THE VILLAGE
INTERNATIONAL SCHOOL
"We Nurture Dreams"

AIM HIGH, TOGETHER WE FLY

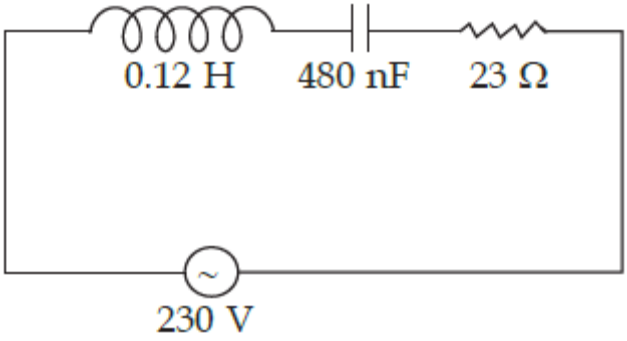
GRADE - XII **07/11/2024**	**MT- 3 [2024-2025]** **PHYSICS (042)**	**Max Marks - 20** **TIME – 50 min**

	Section A	
1	To identify the direction of the current induced in a wire moving in a magnetic field? (a) Ampere's Rule (b) Fleming's Left-Hand Rule (c) Fleming's Right-Hand Rule (d) Lenz law	**1**
2	An a.c. generator is made up of a 50-turn coil with a 2.5m2 area rotating at 60 rad s-1 in a uniform magnetic field of 0.3 T between two fixed pole pieces. When the current is zero, what is the flux across the coil? a) Maximum b) Minimum c) Zero d) Independent of current	**1**
3	**The self-inductance associated with a coil is independent of** (a) current (b) time (c) induced voltage (d) resistance of coil	**1**

4	Assertion and Reasoning: These questions consist of two statements, each printed as Assertion and Reason. While answering these questions, you are required to choose any one of the following four responses. **Assertion:** In series LCR resonance circuit, the impedance is equal to the ohmic resistance. **Reason:** At resonance, the inductive reactance exceeds the capacitive reactance. A) Both Assertion and Reason are correct and Reason is the correct explanation for Assertion. B) Both Assertion and Reason are correct but Reason is not the correct explanation for Assertion. C) Assertion is correct but Reason is incorrect. D) Both Assertion and Reason are incorrect.	**1**
	Section B	
5	The output voltage of an ideal transformer, connected to a 240 V ac main is 24 V when this transformer is used to light a bulb with rating 24 V ,24W. Calculate current in the primary coil in the circuit. $I_s=p/v_s$ $=24/24=1$ A $V_pI_p=V_sI_s$ $Ip=24*1/240=0.1$ A	
6	An inductor L of inductance X_L is connected series with a bulb B to an ac source, how does the brightness of the bulb change when 1.the number turns of inductor is reduced 2.capacitor of reactance $X_C=X_L$ is included in the same circuit $X_L=L_W$ $X_C=1/C_W$ $Z=\sqrt{(R^2=(X_L-X_C)^2}$ hence both case brightness increased	**2**

	Section C	
7	(i)With the help of a labelled diagram, describe briefly the principle and working of step-up transformer. (ii)A step up transformer convert a low voltage to a high output voltage. does it violate law of conservation of energy, explain? (iii)Write any two sources of energy loss in a transformer? 1.Mutial induction 2.fig,no,voltage increases current reduces 3.flux leakage, eddy current etc	3
	Section D	
8	(a)An ac source of voltage $V=V_m$ Sinwt is applied across a series LCR circuit. Draw the phasor diagram for the circuit when the (i) capacitive reactance exceeds the inductive reactance (ii) inductive reactance exceeds capacitive reactance (b)A capacitor and resistor connected in series with an ac source. If the potential difference across C, R are120v and 90 v respectively, if rms current is 3 A. Calculate impedance and power factor of the circuit. a. phasor diagram for XC>XL AND XL>XC b. $Vrms=\sqrt{(Vc^2+Vr^2)}$ $=\sqrt{120^2+90^2}=150v$ $Z=Vrms/Irms=150/3=3$ $\cos\Phi=R/Z=3/5=0.6$	5
	Section E	
	Case Study Based Question: Read the Case Study given below and answer the question that follow:	**1X4=4**
9	Resonant Series LCR Circuit. When the frequency of ac supply is such that the inductive reactance and capacitive reactance become equal, the impedance of the series LCR circuit is equal to the ohmic resistance in the circuit. Such a series LCR circuit is known as resonant series LCR circuit and the frequency of the ac supply is known as resonant frequency. Resonance phenomenon is exhibited by a circuit only if boath L and C are present in the circuit. We	

cannot have resonance in a RL or RC circuit. A series LCR circuit with L = 0.12 H, C = 480 nF, R = 23 Ω is Connect to a 230 V variable frequency supply.



(i) Find Resonant frequency, the value of source for which current amplitude is maximum**.**

(a) 222.32 Hz
(b) 550.52 Hz
(c) 663.48 Hz
(d) 770 Hz

(ii) The value of maximum current is

(a) 14.14 A
(b) 22.52 A
(c) 50.25 A
(d) 47.41 A

(iii) The value of maximum power is

(a) 2200 W
(b) 2299.3 W
(c) 5500 W
(d) 4700 W

(iv) What is the Q-factor of the given circuit?

(a) 25 A
(b) 42.21 A
(c) 35.42 A
(d) 21.74 A

OR

(iv) At resonance which of the following physical quantity is maximum?

(a) Impedance
(b) Current

	(c) Both (a) and (b) (d) Neither (a) nor (b)	