GURUKUL ACADEMY

FOR – XIth , XIIth & Competitive Exam.

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

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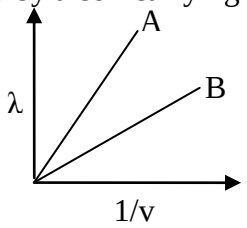
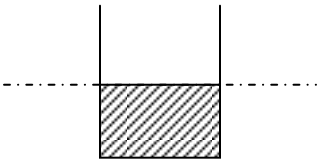
General Instructions:

(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 charged particles of different magnitude, when kept near attract each other. They are then put in contact and again placed at the same distance. What is the nature of force between them now?
2. Two wires of same material and length have cross sectional areas in the ratio 2: 3. What is the ratio of drift velocity of free electrons in them when they are connected in series?
3. A proton and a deuteron enter in a perpendicular uniform magnetic field with equal velocity. Which one will have lesser radii for circular path?
4. Why does a metallic piece become very hot, when it is surrounded by a coil carrying high frequency alternating current ?
5. The graph between de- Broglie wavelength λ and 1/v for two materials A and B is as below. Which one is heavier?



6. A ray of light incident on an equilateral glass prism of refractive index √2 and the refracted ray within the prism moves parallel to its base. What is the angle of incidence of this ray?
7. Name the characteristic of electro magnetic wave that
   i) remain constant
   ii) increases
   in the electro magnetic spectrum , when one moves from gamma radiation to radio wave
8. An electron and a proton are kept between the plates of a parallel plate capacitor. Which one of the two will experience maximum force?
9. In figure below, a dielectric of constant 19 is inserted in half portion between the plates of a parallel plate capacitor. If its initial capacitance is 20 μF, determine the new capacitance



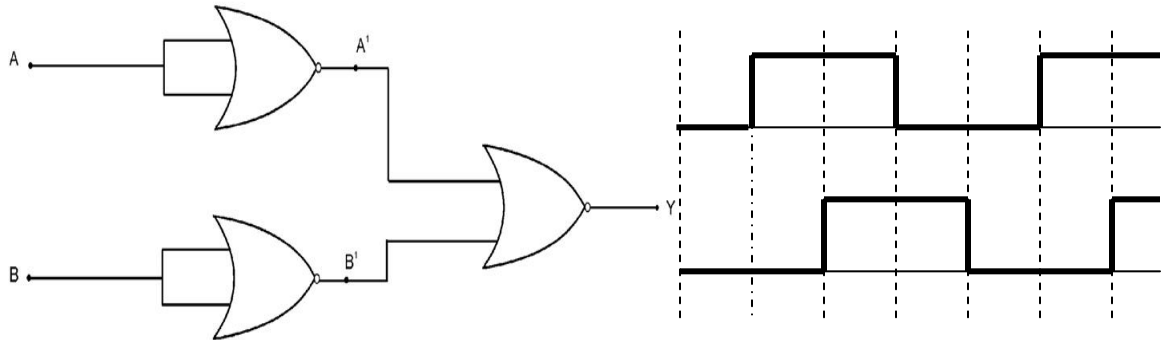
10. A circular coil of N turns and radius r carry a current of I. It is now unwound and rewound to increase the radius 2r keeping the current the same. What will be the ratio of magnetic moment of the new coil to the original coil?

11. Two identical circular loops made of copper and manganin are rotated in perpendicular magnetic field with same angular velocity. Will the
i) induces emf be same in both the loops
ii) will the induced currents be same in both the loops
Give reason for your answer in each case

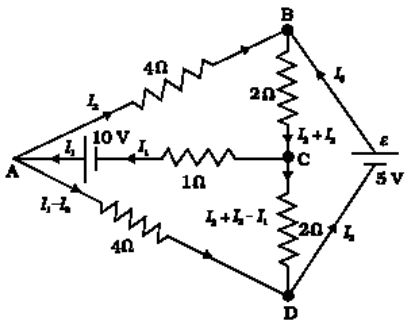
OR

One rectangular loop and a circular loop are moved out of a magnetic field to a field free region with constant speed.
i) Will the shape of flux- time graph be identical in both cases?
ii) If different , give reason for the difference in shape of the graph and draw the required graph for rectangular loop

12. What is the under lying principle of the working of a transformer? How does a transformer help in long distance transmission of electrical energy? Explain briefly
13. A parallel plate capacitor is connected to a dc source through an ammeter. Does the ammeter show any momentary deflection during charging of the capacitor? If yes name the current responsible for it . Write the expression for the current and how is this current related to the current in the circuit?
14. A ray of light incident on the boundary separating two transparent media. At a particular angle of incidence, the reflected ray goes perpendicular to the refracted ray. Obtain the relation between the angle of incidence and refractive index of the denser medium. . Does this angle of incidence depend on the wavelength of the light used?
15. Identify the given gate combination and draw the output wave form at Y using the given inputs A and B



16. What does the term LOS communication mean? Name the type of waves that are used for this communication. What happens to the range of transmission, if height of the antenna is doubled?
17. State the principle behind the working of a potentiometer. Why is Potentiometer preferred to measure emf of a cell? A student while performing experiment with a potentiometer observes that galvanometer shows null deflection while moving the jockey from one end to the other end of the wire. Write two possible reasons for this observation
18. Determine the currents through each branch of the given network below



19. A resistor of resistance 200 Ω and a capacitor of reactance 200 Ω are connected in series to a 200 v , 50 Hz ac source
    i) Determine the current in the circuit
    ii) Determine the potential difference across the resistor and capacitor
    iii) Value of inductance required to make the current and voltage in phase

20 A Convex lens and a convex mirror (of radius of curvature 20 cm) are placed coaxially with the convex mirror placed at a distance of 30 cm from the lens. For a point object at a distance of 25 cm from the lens, the final image due to this combination coincides with the object itself. Draw the required ray diagram and then determine the focal length of the convex lens

21. Which of the following waves can be polarised - X- rays or sound waves? Give reasons
    An incident beam of light of intensity I_0 is made to fall on a Polaroid A. Another Polaroid B is so oriented that both are crossed each other. A third Polaroid C is now introduced mid way between A and B and is so oriented that its axis bisects the angle between the axes of A and B . What is the intensity of transmitted light now between
    (i) A and C (ii) C and B. Give reason for your answer.

22. Define the terms threshold frequency and cut off voltage
    Light of wavelength 200 nm falls on a metal surface of work function 4.0 eV. Will photo electrons be emitted from this metal? If yes, determine the kinetic energy of photo electrons emitted? Also determine the stopping potential required.

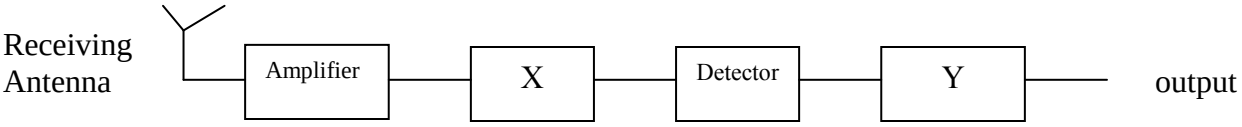
23. Draw the graph between Binding energy per nucleon with mass number. How does the graph help to explain nuclear fission and nuclear fusion?

OR

Draw graph between potential energy of a pair of nucleons with their separation. In the graph mark the regions of attractive force and repulsive force. Write any two characteristics of nuclear force

24. Define the terms Half life period and Activity of a radio active sample. Show that the rate of change of activity of a sample is inversely proportional to square of its half life period

25. The block diagram for a Receiver is given below. Identify X & Y and state their functions.



What is the need of a detector and which semiconducting device forms the important component of detector

26. Mr. Gopal is a farmer, living happily in a hut made of hey and dry leaves. As these materials are cheap and environment friendly, most of his villagers were also living happily in such huts.
    But one day during heavy lightning many huts were burnt making all sad. Mr. Arun, a social worker reached the spot soon with his team to pacify the villagers. The very next day they installed some lightning conductors and few cavities of metal conductors in the village and educated the villagers about the lightning and the use of these things installed.
    (i)What according to you are the values displayed by Mr. Arun and his team?
    (ii)What is the principle behind the working of a lighting conductor?
    (iii)How do metal cavities help the villagers?
    (iv)Apply Gauss theorem to show that the net electric field inside the metal cavity is zero.

27. i) State Ampere circuital law.
ii) A straight thick long wire of uniform cross section of radius 'a' is carrying a steady current I. Use Ampere circuital law to obtain a relation showing the variation of magnetic field inside and outside the wire with distance r {($r \leq a$) and ($r > a$)} of a field point from the centre of its cross section.
iii) Plot graph showing the nature of this variation between B and r.

OR

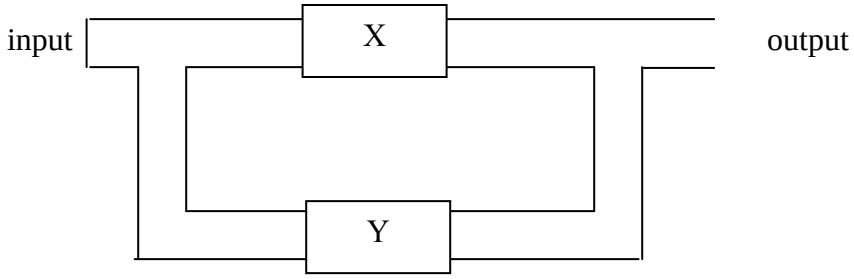
(i)Derive an expression for force per unit length between two long straight parallel current carrying conductors. Write the nature of the force between the conductors
(ii)A wire AB is carrying a current 12 A and is lying on the table. Another wire CD carrying a current 5 A is held just above AB at a height of 1 mm. what should be the weight per unit length of this wire CD so that it remains suspended at its position . Also indicate the direction of current in CD relative to that in AB

28. A plane wave front approaches a plane interface separating two transparent media from rarer to denser medium. Draw the refracted wave front using Huygens Principle and hence prove Snell's law
A beam of light emerging from a convex lens when a point source is placed at its focus is made to incident on one face of an equilateral prism. Draw the shape of wave fronts coming out of the convex lens and the prism

OR

State the essential condition for diffraction of light to take place.
A parallel monochromatic beam of light falls normally on a narrow slit to give a diffraction pattern on the screen Derive expression for the angular width of central maxima obtained on the screen.
'Diffraction defines the limit of ray optics'. Give a brief explanation of this statement

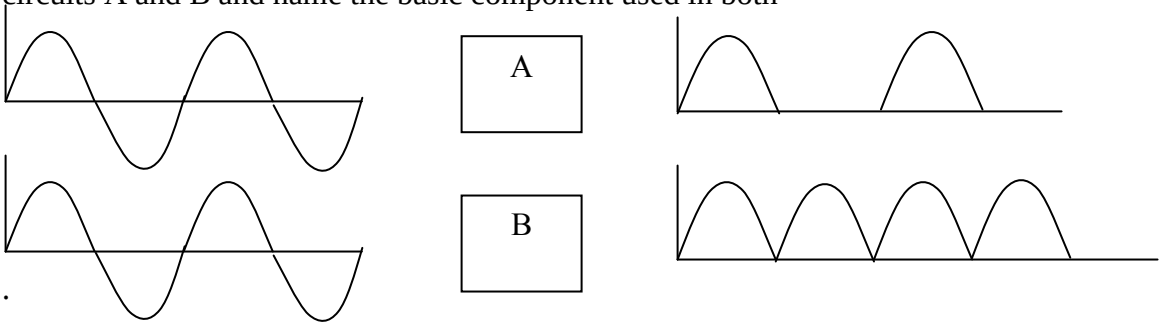
29. i) The block diagram given below is of a set up that can produce a signal of any desired frequency without any external input signal. Identify the components X and Y of this set up and write the function of each.



ii) Draw the circuit diagram for this set up and briefly describe its working.

OR

i) An a.c signal is fed in to two circuits A and B to get out put wave forms as in figure. Identify the circuits A and B and name the basic component used in both



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ii) Also Draw the circuit diagram of B and explain its principle and working.