point is found at a distance l_1 with resistances R and S as shown in the figure. When an unknown resistance X is connected in parallel with the resistance S, the balance point shifts to a distance l_2. Find the expression for X in terms of l_1, l_2 and S.



OR

(i) Derive an expression for drift velocity of free electrons in a conductor in a terms of relaxation time.

(ii) A wire of 15ohm resistance is stretched to double its original length. It is then cut into two equal parts. These parts are then connected in parallel across a 3.0 volt battery. Find the current drawn from the battery