36. From rule: $R_S = \frac{I_g R_g}{I - I_g}$ $\quad R_S = \frac{5\times10^{-3}\times40}{1-5\times10^{-3}}$ $\quad R_S = 0.201\Omega$

$R_T = \frac{R_g \times R_S}{R_g + R_S}$ $\quad R_T = \frac{40\times0.201}{40+0.201}$ $\quad R_T = 0.2\Omega$

37. **Choose to answer (A) or (B): Give reason for:**

A. Since $X_L = 2\pi fL$, the inductive reactance is directly proportional with the frequency so at high frequency, inductive frequency will be large which acts as open circuit ($I = 0$).

B. Due to the ohmic resistance in the coil and the other circuit wiring, a part of energy is dissipated as heat energy so the damping oscillation happens.

38. $\frac{B_1}{B_2} = \frac{\mu}{\mu} \times \frac{N_1}{N_2} \times \frac{I_1}{I_2} \times \frac{r_2}{r_1}$ $\quad \because \mu$ & I are constant.

$\because \frac{N_1}{N_2} = \frac{r_2}{r_1} = \frac{5}{1}$ $\quad \therefore \frac{B_1}{B_2} = \frac{N_1}{N_2} \times \frac{r_2}{r_1} = \frac{5}{1} \times \frac{5}{1} = \frac{25}{1}$

39.

Point of comparison	AC dynamo	Electric motor
The Scientific principle of its operation	Electromagnetic induction (An induced emf and also induced current are generated in the coil by changing the magnetic flux cutting it).	The torque that is generated on a coil carrying current placed in a magnetic field.

40. When ultra-violet rays falls on a metal surface, the photoelectrons will be free with higher kinetic energy and higher velocity.

41. **Give reason for:**

Because the magnetic flux lines is radially directed which makes the magnetic flux density constant in the gap where the coil moves irrespective to the angle of the coil.

42. When no current flows in the circuit (open circuit "I = 0") As ($V = V_B - Ir$).

43. **Choose to answer (A) or (B): Give reason for:**

A. As the wire is moving parallel to the magnetic field and since emf = BLvSinθ and θ = 0°, so emf = 0.

B. Due to the increase in the magnetic flux density linked with the coil with time, so induced emf in the secondary coil will be produced and the induced emf will be in opposite direction to that in the primary coil to resist the increase in the affecting magnetic flux in the primary (Lenz's rule).

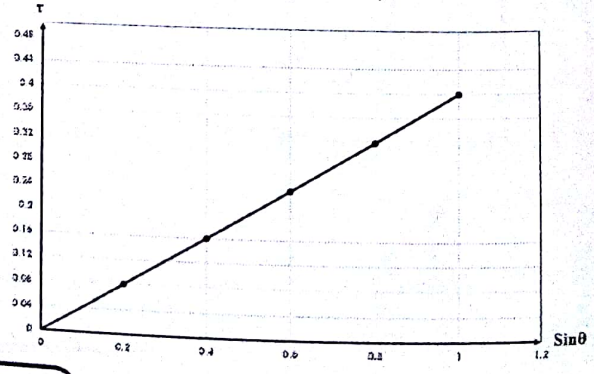
44. The magnetic flux density at a point on the solenoid axis inside it will be **increase to double**, because the magnetic flux density in the interior of a solenoid is inversely proportional with the length of solenoid according to rule ($B = \mu NI/L$), where the other factors are constant.

45. $\tau = B|\overrightarrow{m_d}|\,Sin(\theta)$

$Slope = \frac{\tau}{Sin\theta} = B\overrightarrow{m_d}$

$Slope = \frac{\Delta Y}{\Delta X} = \frac{(0.16-0.08)}{(0.4-0.2)} = 0.4$

$0.4 = 0.1\overrightarrow{m_d}$ $\quad \overrightarrow{m_d} = 4\ Amp.m^2$



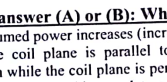
16. **Choose to answer (A) or (B):**

A.

Point of comparison	(OR) Gate having two inputs	(AND) Gate having two inputs
Number of cases to give (0) output	1 case When both inputs are (0)	3 cases When one of inputs is (1) And when both inputs are (0)

B. **First**: Positive holes and negative electrons.
Second: $np = n_i^2$ $(n = N_D')$ $(p = n_i^2/N_D')$

17. Diagram (Z): The stimulated emission will occur electron moves to state (E_1) emitting two photons with the same phase and energy.
Diagram (X): The atom will be excited to the higher state (E_2).



18. In series connection: $R_{eq} = 3R$ $\therefore I_T = V_B/R_{eq} = V_B/3R$

In parallel connection: $R_{eq} = R/3$ $\therefore I_T = \frac{V_B}{R_{eq}} = \frac{V_B}{R/3} = \frac{3V_B}{R}$

$\therefore \frac{I_{T(series)}}{I_{T(parallel)}} = \frac{V_B}{3R} \div \frac{3V_B}{R}$ $\frac{I_{T(series)}}{I_{T(parallel)}} = \frac{V_B}{3R} \times \frac{R}{3V_B}$ $\therefore \frac{I_{T(series)}}{I_{T(parallel)}} = \frac{1}{9}$

19. **Choose to answer (A) or (B):Write down the mathematical relation used to calculate:** A. $X_c = 1/2\pi fC$ B. $Z = \sqrt{(R)^2 + (X_L)^2}$

20. **Choose to answer (A) or (B): Mention ONE application of:**
A. The transformer. B. Used in induction furnaces for melting metals.

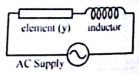
21. **Choose to answer (A) or (B):**
A. **(B)** $1\sqrt{2}$, From rule: $F = \mu I_1 I_2 L/(2\pi d)$ $(I_1 = I_2 = I)$ $F = \mu I^2 L/(2\pi d)$
$\because F\alpha\ I^2$ and $F\alpha\ 1/d$ so if $(d\uparrow_2$ & $I^2\uparrow_2)$ then (F) remains the same.
When the distance (d) is increased to double, the both currents in the wires also increased to double, so the each wire will increase $(\sqrt{2})$ (to keep the force constant)

B.

Point of comparison	Hot-wire Ammeter	Sensitive galvanometer
Reason that makes the pointer settle at a definite reading on its scale	The rate of heat radiated from the wire becomes equal to the rate of heat generated in the wire	The torque is balanced with the spring torsion

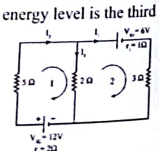
22. $\frac{\lambda_{max(1)}}{\lambda_{max(2)}} = \frac{T_2}{T_1}$ $\frac{0.5\times10^{-6}}{\lambda_{max(2)}} = \frac{300}{6000}$ $\lambda_{earth} = 1\times10^{-5}\,m = 10\mu m$

23. **Choose the correct answer:**
(B) an inductive coil of negligible resistance.
As in pure elements $V_T = V_1 + V_2$ so $V_T = V_{L_1} + V_{L_2}$



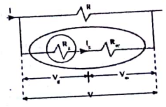
24. $E_n = (-13.6/n^2)(eV)$ $-1.51 = -13.6/n^2$ $n^2 = 9$ $n = 3$ $\therefore$ energy level is the third

25. $I_2 = I_1 + I_3$ $-I_1 + I_2 - I_3 = 0 \rightarrow (1)$
$5I_2 + 2I_3 + 2I_2 - 12 = 0$ $0I_1 + 7I_2 + 2I_3 = 12 \rightarrow (2)$
$3I_1 - 2I_3 + 1I_1 + 6 = 0$ $4I_1 + 0I_2 - 2I_3 = -6 \rightarrow (3)$
$I_1 = -3/5 = -0.6A$ $I_2 = 6/5 = 1.2A$ $I_3 = 9/5 = 1.8A$
So $I_1 = -0.6A$



26. They are unwanted signals caused by the random motion of electrons causing minute randomly varying currents interfering with and disturbing the information. The disturbance affects on the analog signal where noise interfere with the analog signal which carry the information and disturb it.

27. The voltage difference across the coil is : $V_g = I_g R_g$
The maximum voltage drop to be measured is:
$V = V_g + V_m$ $V = V_g + I_g R_m$
$\therefore R_m = \frac{V - V_g}{I_g}$ Where $V_g = I_g R_g$ So $R_m = \frac{V - I_g R_g}{I_g}$

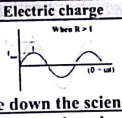


28. **Choose to answer (A) or (B): What happens when?**
A. The consumed power increases (increase energy loss in the wires).
B. When the coil plane is parallel to the magnetic flux lines, the torque will be maximum while the coil plane is perdicular to the magnetic flux lines, the torque will reach to zero, and it completes rotating due to its inertia.

29.

Point of comparison	The electron	The photon
Electric charge	Negative charge	No charge

30.



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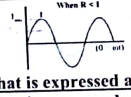
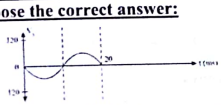
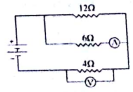


31. **Write down the scientific term that is expressed as:** Line spectrum.
32. **Write down the scientific term that is expressed as:** Optical pumping.
33. **Choose the correct answer:**
(B)



34. $V = IR$ $4.8 = 1\times4$ $I_T = 4.8/4 = 1.2A$

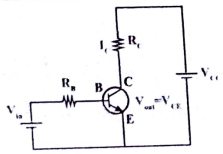


From rule of current divider $I_{6\Omega} = \frac{12}{6+12}\times1.2$
$I_{6\Omega} = 0.8A$ $\therefore$ The reading of ammeter is 0.8A

35. **Choose to answer (A) or (B):**
A.

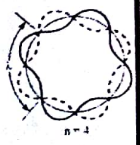
Point of comparison	Forward bias	Reverse bias
Thickness of the depletion region	Small	Large
Possibility of passing a current through the junction	High possibility of passing current	Very low possibility of passing current (almost 0)

B. Transistor as a switch (ON) condition.



Model Trial Ministry Exam (2)

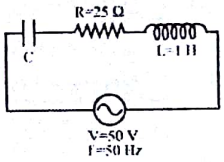
1. **Choose to answer (A) or (B): What is meant by?**
   A. The magnitude of the induced electromotive force is proportional to the rate by which the conductor cuts the lines of the magnetic flux linked with it and the number of turns of the conductor which cut the magnetic flux.
   B. The induced current must be in a direction such as to oppose the change producing it.
2. **Choose to answer (A) or (B): Mention ONE role of:**
   A. It is a metal surface which is heated by filament, thus some electrons are freed from the metal.
   B. They are used to control the electron beam to sweep the screen point by point so called raster until the frame (image) is completed.
3. **Choose to answer (A) or (B): Write down the scientific concept:**
   A. Electromotive force of a source. B. Conductivity of a material.
4. **Mention ONE use for:** It is used to determine the direction of motion of a straight wire when passing through it an electric current and placed normally to a magnetic field.
5. **Give reason for:**
   To minimize thermal energy in wire. **OR** Increase the efficiency of the transformer.
6. **Choose the correct answer:**
   (B) $2\lambda/\pi$ From rule: $r_n = n\lambda \setminus 2\pi$ $\because n = 4$ $\therefore r_n = 4\lambda \setminus 2\pi = 2\lambda \setminus \pi$



7. **First**: Yes the circuit will be in resonance state, because the impedance of the circuit equal the ohmic resistance in the circuit $Z = V/I = 50/2 = 25\Omega$, so $Z = R$.

   Second: From rule $f = \frac{1}{2\pi\sqrt{LC}}$ $C = \frac{1}{4\pi^2 f^2 L}$

   $C = \frac{1}{4\times(22/7)^2\times 50^2\times 1}$ $C = 1.0124\times10^{-5}\,F$

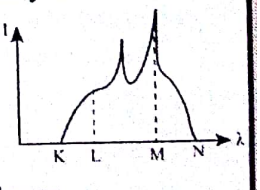


   OR $X_L = 2\pi fL = 2\times(22/7)\times50\times1 = 314.28\Omega$ At resonance $X_C = X_L = 314.28\Omega$

   $X_C = 1/2\pi fC$ $314.28 = 1/(2\times(22/7)\times50\times C)$ $C = 1.0124\times10^{-5}\,F$

8. **Choose the correct answer:** **(B) equal to**
   The two capacitors are connected together in series, then the quantity of charge will be constant.
9. $\theta = 360ft = 360\times50\times2.5\times10^{-3}$ $\theta = 45^\circ$

   $e.m.f_{inst} = e.m.f_{max}\sin\theta$ $e.m.f_{inst} = 100\sin45^\circ$ $e.m.f = 50\sqrt{2}V = 70.71V$
10. **Choose to answer (A) or (B): Mention ONE function of:**
    A. Adjust full-scale deflection of galvanometer when no unknown resistance is connected.
    B. It controls the rotational motion of the coil and it serves as leading current to the coil.
11. $P_W = \phi_L E$ $\phi_L = P_W/E = 30/(3\times10^{-19}) = 1\times10^{20}$ Photons / sec
12. Number of turns - Area of coil – Magnetic flux density – Angular velocity of coil
13. **Wavelength (M).**
    Because the wavelength (M) represents characteristic line spectrum which depends on high atomic number of target atom.
    $\Delta E_{target} = E_{x-ray} = h\upsilon_{x-ray} = hc/\lambda_{x-ray}$ Where $\Delta E = E_{outer} - E_{inner}$



14. **Choose the correct answer:** **(D) Collision with excited helium atoms.**
15. **Choose the correct answer:** **(A) 5V**
    $e.m.f_{av} = -N(\Delta\phi_m/\Delta t)$ $e.m.f = 500\times0.01 = 5V$ $e.m.f = 5V$