

**KENDRIYA VIDYALAYA SANGATHAN**

**Jammu Region**

**Class-12th**

**MM:-70**

**TIME: 3 hr**

General Instructions: -

- i) All questions are compulsory.
  - ii) Questions 1 to 10 VSA **Questions** & carry 1 mark each
  - iii) Questions 10 to 14 are Assertion & Reason based question & carries 1 mark each.
  - iv) Questions 15 to 16 are **Case Study based question with MCQ** and carry 4 marks each.
  - v) Questions 17 to 25 are **Short answer questions** & carry 2 marks each.
  - vi) Questions 26 to 30 are **Short answer questions** & carry 3 marks each.
  - vii) Question 30 to 33 are **Long answer questions** & carry five marks each
- There is no choice; however, an internal choice has been provided.

**SECTION- A**

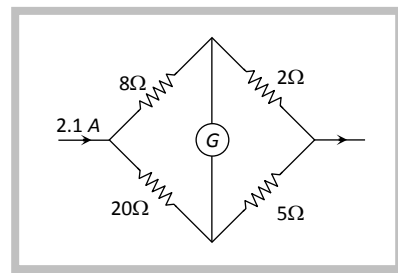
1. Can electric potential at a point be zero but not the Electric field? Give example.

2. What is the difference between emf & potential difference?

**OR**

Why electric field is normal to the equipotential surface?

3. In the given figure, when galvanometer shows no deflection. What is the current (in ampere) flowing through  $5\ \Omega$  resistance will be

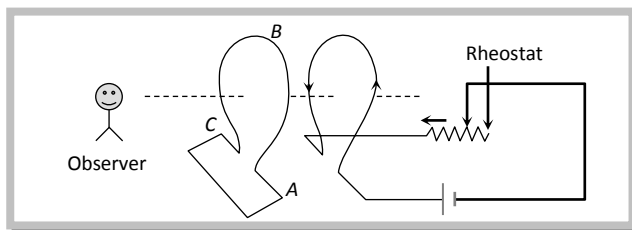


4. Two long straight wires are set parallel to each other. Each carries a current 'I' in the same direction and the separation between them is  $2r$ . What is the intensity of the magnetic field in the midway between them?

**OR**

What is the ratio radius of proton & alpha particle fired in a magnetic field perpendicular with equal momentum?

5. Figure shows two coils placed close to each other. When the current through one coil is increased. What will be the direction of current in second coil.



6. Which EM wave is used in RADAR?

7. Which colour of light travel faster in a medium?

**OR**

Why does a water tank appears shallower?

8. What happens to the photo electric current, if wavelength of incident light is increased?

9. Write any two properties of nuclear forces.

10. What is the charge on p-type semiconductor?

**OR**

What is Drift current ?

**Choose the correct option**

- a) Both A & R are true and R is the correct explanation of A.
- b) Both A & R are true but R is not the correct explanation of A.
- c) A is true but R is false.
- d) A is false and R is also false.

11. **Assertion**

The energy of a capacitor connected to a battery is increased, when a dielectric slab is inserted between the plates.

**Reason**

Capacitance increases, when a dielectric slab is inserted between the plates.

12. **Assertion**

Circular shape will have more magnetic moment for a current carrying wire of given length 'L'.

**Reason**

A circle will have the largest area.

### 13. Assertion

All the electrons ejected in a photo electric effect will have same kinetic energies?

#### Reason

Work function depends upon frequency of incident radiation.

### 14. Assertion

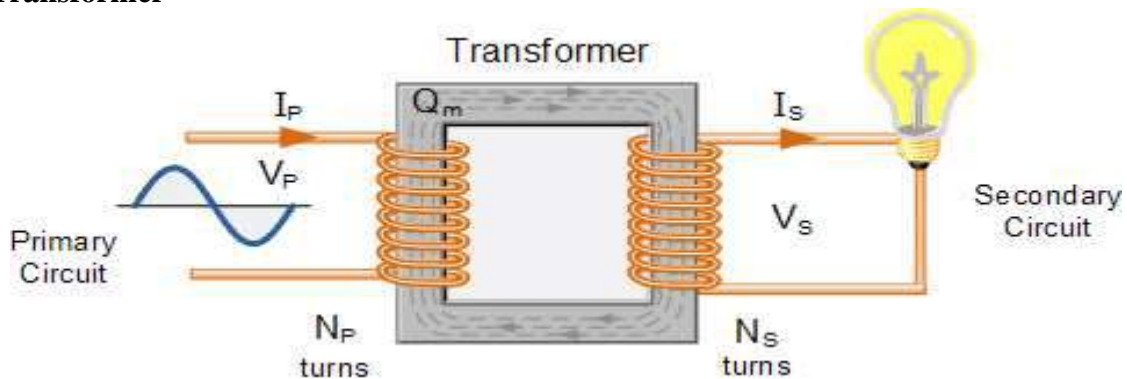
In reverse bias p-n junction current is almost independent of voltage.

#### Reason

Concentration of minority charge carrier depends only on temperature.

## SECTION-B

### 15. Transformer

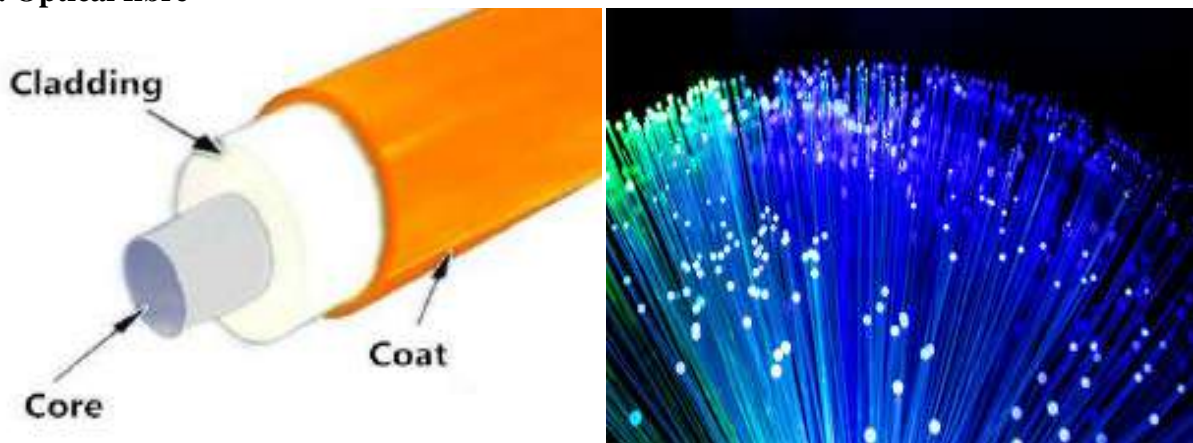


A transformer is a static electrical machine which transfers AC electrical power from one circuit to other at a constant frequency, but voltage can be altered according to the requirement. Number of turns in the primary and secondary coil decides a transformer to be step up or step down.

1. On which principle transformer works
  - a) Self induction in Primary coil
  - b) Mutual induction secondary coil
  - c) Electromagnetic induction
  - d) a) & b) both
2. Laminated iron core is used to reduce
  - a) Hysteresis loss
  - b) Eddy current loss
  - c) Copper loss
  - d) Flux loss
3. In step up transformer Voltage is increased at th cost of
  - a) Power is reduced & Current is constant

- b) Power & Current are reduced
  - c) Power is constant & Current is reduced
  - d) Power is increased & Current is reduced
4. Choose the correct use of transformer out of the following.
- a) Step up for induction furnace
  - b) Step down for long range electrical power transmission
  - c) Step up for producing large current
  - d) Step down for Welding
5. Soft iron core is used in transformer to avoid
- a) Eddy Current loss
  - b) Hysteresis loss
  - c) Flux loss
  - d) Copper loss

## 16. Optical fibre



These days we find in the market some decorative lamps with fine plastic fibres. At their one end fibres are fixed in electric lamp while their free ends form a fountain of light dots. The working of optical fiber is based on the principle of Total Internal Reflection.

1. What can be the best function of cladding in the optical fibre?
  - a) To provide denser medium
  - b) To provide rarer medium
  - c) To provide safety to the core
  - d) To provide path to light
  
2. Choose the condition for TIR in optical fibre
  - a) Critical angle  $<$  angle of deviation
  - b) Critical angle  $<$  angle of incidence
  - c) Critical angle  $<$  angle of reflection
  - d) Critical angle  $<$  angle of refraction

3. What will be the speed of light in the core, whose critical angle is 30 degree?
- $3.0 \times 10^8$  m/s
  - $2.5 \times 10^8$  m/s
  - $1.5 \times 10^8$  m/s
  - $0.5 \times 10^8$  m/s
4. If a white light is entered on one end and yellow colour is absent on the other end. Which of the following colours of light will likely to emerge?
- Red & Blue
  - Blue & Green
  - Green & red
  - Only Red
5. Which characteristic of material is best suited for the formation of core of optical fibre?
- Large critical angle & Large refractive index
  - Large critical angle & Small refractive index
  - Small critical angle & Small refractive index
  - Small critical angle & Large refractive index

### SECTION-C

17. A potentiometer wire of length 1m has a resistance of  $10 \Omega$ . It is connected to a 6V battery in series with a resistance of  $5\Omega$ . Determine the emf of a cell which gives a balance point at 40cm.

**OR**

Find the expression of equivalent emf of two cells connected in parallel having emf as  $E_1$  &  $E_2$  and internal resistance  $r_1$  &  $r_2$ .

18. Calculate the % increase in the resistance of a wire stretched by 10% of length.

19. What is the function of radial magnetic field & soft iron core in a moving coil galvanometer?

**OR**

A shunt of  $6\Omega$  is connected across a galvanometer of resistance  $294\Omega$ . Find the fraction of total current passing through a galvanometer?

20. Derive expression of motional emf.

21. Prove the law of reflection using Huygen's principle.

**OR**

Find the refraction formula at a convex surface, when object lies in rarer medium & image formed is real.

22. Two coherent sources have intensities in the ratio 25: 16. Find the ratio of intensities of maxima to minima after interference.

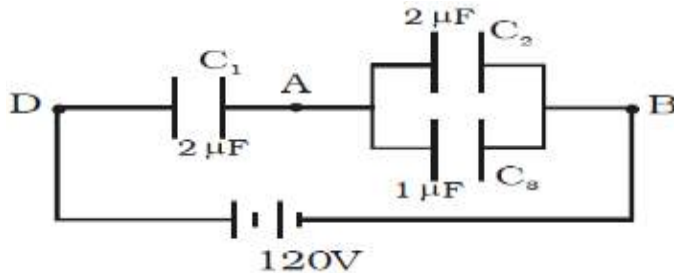
23. Sketch the graph showing variation of stopping potential with frequency of incident radiation for two different photosensitive materials A & B. What information do you get from the slope of the graphs?

24. A proton & alpha particle are accelerated through same potential. Find the ratio of their wavelength?

25. Why a photo diode is connected in reverse bias? Justify.

### SECTION D

26. Find the charges on the capacitor shown in figure and the potential difference across them.



OR

Define dielectric constant derive its relation with electric susceptibility.

27. Using Ampere's circuital law, find the magnetic field inside and outside a thick current carrying wire of radius 'a' at a distance 'r' from the axis.

28. Using phasor diagram find the expression of impedance of series LCR circuit. Find the conditions of resonance of series LCR circuit.

29. Using diagram find the magnifying power of astronomical telescope when image is formed at least distance of distinct vision.

OR

In young double slit experiment the intensity of light at a point on the screen where path difference is  $\lambda$  is k units. Find the intensity at a point where path difference is  $\lambda/4$ .

30. Draw the circuit diagram of full wave rectifier. Explain its working.

### SECTION-E

31.a) Establish a relation for Electric Field Intensity at an equatorial point of an electric dipole using a proper diagram.

b) An electric dipole of dipole moment  $5 \times 10^{-20}$  Cm is kept in a uniform electric field of intensity  $10^4$  NC<sup>-1</sup> making an angle of  $30^\circ$  with direction of Electric field. Find the torque on the dipole.

**OR**

- Deduce Coulomb's law using Gauss' Theorem.
- Two point charges  $+4e$  &  $+e$  are 'd' distance apart. Where the third charge q should be placed so that it may be in equilibrium. In which case equilibrium is stable & unstable.

- Derive relation between angle of deviation, angle of prism, angle of incidence & angle of emergence.
  - Find the angle of minimum deviation for an equilateral triangular prism of refractive index  $\sqrt{3}$ .
  - Does a beam of white light disperse through a hollow prism? Justify.

**OR**

- Derive the expression of lens maker formula.
  - A convex lens has a focal length of 25cm in air. When it is dipped in a liquid of refractive index  $4/3$ , its focal length is increased to 100cm. Find the refractive index of lens material.
- Using Bohr's theory, show that the radius, velocity & energy of electron revolving in nth orbit of an atom is quantised.
    - What are the limitations of Bohr's theory.

**OR**

- Explain the origin of various spectral series of hydrogen atom.
- Show that the shortest wavelength lines in Lyman, Balmer & Paschen series have their wavelengths in the ratio 1:4:9.

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**Answer Key**

<b>SECTION- A</b>		
<b>1</b>	Yes, Equatorial point of dipole	<b>1</b>
<b>2</b>	P. D is work per unit charge b/w two points but emf is work per unit charge over a closed circuit. Or $dV = E \cdot dr = 0$ So E is normal to dr.	<b>1</b>
<b>3</b>	0.6 A	<b>1</b>

4	Zero Or 1:1	1
5	Direction of current is along CBA	1
6	Microwave	1
7	Red Or Apparent dwpth = Real depth/refractive index	1
8	Remain same	1
9	Two properties	1/2 +1/2
10	No charge Or Definition	1
11	b)	1
12	a)	1
13	d)	1
14	a)	1
15	d), b), c), d), c)	1x4
16	a), b), c), b), d)	1x4
17	Correct solution Ans: 1.6 V Or Correct derivation	2  2
18	Correct solution 21%	1
19	To provide maximum torque To intensify magnetic field Or Correct solution Ans: 1/50	1 1 2
20	Correct derivation $E = Blv$	2
21	Correct derivation	2
22	Correct solution Ans: 81: 1	2
23	Correct Graph Slope = $h/e = \text{constant}$	1 1
24	Correct solution Ans: $1:2\sqrt{2}$	2
25	Fractional change is large for change in minority charge carrier. If $n > p$ then $dp/p > dn/n$	2
26	$Q_1 = 144\mu\text{C}$ , $Q_2 = 96\mu\text{C}$ , $Q_3 = 48\mu\text{C}$	$(\frac{1}{2})$



	$V_1=72V, V_2=48V, V_3=48V$ Or Definition Correct derivation, $\kappa = 1+\chi$	$(1\frac{1}{2})$  1 2
27	Correct derivation Magnetic field inside Magnetic field outside	$(1\frac{1}{2})$ $(1\frac{1}{2})$
28	Phasor diagram Finding impedance Condition of resonance	1 1 1
29	Diagram Finding magnifying power Or $I=2I_0(1+\cos\phi)$ if $p=\lambda/4$ so $\phi=\pi/2$ $I=k/2$	1 2  1 1 1
30	Diagram Input output waveform Working	1 1 1
31	a) Derivation b) Torque = $pxE$ Ans: $2.5 \times 10^{-16}$ Or Coulomb's law using Gauss' Theorem Correct solution Ans: $2d/3$ Equilibrium is stable if $q$ is +ve	3 2  2 2 1
32	Derivation of $(i+e)=(A+\delta)$ Correct solution Ans: $60^\circ$ Correct Reason Or Derivation Correct solution Ans: $\mu=1.5$	2 2 1  3 2
33	Derivation of radius Derivation of velocity Derivation of energy Limitations (any 2) Or Derivation of Rydberg's Formula Correct solution	1 1 1 2  3 2

## BLUE PRINT

S No.	UNITS	VSA (1MARK)	Case Study (4 Marks)	SA 1 (2MARKS)	SA2 (3 MARKS)	LA (5 MARKS)	TOTAL
1	<b>Electrostatics and Current Electricity</b>	4(4)		2(4)	1(3)	1(5)	8(16)
2	<b>Magnetic effect of current &amp; magnetism,  Electromagnetic Induction &amp; Alternating current</b>	3(3)	1(4)	2(4)	2(6)		8(17)
3	<b>Electromagnetic Waves and Optics</b>	2(2)	1(4)	2(4)	1(3)	1(5)	7(18)
4	<b>Dual Nature of Matter  Atoms &amp; Nuclei</b>	3(3)		2(4)		1(5)	6(12)
5	<b>Electronic devices</b>	2(2)		1(2)	1(3)	-	4(7)
6	<b>Total</b>	<b>14(14)</b>	<b>2(8)</b>	<b>9(18)</b>	<b>5(15)</b>	<b>3(15)</b>	<b>33(70)</b>