GURUKUL ACADEMY

FOR – XIth , XIIth & Competitive Exam.

Time – 3hr. **Test – Full Syllabus.** **M.M – 70**

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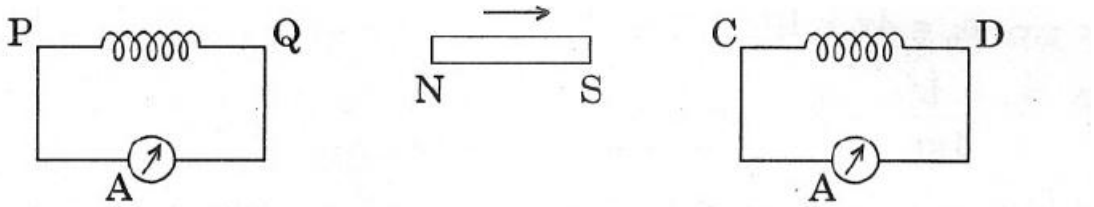
General Instructions:

(i) ***All questions are compulsory.***
(ii) ***Question numbers 1*** *to* ***8*** *are very short answer type questions, carrying one mark each.*
(iii) ***Question numbers 9*** *to* ***16*** *are short answer type questions, carrying two marks each.*
(iv) ***Question numbers 17*** *to* ***25*** *are also short answer type questions, carrying three marks each.*
(v) ***Question numbers 26*** *is value based question, carrying four marks.*
(vi) ***Question numbers 27*** *to* ***29*** *are long answer type questions, carrying five marks each.*
(vii) *Use of calculators is not permitted. However, you may use log tables, if necessary.*

1. Two wires of equal length, one of copper and other of manganin have same resistance. Which wire is thicker?
2. Which conservation law does Kirchhoff's voltage law deal with?
3. An electric dipole of moment *p* is placed inside a cube of side *a*. Find the electric flux through the surface of the cube.
4. A bar magnet is moved in a direction indicated by the arrow between two coils PQ and CD. Predict the direction of the induced current in each coil.



5. State Ampere's circuital law.
6. Name four important parts of a communication system.
7. For same angle of incidence two media A and B have angle of refraction 25° and 35°. In which medium would the speed of light is minimum?
8. What do you mean by amplitude modulation in communication system.
9. Two capacitors each of capacitance 2 μF are connected in series and the combination is connected to a 1μF capacitor in parallel. Draw the necessary diagram and find the equivalent capacitance of the whole arrangement.
10. Write down Gauss's law in electrostatics.
11. Mention one application of potentiometer. Draw the relevant circuit.

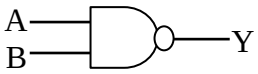
12. Show that the current leads the voltage by a phase 90° in a purely capacitive circuit.

13. State Brewster's law. Find the angle of refraction corresponding to an incidence at the Brewster's angle of 45°

14. A proton and an electron have same kinetic energy. Which of them has shorter de Broglie wavelength?

15. Define 'stopping potential' and 'threshold frequency' in the context of photoelectric effect.

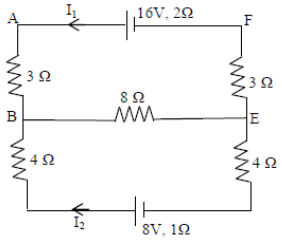
16. (i) Identify the following logic gate.



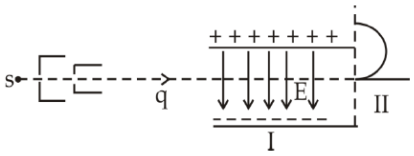
(ii) Write down its truth table.

17. A capacitor of capacitance C is charged to a potential V. Find the electrostatic energy stored in the capacitor.

18. Apply Kirchoff's Laws to determine the currents I_1 and I_2 in the circuit as shown in below.



19. A beam of β particles, moving with a speed *v*, enters a region (region I), where a uniform electric and a uniform magnetic field are both present. These β particles then move into region II where only the magnetic field, (out of the two fields present in region I), exists. The path of the β particles, in the two regions, is as shown in the figure.



(i) State the direction of the magnetic field.

(ii) State the relation between 'E' and 'B' in region I.

(iii) Drive the expression for the radius of the circular path of the β particle in region II.

20. Show in a diagram the relative orientation of the electric field, magnetic field and the direction of propagation in an electromagnetic wave. Arrange atleast four electromagnetic spectra of your choice in their decreasing order of wavelength.

21. Mention three different modes of propagation used in communication system. What is that device in communication system called that changes the nonelectrical signal into the electrical signal?

22. Name the series of hydrogen spectra corresponding to radiation in the visible range. Find the maximum and minimum wavelength of this series.

OR

Define half – life of a radioactive sample. Obtain the relation between the half life and decay constant .

23. Write down atleast three comparative properties between α, β and γ rays.

OR

A neutron is absorbed by a $_3Li^6$ nucleus with the subsequent emission of an alpha particle.

(i) Write down the associated nuclear reaction.

(ii) Calculate the energy released, in MeV, in this nuclear reaction.

Given: mass of $_3Li^6$ nucleus = 6.01512126 u

mass of neutron = 1.0086654 u, mass of alpha particle = 4.0026044 u, mass of triton = 3.01 u

1 u = 931.5 MeV/

24. Draw a labelled diagram of a simple microscope and write down its magnification power.

25. Define polarization of light. What is Polaroid? Write down its applications.

OR

Two coherent beams of amplitudes in the ratio 3:4 are superposed to produce interference fringes. Find the ratio of maximum and minimum intensities of the interference fringes.

26. Rahul and Anurag were doing an experiment to find the magnetic field of earth with the help of a tangent galvanometer. After completing the circuit they found that the ammeter was not giving a proper deflection. They approached respective teacher who suggested to use larger number of turns in the circular coil of the galvanometer and replace the ammeter with a micro – ammeter.

(i) What were the problems in Rahul and Anurag's approach?

(ii) How teacher's suggestion can help the measurement?

27. Draw the voltage – current characteristics of a Zener diode in both forward and reverse biased condition. Draw the circuit diagram for the Zener diode used as a voltage regulator and explain its functioning.

OR

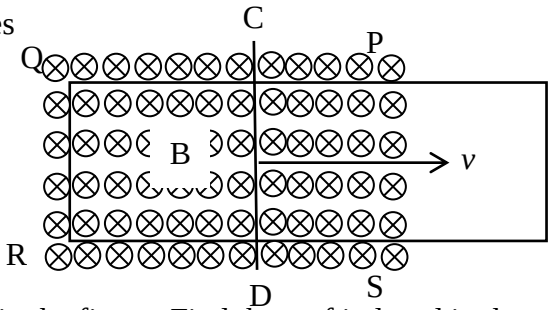
Explain with necessary circuit diagram the functioning of a transistor as a switch.

28. State Huygen's principle of wave theory of light. Apply it to derive Snell's law due to refraction in plane surfaces.

OR

Derive Lens maker's formula.

29. A straight wire is bent at right angles successively two times as shown in the following figure (PQRS). Another straight wire CD is placed on the frame PQRS. The whole set – up is now kept in a uniform magnetic field B that is directed perpendicular to the plane of the wire frame and pointing downwards as shown in the figure.



(i) Find the magnetic flux associated with the loop CQRD

(ii) The wire CD is now moved with a velocity v as shown in the figure. Find the emf induced in the circuit.

(iii) Find the direction of the current. Which law governs the direction of the current in this case?

OR

An alternating current $i = i_0 \sin 100\pi t$ passes through an inductor of inductance 0.1 H. Find the (i) peak value, (ii) rms value of the potential drop across the inductor. What is the phase difference between the current and the potential drop?

What should be the value of the capacitance across which same potential drop is produced due to flow of same current as mentioned above?