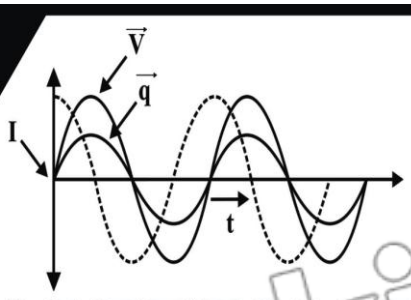

Chapter 16

ALTERNATING CURRENT

TOPICAL MULTIPLE CHOICE QUESTIONS

Topic 16.1

Alternating Current

(1) A.C is that which is produced by a voltage whose polarity keeps on reversing with

(a) distance **(b)** time

(c) voltage **(d)** charges

(2) The main reason for the world wide use of A.C is that it can be transmitted to

(a) short distances **(b)** long distances

(c) very short distances **(d)** intermediate distances

(3) The most common source of alternating current is

(a) D.C generator **(b)** A.C generator

(c) D.C motor **(d)** battery

(4) The output voltage of A.C generator at any instant is given by

(a) $V = V_o sin \frac{2\pi}{T} \times \frac{1}{f}$ **(b)** $V = V_o \sin \frac{2\pi}{T} \times \frac{1}{t}$

(c) $V = V_o \sin \frac{2\pi}{T} \times t$ **(d)** $V = V_o \sin \frac{T}{2\pi} \times t$

(5) When t=T/4 then the voltage attains the

(a) maximum value **(b)** minimum value

(c) zero value **(d)** none of these

(6) The angular frequency of rotation of the coil in A.C generator is expressed as

(a) $\omega = \frac{2\pi}{T}$ **(b)** $\omega = \frac{T}{2\pi}$

(c) $\omega = \frac{2\pi}{f}$ **(d)** $\omega = 2\pi T$

(7) The waveform of an alternating voltage is the formation of graph between

(a) time and frequency **(b)** voltage and frequency

(c) voltage and time **(d)** frequency and time period

(8) The sum of positive and negative peak value is written as

(a) p-p value **(b)** p-n value

(c) p-n-p value **(d)** n-n value

(9) The highest value reached by the voltage or current in one cycle is called

(a) peak value **(b)** root mean square value

(c) instantaneous value **(d)** peak to peak value

(10) The root mean square value of V is given by

(a) $V_{rms} = \frac{V_o}{\sqrt{2}}$ **(b)** $V_{rms} = \frac{\sqrt{2}V_o}{2}$

(c) $V_{rms} = V_o\sqrt{2}$ **(d)** both a and b

(11) The instantaneous voltage "V" generated by a rotating coil in a magnetic field has the form $V = V_0 \sin 2\pi f t$ **here** $2\pi f$ **is**

(a) Amplitude of the voltage **(b)** Period of the voltage
(c) Angular frequency of A.C **(d)** frequency of voltage

(12) The e.m.f. Generated by a rotating coil in magnetic field has a graph similar to

(a) Straight line **(b)** Sine wave
(c) square wave **(d)** All of the above

(13) The value of V_{rms} is

(a) $2\ V_o$ **(b)** $0.707\ V_o$
(c) $\frac{V_o}{\sqrt{2}}$ **(d)** both b and c

(14) An A.C voltmeter reads 440V, its peak value is

(a) 611.25V **(b)** 311.23V
(c) 311.12V **(d)** 620.4V

(15) The root mean square value of A.C circuit is always

(a) positive **(b)** negative
(c) zero **(d)** none of these

(16) The value of I_{rms} is

(a) $0.87I_0$ **(b)** $0.707\ I_0$
(c) $0.07\ I_0$ **(d)** $7.707\ I_0$

(17) In '$V=V_o \sin\theta$' the angle θ which specifies the instantaneous value of alternating voltage or current is known as

(a) displacement **(b)** phase
(c) angular distance **(d)** angular frequency

(18) The point where the waveform crosses the time axis, the phase is

(a) $\frac{3\pi}{2}$ **(b)** 2π
(c) π **(d)** $\frac{\pi}{2}$

(19) The loss of energy in transmitting power at long distances is less in

(a) alternating current **(b)** thermal electricity
(c) direct current **(d)** electromagnetism

(20) By connecting the D.C ammeter to measure the A.C, it would measure its

(a) p-p value **(b)** instantaneous value
(c) peak value **(d)** average value over the cycle

(21) If $V_o = 25.5\sqrt{2}$ then the V_{rms} value will be

(a) 25.5V **(b)** 18.02V
(c) 36.06V **(d)** 25.95V

(22) The instantaneous values of voltage and current in A.C circuit is

(a) in phase **(b)** out of phase

(c) any phase **(d)** none of these

(23) A sinusoidal current has rms value of 10A. What is the maximum or peak value will be

(a) 14.14 A **(b)** 18.02 A

(c) 7.07 A **(d)** 25.05 A

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(24) The value of peak to peak voltage is: LHR -2017 (G-I)

(a) V_o **(b)** $-V_o$

(c) $\sqrt{2}V_o$ **(d)** $2V_o$

(25) During each cycle of A.C, voltage reaches a peak value; MIRPUR (AJK) 2017, BWP-2019 (G-II)

(a) once **(b)** twice

(c) thrice **(d)** four times

(26) The phase of AC at positive peak from origin is SGD-2017 (G-I)

(a) $\frac{3\pi}{2}$ **(b)** $\frac{\pi}{2}$

(c) $\frac{\pi}{4}$ **(d)** π

(27) The sum of positive and negative peak values are usually written as SGD-2017 (G-II)

(a) p-p values **(b)** rms values

(c) cycle values **(d)** p-n values

(28) An A.C voltmeter reads 220V, its peak value will be:SGD-2022 (G-I), RWP-2022 (G-I)

(a) 255V **(b)** 311.12V

(c) 300V **(d)** 200V

(29) When effective value of current is 10. What is its peak value? SGD-2022 (G-II)

(a) 10 **(b)** 14.2

(c) 12 **(d)** 13

(30) The mean value of A.C. in one complete cycle is: LHR-2022 (G-I)

(a) 1 **(b)** zero

(c) I_o **(d)** $\frac{I_o}{\sqrt{2}}$

(31) If V_o is peak of A.C. voltage then mean square value of voltage is: LHR-2022 (G-II)

(a) $\frac{V_o}{\sqrt{2}}$ **(b)** V_o^2

(c) $\frac{1}{2}V_o^2$ **(d)** V

(32) If the frequency of A.C is 40 Hz then current passing through filament bulb get brilliance: LHR-2022 (G-II)

(a) 100 times **(b)** 80 times

(c) 40 times **(d)** 50 times

(33) Root mean square value of alternating voltage with V_o = 100V, is equal to. DGK-2022 (G-II)

(a) 0.7 V **(b)** 7 V

(c) 700 V **(d)** 70 V

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(34) In an A.C circuit instantaneous current is - I_o. It is possible when t =?

(a) $t = \frac{T}{2}$ **(b)** $t = \frac{3T}{4}$

(c) $t = \frac{T}{4}$ **(d)** t = T

(35) The peak value of an alternating 60 Hz power supply is 140 V. An AC voltmeter connected to the power supply will give a reading of approximately.

(a) 100V **(b)** 98 V

(c) 140 V **(d)** 70 V

Topic 16.2 & 16.3:

A.C Circuits and A.C Through a Resistor

(36) V= IR is

(a) Joule's law **(b)** Pascal's law

(c) Ohm's law **(d)** Charles law

(37) The symbol used for inductor is

(a) R **(b)** L

(c) C **(d)** R-C

(38) At any time 't' the potential difference across the terminals of the resistors is given by

(a) $V = V_o \sin \omega t$ **(b)** $V = V_o \sin \omega f$

(c) $V = V_o \cos \omega t$ **(d)** $V = V_o \cos \omega f$

(39) The relation for the resistance according to Ohm's law is given by

(a) R=IV **(b)** V/I =R

(c) I/V=R **(d)** 1/IV =R

(40) The power dissipated in a resistive circuit is

(a) $P=I^2R$ **(b)** P=IV

(c) $P=V^2/R$ **(d)** all of these

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(41) The basic element in a D.C circuit which controls the current or voltage is called **BWP-2022 (G-II)**

(a) inductor **(b)** resistor

(c) capacitor **(d)** voltmeter

(42) In a capacitive circuit of A.C quantity, when q = 0, the slope of q – t curve is: **GRW-2019 (G-I)**

(a) minimum **(b)** maximum

(c) zero **(d)** negative

(43) Phase Difference between V and I of an A.C. through Resistor is: **BWP-2019 (G-II)**

(a) 0° **(b)** 90°

(c) 180° **(d)** 270°

ENTRY TEST MCQS

(44) The phase angle between the voltage and the current in an AC circuit consisting of a resistance is _____

(a) Zero **(b)** 45º
(c) 90º **(d)** 180º

Topic 16.4:

A.C through a Capacitor

(45) The device used to store charges is called

(a) resistor **(b)** inductor
(c) capacitor **(d)** impedance

(46) Which current cannot flow continuously through the capacitor?

(a) A.C **(b)** D.C
(c) thermoelectricity **(d)** photo electricity

(47) The unit of capacitance

(a) Pascal **(b)** Joule
(c) Henry **(d)** Farad

(48) The basic relation between charge 'q' and the voltage 'V' across its plates is

(a) q=C/V **(b)** q=CV
(c) q=V/C **(d)** q=1/CV

(49) The opposition offered by a capacitor to the flow of A.C is called

(a) capacitor **(b)** inductive reactance
(c) capacitive reactance **(d)** resistor

(50) The reactance of capacitors is represented by

(a) X_C **(b)** X_L
(c) X_q **(d)** X_A

(51) The unit of reactance of a capacitor is given by

(a) tesla **(b)** volt
(c) farad **(d)** ohm

(52) The reactance of a capacitor is given by

(a) $X_C = \frac{1}{\omega C}$ **(b)** $X_C = \omega C$

(c) $X_C = \frac{1}{2\pi f \omega C}$ **(d)** $X_C = \frac{\omega}{2\pi C}$

(53) The X_C of a capacitor joined across alternating source can be found by the relation

(a) $X_C = \frac{I_{rms}}{V_{rms}}$ **(b)** $X_C = \frac{V_{rms}}{I_{rms}}$

(c) $X_C = \frac{V_{rms}}{\sqrt{I_{rms}}}$ **(d)** $X_C = \frac{I_{rms}}{\sqrt{V_{rms}}}$

(54) In a capacitor circuit, at low frequency, the reactance will be

(a) high **(b)** low
(c) zero **(d)** infinite

(55) The device that allows only the continuous flow of an A.C through a circuit is

(a) capacitor **(b)** resistor
(c) reactor **(d)** inductor

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(56) The device which allows only flow of A.C through it is: **LHR-2021 (G-I)**

(a) Capacitor **(b)** Inductor
(c) Battery **(d)** Thermistor

(57) Direct current cannot flow through **GRW-2022 (G-I)**

(a) Resistor **(b)** Capacitor
(c) Inductor **(d)** Ammeter

(58) The reactance of a capacitor is equal to; **MIRPUR (AJK) 2017**

(a) ωC **(b)** $\frac{\omega}{C}$

(c) $\frac{C}{\omega}$ **(d)** $\frac{1}{\omega C}$

(59) In pure capacitor AC circuit, the current I and charge q are **SGD-2017 (G-I)**

(a) in phase **(b)** out of phase
(c) parallel to each other **(d)** none of above

(60) If the frequency of AC supply is doubled then the capacitive reactance becomes **SWL-2017**

(a) half **(b)** two times
(c) four times **(d)** one fourth

(61) The slope of (q–t) curve at any instant of time gives: **BWP-2017 (G-I)**

(a) voltage **(b)** current
(c) capacitance **(d)** inductance

(62) The device which flow of A.C allows is. **MTN-2022 (G-I)**

(a) capacitor **(b)** inductor
(c) D.C motor **(d)** battery

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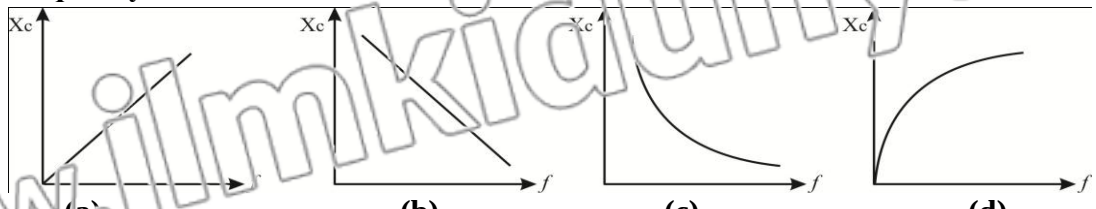
(63) A 1 μF capacitor is connected across an AC source whose voltage amplitude is 50 V and angular frequency is 100 rad/s. The current amplitude will be

(a) 2.5 mA **(b)** 5 mA
(c) 10 mA **(d)** 15 mA

(64) The correct curve representing the variation of capacitive reactance X_c with frequency f is



(a) **(b)** **(c)** **(d)**

(65) The capacitive reactance of a capacitor in D.C circuit is

(a) 0 **(b)** ωC
(c) $\frac{1}{\omega c}$ **(d)** ∞

Topic 16.5:

A.C Through An Inductor

(66) When an alternating source of voltage is applied across an inductor, it must
(a) attract the flow of A.C **(b)** oppose the flow of A.C
(c) cancel the flow of A.C **(d)** none of these

(67) The inductive reactance can be expressed by the relation
(a) $X_L = \frac{1}{\omega L}$ **(b)** $X_L = \frac{1}{2\pi\omega L}$
(c) $X_L = \omega L$ **(d)** $X_L = \frac{\omega L}{2\pi f}$

(68) In an inductive AC circuit, the current
(a) leads the voltage by 90° **(b)** lags behind the voltage by 90°
(c) leads the voltage by 60° **(d)** leads the voltage by 30°

(69) The inductance and capacitance behave oppositely as a function of
(a) sine **(b)** current
(c) frequency **(d)** cosine

(70) A coil which consists of thick copper wire closely wound in a large number of turns over a soft iron laminated core is called
(a) impedance **(b)** R-L circuit
(c) choke **(d)** inductor

(71) The behaviour of reactance is independent of
(a) frequency **(b)** voltage
(c) current **(d)** both b and c

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(72) When A.C passes through an inductor, voltage leads the current by an angle: GRW-2019 (G-I)
(a) 0° **(b)** 45°
(c) 90° **(d)** 180°

(73) At what frequency will an inductor of 1.0 H have a reactance of 500Ω: LHR-2019 (G-II)
(a) 50 Hz **(b)** 80 Hz
(c) 500 Hz **(d)** 1000 Hz

(74) A device which opposes the flow of A.C. is DGK-2017 (G-I)
(a) resistor **(b)** capacitor
(c) inductor **(d)** none

(75) An inductor of 1 henry inductance has a reactance 500 ohms, then the frequency required is approximately: BWP-2017 (G-I)
(a) 50 Hz **(b)** 100 Hz
(c) 80 Hz **(d)** 120 Hz

(76) In alternating current circuit inductor behave like DGK-2022 (G-I)
(a) Semiconductors **(b)** Resistors
(c) Insulators **(d)** Conductors

(77) The device which allows only the flow of DC is. DGK-2022 (G-I), BWP-2022 (G-II)
(a) Capacitor **(b)** Inductor
(c) Transformer **(d)** Generator

(78) For higher frequency, the X_L will be RWP-2022 (G-I)

(a) high **(b)** low
(c) zero **(d)** infinite

(79) The reactance of an inductor increases with increase in _____. RWP-2022 (G-II)
(a) frequency **(b)** voltage
(c) resistance **(d)** capacitance

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(80) The inductive reactance of a choke coil of $\frac{1}{4\pi}$ m Henry in an A.C circuit of frequency 50 Hz, will be
(a) 0.25 Ω **(b)** 0.025 Ω
(c) 2.5 Ω **(d)** 25 Ω

(81) The inductive reactance of 2 mH coil in 5 k Hz A.C is
(a) 6.3 Ω **(b)** 6.38 Ω
(c) 12.6 Ω **(d)** 63 Ω

Topic 16.6:

Impedance

(82) The combined effect of resistance and reactance in a circuit is called
(a) impedance **(b)** R-L circuit
(c) choke **(d)** inductor

(83) The unit of impedance is
(a) ohm **(b)** volt
(c) ampere **(d)** henry

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(84) S.I unit of impedance is: LHR-2021 (G-II)
(a) Henry **(b)** Hertz
(c) Ampere **(d)** Ohm

(85) When 10V are applied to an AC circuit the current flowing in it is 100mA. Then the impedance will be FSD-2022 (G-II)
(a) 50Ω **(b)** 200 Ω
(c) 1000 Ω **(d)** 100 Ω

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(86) What will be the impedance for V = 10 sin(ωt) and I = 20 sin (ωt)?
(a) 200 Ω **(b)** 2 Ω
(c) 0.707 Ω **(d)** 0.5 Ω

(87) The impendence Z of an A.C circuit does not depend on
(a) Resistance **(b)** Capacitance
(c) Frequency **(d)** Current

Topic 16.7:

R-C and R-L Series Circuits

(88) In R-C series circuit

(a) the current lags the applied voltage
(b) the voltage leads the applied current
(c) the current leads the applied voltage
(d) none of these

(89) For R-C series A.C circuit the applied voltage is expressed as

(a) $V_{rms} = I_{rms}\sqrt{R^2 + (\omega C)^2}$ **(b)** $V_{rms} = I_{rms}\sqrt{\frac{1}{R^2} + (\omega C)^2}$

(c) $V_{rms} = I_{rms}\sqrt{R^2 + \frac{1}{(\omega C)^2}}$ **(d)** $V_{rms} = I_{rms}\sqrt{R + \frac{1}{(\omega C)^2}}$

(90) In R-L series circuits

(a) the current lags the applied voltage
(b) the voltage lags the applied current
(c) the current leads the applied voltage
(d) none of these

(91) The impedance of R-L series circuits is expressed as

(a) $\frac{I_{rms}}{V_{rms}} = \sqrt{R^2 + \frac{1}{(\omega L)^2}}$ **(b)** $Z = \sqrt{R^2 + (\omega L)^2}$

(c) $Z = \sqrt{R + \frac{1}{(\omega L)^2}}$ **(d)** $\frac{I_{rms}}{V_{rms}} = \sqrt{R + \frac{1}{(\omega L)^2}}$

(92) In R-L series circuit, the impedance of the circuit is obtained by the vector sum of

(a) R and ωC **(b)** R and ωL
(c) X_C and R **(d)** R and 2πfC

(93) The potential across the inductance leads the current by

(a) $\frac{\pi}{3}$ **(b)** π

(c) $\frac{2\pi}{3}$ **(d)** $\frac{\pi}{2}$

(94) For R-L series circuit, the voltage is given by

(a) $V_{rms} = I_{rms}\sqrt{R^2 + \frac{1}{(\omega L)^2}}$ **(b)** $V_{rms} = I_{rms}\sqrt{R + \frac{1}{(\omega L)^2}}$

(c) $V_{rms} = I_{rms}\sqrt{R^2 + (\omega L)^2}$ **(d)** $V_{rms} = I_{rms}\sqrt{\frac{1}{R^2} + (\omega L)^2}$

(95) In R-C series circuit, the phase difference between the applied voltage and current is given by

(a) $\theta = \tan^{-1}\frac{\omega L}{R}$ **(b)** $\theta = \tan^{-1}\frac{R}{\omega L}$

(c) $\theta = \tan^{-1}\frac{1}{\omega CR}$ **(d)** $\theta = \tan^{-1}\omega CR$

(96) By taking R as a reference in R-C and R-L series circuits, it can be seen that reactance (X_C) and inductance (X_L) are

(a) directed parallel to each other

(b) directed perpendicular to each other
(c) directed opposite to each other
(d) none of these

(97) The potential across the inductance is given by
(a) $V_{rms} = I_{rms} X_C$ **(b)** $V_{rms} = I_{rms} \omega X_L$
(c) $V_{rms} = I_{rms} \omega C$ **(d)** $V_{rms} = I_{rms} (\omega L)$

(98) If the frequency is doubled, then the reactance of a capacitor would be
(a) one fourth **(b)** half
(c) four times **(d)** doubled

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(99) The impedance of R-L series circuit is: MTN-2019 (G-I), MTN-2022 (G-I)
(a) $Z = \sqrt{R^2 + X_L^2}$ **(b)** $Z = \sqrt{R^2 + X_C^2}$
(c) $Z = \sqrt{R + X_L}$ **(d)** $Z = R$

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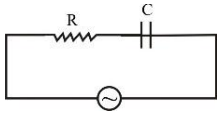
(100) A 50 Hz, 20V A.C source is connected across RC series circuit as shown in the figure.



If the voltage across R is 12V, then voltage across capacitor C will be
(a) 8V **(b)** 410V
(c) 16V **(d)** Not possible as value of C and R not given

(101) A wire of resistance R is coiled inductively so that its inductance is L. The impedance of the coil at a frequency of f is
(a) $(R+2\pi fL)^{1/2}$ **(b)** $R+1/2\pi fL$
(c) $(R^2+f^2L^2)^{1/2}$ **(d)** $(R^2+4\pi^2f^2L^2)^{1/2}$

Topic 16.8:

Power in A.C Circuits

(102) When voltage and current are in phase, the power is given by
(a) $P=V_{rms} I_{rms}$ **(b)** $P=V_{rms} / I_{rms}$
(c) $P=I_{rms} / V_{rms}$ **(d)** $P=1/ I_{rms} V_{rms}$

(103) The power dissipation in a pure inductive or in a pure capacitive circuit is
(a) 1 **(b)** 0
(c) -1 **(d)** infinite

(104) In A.C circuit the relation $P=I_{rms} V_{rms}$ is valid only when,
(a) V and I are out of phase **(b)** I and V are in phase
(c) P and IV are in phase **(d)** none of these

(105) The power dissipation in A.C circuits is
(a) $P = I_{rms} V_{rms}$ **(b)** $P = I_{rms} \omega V_{rms}$

(c) $P = I_{rms} \times V_{rms} \cos\theta$ **(d)** $P = I_{rms} (\omega V)$

(106) In the given relation $P = I_{rms} \times V_{rms} \cos\theta$ the power factor is

(a) P **(b)** V_{rms}

(c) $I_{rms} \times V_{rms}$ **(d)** $\cos\theta$

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(107) Which consumes small power? DGK-2017 (G-II)

(a) inductor **(b)** resistor

(c) motor **(d)** all of them

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(108) In the given relation $P = I_{rms} V_{rms} \cos\theta$ the power factor is

(a) P **(b)** V_{rms}

(c) $I_{rms} \times V_{rms}$ **(d)** $\cos\theta$

(109) In an ac circuit, the instantaneous values of e.m.f. and current are $\varepsilon = 200 \sin 314\ t$ volt and $I = \sin(314t+\pi/3)$ ampere. The average power consumed in watt is

(a) 20 **(b)** 100

(c) 200 **(d)** 50

(110) If $E = 100 \sin (100t)$ volt and $I = 100 \sin \left(100t + \frac{\pi}{3}\right) A$. Power is

(a) 10^4 kW **(b)** 10 kW

(c) 2.5 kW **(d)** 5 kW

Topic 16.9:

Series Resonance Circuit

(111) In RLC series circuits, when the frequency of AC source is very small then

(a) $X_C > X_L$ **(b)** $X_C < X_L$

(c) $X_C = X_L$ **(d)** $X_C = 0$

(112) At resonance V_L, in R-L-C series circuit

(a) the voltage drop across capacitance **(b)** the voltage drop across inductance

(c) the current drop across inductance **(d)** the current drop across capacitance

(113) When $X_L = X_C$, this condition is called

(a) inductance **(b)** resonance

(c) capacitance **(d)** balanced

(114) At resonance, in R-L-C series circuit the impedance of the circuit is

(a) inductive **(b)** resistive

(c) zero **(d)** capacitive

(115) At resonance frequency, in R-L-C series circuit the impedance of the circuit is

(a) minimum **(b)** maximum

(c) zero **(d)** infinite

(116) At resonance frequency, in R-L-C series circuit if the amplitude of the source voltage is constant then the current would be

(a) minimum **(b)** maximum

(c) zero **(d)** infinite

(117) In RLC series circuits, the relation '$X_L > X_C$' true for

(a) high frequencies **(b)** low frequencies

(c) null frequencies **(d)** none of these

(118) In RLC series circuits, when the voltage and current are in phase then the power factor would be

(a) -1 **(b)** 0
(c) 1 **(d)** 2

(119) The net power loss through a pure capacitor or inductor is

(a)-1 **(b)** 0
(c) 1 **(d)** 2

(120) The RLC series circuit is also referred as

(a) simple circuit **(b)** acceptor circuit
(c) rejector circuit **(d)** transmitted circuit

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(121) At high frequency, the value of reactance of capacitor will be **GRW-2019 (G-II), LHR-2021 (G-I)**

(a) large **(b)** small
(c) zero **(d)** infinite

(122) In RLC series circuit, the current at resonance frequency is **GRW-2019 (G-II), DGK-2022 (G-II)**

(a) minimum **(b)** maximum
(c) zero **(d)** infinite

(123) In RLC series circuit, the condition for resonance is. **DGK-2017 (G-I), GRW-2022 (G-I), BWP-2022 (G-I)**

(a) $X_C > X_L$ **(b)** $X_C = X_L$
(c) $X_C < X_L$ **(d)** $X_C = Z$

(124) In RLC series circuit, at resonance frequency, the impedance is_____. **GRW-2022 (G-II)**

(a) Zero **(b)** Minimum
(c) Maximum **(d)** Infinite

(125) In RLC series resonance circuit, at resonance frequency, impedance Z is: FSD-2019 (G-I)

(a) $\sqrt{R^2 + X_L^2}$ **(b)** R

(c) $\sqrt{R^2 + X_C^2}$ **(d)** X_L

(126) In RLC series circuit, at higher frequencies. RWP-2019 (G-I)

(a) $X_L = X_C$ **(b)** $X_L > X_C$
(c) $X_L < X_C$ **(d)** $X_L = 0$

(127) The capacitance required to construct a resonance circuit of frequency 1000kHz with an inductor of 5 mH is: MTN-2019 (G-I)

(a) 5.09 pF **(b)** 5.09 μF
(c) 5.0 mF **(d)** 50.9 pF

ENTRY TEST MCQS

(128) In an LCR series circuit, the capacitor is changed from C to 4C. For the same resonant frequency, the inductance should be changed from L to

(a) 2L **(b)** $\frac{L}{2}$

(c) $\frac{L}{4}$ **(d)** 4L

(129) In RLC series circuit the impedance is $Z = \sqrt{R^2 + (X_L - X_c)^2}$. The phase difference between I_{rms} and V_{rms} is

(a) $\theta = \tan^{-1}\frac{X_L}{R}$ **(b)** $\theta = \tan^{-1}\frac{X_C}{R}$

(c) $\theta = \tan^{-1}\frac{(X_L + X_C)}{R}$ **(d)** $\theta = \tan^{-1}\frac{(X_L - X_C)}{R}$

Topic 3.6.3:

Parallel Resonance Circuit

(130) The L-C parallel circuit is excited by an alternating source of voltage whose frequency

(a) could be varied **(b)** could not be varied

(c) is zero **(d)** none of these

(131) The inductance (L) has a resistance which is

(a) negligible small **(b)** zero

(c) very large **(d)** infinite

(132) In parallel resonance circuits, the frequency is given by

(a) $f_r = \frac{1}{2\pi\sqrt{RC}}$ **(b)** $f_r = \frac{1}{2\pi\sqrt{LC}}$

(c) $f_r = \frac{1}{4\pi\sqrt{RC}}$ **(d)** $f_r = \frac{1}{4\pi\sqrt{LR}}$

(133) In L-C parallel circuit, the current at the resonance frequency is

(a) minimum **(b)** maximum

(c) zero **(d)** infinite

(134) In L-C parallel circuits. The circuit resonate at a frequency $\omega = \omega_r$ which makes

(a) $X_C > X_L$ **(b)** $X_C < X_L$

(c) $X_C = X_L$ **(d)** $X_C = 0$

(135) For L-C parallel circuit,

(a) current and voltage are out of phase **(b)** current and voltage are in phase

(c) inductance and voltage are out of phase **(d)** current and voltage has phase of 30^0

(136) At the resonance the current is minimum in L-C parallel circuit, the power factor is

(a) 0 **(b)** 1

(c) -1 **(d)** infinite

PAST PAPER MCQS

(137) The SI unit of $\sqrt{LC}$ is: **MTN-2019 (G-II)**

(a) Second **(b)** Ampere

(c) Hertz **(d)** Farad

ENTRY TEST MCQS

(138) Which one is not the property of parallel resonant circuit?

(a) At the resonance frequency, circuit impedance is maximum

(b) At the resonance the current is minimum

(c) At the resonance, power factor is 1

(d) At resonance, the branch current I_L and I_C may each be larger than the source current I_r

(139) Simple oscillating circuit consists of?

(a) Inductor and capacitor **(b)** Resistance and capacitor
(c) Resistance and coil **(d)** Inductor and resistance

Topic 16.11:

Three Phase A.C Supply

(140) An A.C generator consists of a coil with
(a) with a slip ring **(b)** with a pair of slip rings
(c) with a pair of magnet **(d)** with a Commutator

(141) As the coil rotates an alternating voltage is generated across the
(a) Commutator **(b)** magnet
(c) coil **(d)** slip rings

(142) The number of coils used in three phase A.C generated are
(a) 1 **(b)** 2
(c) 4 **(d)** 3

(143) The coils in three phase A.C generator inclined at
(a) 90° **(b)** 0°
(c) 120° **(d)** 60°

(144) When the combination of three coils rotate in three phase A.C generator, then
(a) a voltage is generated **(b)**3 alternating voltage generated
(c) no voltage generate **(d)**2 alternating voltage generated

(145) The voltages generate in three phase A.C generator has the phase difference of
(a) 120^0 **(b)** 90^0
(c) 360^0 **(d)** 180^0

(146) The main advantage of having three phase supply is that the total load of the house or a factory is divided into
(a) 4 parts **(b)** 3 parts
(c) 5 parts **(d)** 2 parts

(147) The voltage across each of lines connected to terminals A,B & C of machine and the neutral line in three phase AC supply is
(a) 400V **(b)** 120V
(c) 230V **(d)** 440V

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(148) In three phase A.C supply, the coils are inclined at an angle of: MTN-2019 (G-II)
(a) 0° **(b)** 90°
(c) 130° **(d)** 120°

(149) The voltage across any two live lines in three phase AC supply is FSD-2022 (G-II)
(a) 400V **(b)** 120V
(c) 230V **(d)** 440V

ENTRY TEST MCQS

(150) The line to neutral voltage in three phase A.C supply is
(a) 230 V **(b)** 400 V
(c) 120 V **(d)** 0 V

(151) In three phase A.C if rms value of any phase is V volt then potential difference between any two-phase lines is

(a) V volt **(b)** 3V volt

(c) $\sqrt{3}$ V volt **(d)** $\frac{\sqrt{3}}{2}$ V volt

Topic 16.12:

Principle of Metal Detectors

(152) A coil and a capacitor are electrical components which together can produce

(a) oscillation of voltage **(b)** oscillation of current

(c) oscillation of reactance **(d)** oscillation of capacitance

(153) An L-C circuit behaves like an

(a) oscillating pendulum **(b)** oscillating mass-spring system

(c) Amplifier **(d)** all of these

(154) In metal detector the energy oscillates between

(a) resistor and capacitor **(b)** capacitor and resonance

(c) inductor and capacitor **(d)** resistor and inductor

(155) The metal detectors are used to locate

(a) buried metal objects **(b)** metal at security checks

(c) both a and b **(d)** none of these

PAST PAPER MCQS

(156) When a metal detector comes close to a metal then its frequency: RWP-2019 (G-I)

(a) becomes double **(b)** remains same

(c) Decreases **(d)** increases

(157) Metal detector consists of SWL-2017

(a) L–C circuit **(b)** R–L circuit

(c) R–C circuit **(d)** RLC–series circuit

(158) When an inductor comes close to a metallic object, its inductance is DGK-2017 (G-II)

(a) decreased **(b)** increased

(c) becomes half **(d)** becomes 4 times

(159) The principle of metal detector is. MTN-2022 (G-II)

(a) resonance **(b)** beats

(c) Faraday's law **(d)** Lenz's law

ENTRY TEST MCQS

(160) In a metal detector, in absence of any metal the inductance L_A and L_B have the relation

(a) $L_A > L_B$ **(b)** $L_A < L_B$

(c) $L_A = L_B$ **(d)** None of these

Topic 16.13 & 16.14:

Choke and Electromagnetic Waves

(161) In space the speed of electromagnetic waves is

(a) $3 \times 10^{9} ms^{-1}$ **(b)** $2 \times 10^{8} ms^{-1}$

(c) $3 \times 10^{8} ms^{-1}$ **(d)** $3 \times 10^{-8} ms^{-1}$

(162) The waves which do not require any medium for their propagation

(a) mechanical waves **(b)** stationary waves

(c) matter waves **(d)** electromagnetic waves

(163) The electromagnetic phenomenon explained by

(a) Maxwell **(b)** Einstein

(c) Newton **(d)** Bohr

(164) The choke coil makes the inductance L of the coil

(a) quite large **(b)** very small

(c) zero **(d)** infinite

(165) The electromagnetic phenomenon explained Maxwell in

(a) 1894 **(b)** 1864

(c) 1789 **(d)** 1869

(166) According to Maxwell's equation the changing magnetic flux creates an

(a) electric charge **(b)** electric field

(c) magnetic field **(d)** both b & c

(167) The choke coil is used in

(a) A.C circuits **(b)** D.C circuits

(c) potential meter **(d)** potential divider

(168) According to Maxwell's equation the magnetic field produce due to

(a) changing in magnetic flux **(b)** changing electric field

(c) changing power **(d)** none of these

(169) The choke coil used in A.C circuits used to

(a) limit the voltage **(b)** limit the current

(c) limit the power **(d)** limit the potential difference

(170) In electromagnetic phenomenon the magnetic field, electric field and direction of their propagation are

(a) opposite to each other **(b)** anti-parallel to each other

(c) parallel **(d)** mutually orthogonal

(171) The electromagnetic waves have been classified into spectrum depending upon

(a) speed ` **(b)** wavelength

(c) frequency **(d)** both b and c

(172) Which one has the smallest wavelength

(a) gamma rays **(b)** X-rays

(c) radio waves **(d)** infra red rays

(173) Which one has the highest frequency

(a) gamma rays **(b)** X-rays

(c) radio waves **(d)**infra red rays

(174) The formula for speed of electromagnetic waves is

(a) $c = f\lambda$ **(b)** $v = c\lambda$

(c) $c = f/\lambda$ **(d)** $c = \lambda/f$

(175) To generate the electromagnetic waves the charged particle must

(a) be stationary **(b)** be accelerated

(c) have no energy **(d)** none of these

(176) The speed of light is same as the speed of

(a) radio waves **(b)** electromagnetic waves

(c) gamma rays **(d)** all of these

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(177) Which of the following electromagnetic waves have the shortest wavelength?

GRW-2022 (G-II)

(a) Radio wave **(b)** Infrared wave

(c) Ultraviolet wave **(d)** Micro wave

(178) Choke consumes extremely small: **FSD-2019 (G-I), SGD-2022 (G-II)**

(a) Current **(b)** Charge

(c) Power **(d)** Potential

(179) Resistance of pure choke is **DGK-2022 (G-I), FSD-2022 (G-II)**

(a) Zero **(b)** Large

(c) Very Small **(d)** Infinite

ENTRY TEST MCQS

(180) Which one is not true about choke coil?

(a) It is an inductive coil **(b)** It consumes extremely large power

(c) Used to limit current in AC circuit **(d)** Both a and c

(181) X-rays have frequency greater than

(a) Visible light **(b)** Ultraviolet

(c) Microwaves **(d)** All of these

Topic 16.15:

Principle of Generation, Transmission and Reception of Electromagnetic Waves

(182) The electric charge at rest gives rise to

(a) gravitational force **(b)** Coulomb's field

(c) frictional force **(d)** Newton's force

(183) By shaking an electrically charged object to and fro, it is produced

(a) electromagnetic waves **(b)** electric waves

(c) mechanical waves **(d)** matter waves

(184) The electromagnetic waves which are propagated out in space from radio transmitting antenna are known as

(a) radio waves **(b)** infrared waves

(c) mechanical waves **(d)** matter waves

(185) A radio transmitting antenna generate electromagnetic waves by

(a) stationary charges **(b)** accelerating charges

(c) both a and b **(d)** none of these

(186) The piece of wire along which charges are made to accelerate is called

(a) transmitting antenna **(b)** receiving antenna

(c) L-C antenna **(d)** receiving station

(187) Which electromagnetic waves emitted from antenna

(a) stationary waves **(b)** light waves

(c) transverse waves **(d)** longitudinal waves

(188) As the charging potential alternates, the charge on the antenna

(a) remain same **(b)** always positive

(c) constantly reverses **(d)** always negative

(189) The voltage appears across a receiving antenna placed in space is usually due to the

(a) radio waves of large number of frequencies

(b) longitudinal waves of high frequency

(c) light waves

(d) radio waves of single frequencies

(190) When a number of transmitting stations operate simultaneously, then in space we have a number of
(a) radio waves of same frequencies
(b) radio waves of different frequencies
(c) longitudinal waves of same frequencies
(d) longitudinal waves of different frequencies

PAST PAPER MCQS

(191) When we accelerate the charge, which type of waves are produced? SGD-2022 (G-I)
(a) mechanical wave **(b)** travelling wave
(c) stationary wave **(d)** electromagnetic wave

ENTRY TEST MCQS

(192) Which one is true about electromagnetic waves?
(a) Speed of electromagnetic wave is = $c = \frac{1}{\sqrt{\mu_o \varepsilon_o}} = 3\times10^8\ ms^{-1}$
(b) Electromagnetic waves are generated by accelerating charges.
(c) Particular frequency radio signal is tuned on receiver radio by adjusting the value of c.
(d) All of these

(193) Electromagnetic waves do not transport
(a) Energy **(b)** Charge
(c) Momentum **(d)** Information

(194) Accelerating charge has:
(a) Electric field **(b)** Magnetic field
(c) Both **(d)** None

Topic 16.16:

Modulation

(195) The process of combining the low frequency signal with high frequency radio waves is called
(a) modulation **(b)** de-modulation
(c) rectification **(d)** none of these

(196) As a result of modulation, the resultant wave is called
(a) de-modulated carrier waves **(b)** carrier waves
(c) both a & b **(d)** modulated carrier waves

(197) The low frequency signals is known as
(a) modulation signals **(b)** modulated carrier signals
(c) de-modulated signals **(d)** carrier signals

(198) The types of modulations are
(a) 3 **(b)** 4
(c) 5 **(d)** 2

(199) The type of modulation in which the amplitude of the carrier wave is increased or diminished as the amplitude of the superposing modulation signal increasing or decreasing called
(a) A.F **(b)** W.M
(c) F.M **(d)** A.M

(200) The A.M transmission frequencies range is from
(a) 570 kHz to 1800 kHz **(b)** 570 kHz to 1600 kHz

(c) 540 kHz to 1600 kHz **(d)** 940 kHz to 1700 kHz

(201) In which type of modulation the carrier wave amplitude remain same

(a) wavelength modulation **(b)** light modulation

(c) frequency modulation **(d)** amplitude modulation

(202) The F.M transmission frequencies range is from

(a) 70kHz to 180kHz **(b)** 88MHz to 108MHz

(c) 60kHz to 160kHz **(d)** 40kHz to 170kHz

(203) Which radio waves are less effected by electric interference

(a) F.M **(b)** A.M

(c) A.F **(d)** both a & b

(204) Modulation is the process of combining the low frequency signal with a high frequency radio waves called

(a) modulated waves **(b)** carrier waves

(c) both a and b **(d)** none of these

(205) The waves which are less able to travel around obstacles such as hills and large buildings are

(a) A.M waves **(b)** A.F waves

(c) F.M waves **(d)** both a & c

PAST PAPER MCQS

(206) The process of combining low frequency signal with a high frequency radio waves is called **SGD-2017 (G-II)**

(a) amplification **(b)** resonance

(c) demodulation **(d)** modulation

(207) The A.M transmission frequencies range is from **DGK-2022 (G-II)**

(a) 540 Hz to 1600 Hz **(b)** 540 MHz to 1600 MHz

(c) 540 kHz to 1600 kHz **(d)** 540 Hz to 1600 kHz

ENTRY TEST MCQS

(208) Frequency range of F.M signal is

(a) 540 kHz to 1600 kHz **(b)** 88 MHz to 108 MHz

(c) 1 MHz to 100 MHz **(d)** None of these

(209) The modulated electromagnetic waves of frequency 100 kHz are falling on an aerial of radio. These will induce a current of frequency.

(a) 10 kHz **(b)** 50 kHz

(c) 100 kHz **(d)** 150 kHz

ANSWER KEYS

(Topical Multiple Choice Questions)

1	B	21	A	41	B	61	B	81	D	101	D	121	B	141	D	161	C	181	D	201	C	221	
2	B	22	C	42	B	62	A	82	A	102	A	122	B	142	C	162	D	182	B	202	B	222	
3	B	23	A	43	A	63	B	83	A	103	B	123	B	143	B	163	A	183	A	203	A	223	
4	C	24	D	44	A	64	C	84	D	104	B	124	B	144	A	164	A	184	A	204	B		
5	A	25	B	45	C	65	D	85	D	105	C	125	B	145	C	165	B	185	B	205	C		
6	A	26	B	46	B	66	B	86	D	106	D	126	B	146	B	166	B	186	C	206	D		
7	C	27	A	47	D	67	C	87	D	107	A	127	A	147	C	167	A	187	A	207	C		
8	A	28	B	48	B	68	B	88	C	108	D	128	C	148	D	168	B	188	C	208	B		
9	A	29	B	49	C	69	C	89	C	109	D	129	D	149	A	169	B	189	A	209	C		
10	D	30	B	50	A	70	C	90	A	110	C	130	A	150	A	170	D	190	B	210			
11	C	31	C	51	D	71	D	91	B	111	A	131	A	151	C	171	D	191	D	211			
12	B	32	B	52	A	72	C	92	B	112	B	132	B	152	B	172	A	192	D	212			
13	D	33	D	53	B	73	B	93	D	113	B	133	A	153	B	173	A	193	B	213			
14	D	34	B	54	A	74	C	94	C	114	B	134	C	154	C	174	A	194	C	214			
15	A	35	B	55	A	75	C	95	C	115	A	135	B	155	C	175	B	195	A	215			
16	B	36	C	56	A	76	B	96	C	116	B	136	B	156	C	176	D	196	D	216			
17	B	37	B	57	B	77	B	97	D	117	A	137	C	157	A	177	C	197	A	217			
18	C	38	A	58	D	78	A	98	B	118	C	138	A	158	A	178	C	198	D	218			
19	A	39	B	59	D	79	A	99	A	119	B	139	A	159	B	179	A	199	D	219			
20	D	40	D	60	A	80	B	100	C	120	B	140	B	160	C	180	B	200	C	220			

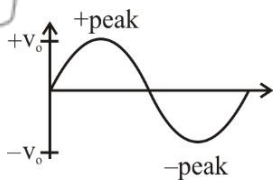
KIPS TOPICAL SHORT QUESTIONS

16.1 ALTERNATING CURRENT

(1) What is meant by peak value? Define also peak to peak value?

Ans: Peak Value

Maximum value of voltage or current on either side is called peak value. It is denoted by V_o for voltage and I_o for current.



Peak to peak value

It is the sum of positive and negative peak values usually written as p-p value.

For voltage $V_{P-P} = 2V_o = 2\sqrt{2}V_{rms}$

For current $I_{PP} = 2I_o = 2\sqrt{2}I_{rms}$

(2) Prove that

(i) $V_{rms} = 0.707\ V_o$ (ii) $I_{rms} = 0.707\ I_o$

Ans: **(i)** V_{rms} is defined as the square root of the average of square of voltages through out the cycle.

Proof: Since the numbers of positive and negative peaks in A.C are same, which may reduce the total value to zero, but average of squares will not be zero. So

$$V_{rms} = \sqrt{\frac{V^2_{min} + V^2_{max}}{2}} = \sqrt{\frac{0 + V_0^2}{2}}$$

$$V_{rms} = \frac{V_o}{\sqrt{2}} \quad \Rightarrow \quad V_{rms} = 0.707\ V_o$$

(ii) I_{rms} is defined as the square root of the average of squares of maximum and minimum currents through out the cycle.

Proof: Since the number of positive and negative peaks in A.C are same which may reduce the total current to zero, but average of squares will not be zero. So

$$I_{rms} = \frac{\sqrt{I^2_{min} + I^2_{max}}}{2} = \frac{\sqrt{0 + I^2}}{2} = \frac{I_o}{\sqrt{2}}$$

$$I_{rms} = 0.707\ I_o$$

(3) Define (a) instantaneous value (b) Peak value.

Ans: **1) Instantaneous value:** The value of alternating voltage or current at any instant in a circuit from some reference point is known as its instantaneous value. It is given by

$V = V_o \sin\theta$

$V = V_o \sin\omega t$ Q $\theta = \omega t$

$V = V_o \sin 2\pi ft$

Similarly,

$I = I_o \sin\theta$

$I = I_o \sin\omega t$ Q $\theta = \omega t$

$I = I_o \sin 2\pi ft$

2) Peak value: Highest value attained by an alternating quantity (voltage or current) in a cycle is called peak value. It is represented by V_o and I_o.

(4) How does the voltage output of a generator change with angular velocity?

Ans: The output V of A.C generator at any instant

$$V = V_0 \sin\frac{2\pi}{T}t$$

Where T = time period of rotation of coil

$\frac{2\pi}{T}$ =2πf=ω=angular fequency of rotation

t= 0	$\theta = \frac{2\pi}{T}.0 = 0$	V = 0
$t = \frac{T}{4}$	$\theta = \frac{2\pi}{T}.\frac{T}{4} = \frac{\pi}{2}$	$V = V_o$
$t = \frac{T}{2}$	$\theta = \frac{2\pi}{T}\frac{T}{2} = \pi$	V = 0
$t = \frac{3T}{4}$	$\theta = \frac{2\pi}{T} \times \frac{3T}{4} = \frac{3\pi}{2}$	$V = -V_o$
$t = T$	$\theta = \frac{2\pi}{T}.T = 2\pi$	V = 0

(5) What is meant by phase of A.C quantities?

Ans: The instantaneous value of voltage is given by the relation

$$V = V_0 sin\omega t = V_0 sin\theta$$

The angle θ which specified the instantaneous value of alternating voltage or current is known as its phase.

(6) What is difference between alternating and direct current?

Ans:

Alternating Current (A.C.)	Direct Current (D.C.)
• Alternating current whose magnitude varying continuously and reverses its direction periodically. • A.C. generator is common source of alternating current. • The frequency of A.C. in Asia 50 Hz. • A.C. cannot flow through an inductor.	• Direct current is due to flow of charges in one direction without reversing its direction. • Cell and battery are common source of direct current. • The frequency of pure D.C. is zero. • D.C. cannot flow through a capacitor.

(7) Define Root Mean Square (rms) value of potential and current.

Ans: Root Mean Square value of voltage is defined as the square root of the average of square of voltage throughout the cycle. V_{rms} is given by;

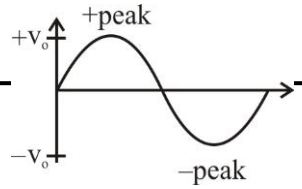
$$V_{rms} = \frac{V_o}{\sqrt{2}}$$

Root Mean Square value of current is defined as the square root of the average of squares of maximum and minimum currents throughout the cycle. I_{rms} is given by;

$$I_{rms} = \frac{I_o}{\sqrt{2}}$$

(8) Define peak value of A.C. voltage.

Ans: Maximum value of voltage on either side is called peak value. It is denoted by V_o.



(9) Define phase of alternating voltage.

Ans: The instantaneous value of voltage is given by the relation

$$V = V_0 sin\omega t = V_0 sin\theta$$

The angle θ which specifies the instantaneous value of alternating voltage or current is known as its phase.

(10) What is the main reason for the worldwide use of A.C.?

Ans: The main reason for the worldwide use of A.C. is that it can be transmitted to long distances easily and at a very low cost.

(11) Give different conditions for representing an alternating quantity?

Ans: A.C quantities are represented by anti-clock wise rotating vectors such that Length of vector represent the peak or rms value of A.C quantity.
Vector is along horizontal plane of A.C quantity is zero.
The angular frequency ω of rotating vector must same as that of A.C quantity.

PAST PAPER SHORT QUESTIONS

(12) What is meant by phase of A.C quantities? **LHR-2017 (G-I), DGK-2017 (G-II)**

(13) A sinusoidal current has rms value of 10A. What is the maximum or peak value?
SGD-2017 (G-II), MIRPUR-2017, LHR-2017 (G-I), LHR-2021 (G-I, II), DGK-2022 (G-I, II), FSD-2022 (G-I)

(14) How many times per second will an incandescent lamp reach maximum brilliance when connected to a 50 Hz source?
DGK-2017 (G-II), SGD-2017 (G-II), LHR-2021 (G-II), RWP-2022 (G-I)

(15) Define instantaneous value and peak value of alternating current.
MTN-2016 (G-I), BWP-2017 (G-I)

(16) Define peak value and peak to peak value of A.C. voltage?
BWP-2014, DGK-2017 (G-II), LHR-2022 (G-II)

(17) What do you mean by root mean square value of voltage and write its formula?
MTN-2019 (G-II), BWP-2022 (G-I)

(18) What do you mean by phase lag and phase lead? **RWP-2022 (G-I)**

(19) What is meant by phase difference? **RWP-2022 (G-II)**

16.2 A.C. CIRCUITS

(20) How voltage and current are controlled in A.C circuits?

Ans: In A.C circuit voltage and current are controlled by resistor, capacitor and inductor

PAST PAPER SHORT QUESTIONS

(21) What is difference between A.C. circuit and D.C. circuit? **LHR-2022 (G-I), DGK-2022 (G-II)**

16.3 A.C. THROUGH A RESISTER

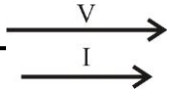
(22) Explain shortly A.C through a Resistor.

Ans: At any time t, the potential difference across the resistor produced by A.C source is given as $V = V_o \sin(\omega t)$ ----------(1)

And by ohm's law, current is given as

$$I = \frac{V}{R} = \frac{V_o}{R} \sin\omega t$$

$$I = I_o \sin\omega t \quad \text{--------(2)}$$



from equation (1) and (2) it is clear that both are in phase in resistor. It can be represented vectorially as.

PAST PAPER SHORT QUESTIONS

16.4 A.C. THROUGH A CAPACITOR

(23) Define reactance of a capacitor. Also write down its formula.

Ans: It is opposition offered by capacitor to alternating current. It is also called alternating current. Resistance of capacitor, it is denoted by Xc and is given by

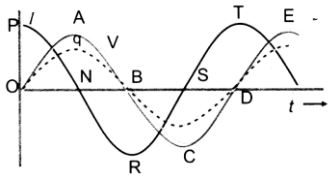
$$X_c = \frac{\text{Voltage}}{\text{Current}}$$

Its unit is ohms $X_C = \frac{1}{\omega C} = \frac{1}{2\pi fC}$

where $\omega = 2\pi f$

(24) In a RC circuit, will the current lag or lead the voltage? Illustrate your answer by a vector diagram. **LHR-2012**

Ans: As $I = \frac{\Delta q}{\Delta t}$ = rate of flow of charge.



Hence current at any instant is the slope of q-t curve.

At O when q = 0 slope is maximum so I is maximum. From O to A slope q – t curve decreased to zero. So I is zero at N. From A to B slope of q – t curve is negative so I is negative from N to R. Variation of current is represented by curve PNRST. From fig it is clear that current leads the voltage by $\frac{\pi}{2}$ because when at point A phase of V is $\frac{\pi}{2}$ and that of I is π. Hence current leads V by $\frac{\pi}{2}$ vectorially it is represented in fig c.

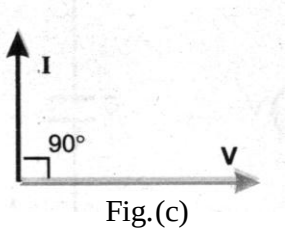


Fig.(c)

(25) Describe the condition which will make the reactance small.

Ans: It is opposition offered by capacitor to A.C. It is also called A.C resistance of capacitor, it is denoted by X_c and is given by

$$X_c = \frac{\text{Voltage}}{\text{Current}}$$

Its unit is ohms $X_C = \frac{1}{\omega C} = \frac{1}{2\pi fC}$

In case of capacitor reactance becomes small by using higher frequency A.C. source

PAST PAPER SHORT QUESTIONS

(26) Define reactance of a capacitor. Also write down its formula. **BWP-2017 (G-I)**

(27) How does doubling the frequency affect the reactance of a capacitor? **FSD-2022 (G-II)**

16.5 A.C. THROUGH AN INDUCTOR

(28) What is meant by inductive reactance?

Ans: The opposition offered by the inductive coil to the flow of A.C is called inductive reactance. It is denoted by X_L. Its unit is ohm.

Mathematically,

$$X_L = \omega L = 2\pi fL$$

(29) At what frequency will an inductor of 1.0H have a reactance of 500 Ω?

RWP-2019 (G-I)

Ans: The reactance of an inductor is given by;

$$X_L = \omega L$$

$$X_L = 2\pi fL$$

$$f = \frac{X_L}{2\pi L} = \frac{500}{2(3.14)(1)} = 79.6\,Hz$$

(30) Define choke?

Ans: An inductor coil does not consume energy, the coil is often employed for controlling A.C without consumption of energy. Such an inductance coil is known as choke.

PAST PAPER SHORT QUESTIONS

(31) At what frequency will an inductor of 1.0H have a reactance of 500 Ω?

GRW-2019 (G-II), RWP-2019 (G-I)

(32) Explain the power dissipation in an inductor. **LHR-2021 (G-I)**

16.6 IMPEDENCE

(33) When 10V are applied to an A.C circuit, the current flowing in it is 100 mA. Find its impedance.

Ans: As we know that;

$$\text{Impendence} = \frac{\text{voltage}}{\text{current}} = \frac{10}{100\times10^{-3}} = 100\,\Omega$$

(34) Define impedance and write its formula? Also give its unit?

Ans: The combined opposing effect of resistance and reactances to A.C is called impedance it is denoted by Z

$$Z = \frac{V_{rms}}{I_{rms}}.$$

Its unit is ohm.

PAST PAPER SHORT QUESTIONS

(35) Define impedance and write its formula. Also give its units.

MTN-2017 (G-I), LHR-2019 (G-II), DGK-2022 (G-I)

(36) When 10V are applied to an A.C circuit, the current flowing in it is 100 mA. Find its impedance. **BWP-2022 (G-I)**

16.7 R-C AND R-L SERIES CIRCUITS

(37) Define impedance and write the impedance expression for R-L series circuit.

MTN-2019 (G-I)

Ans: Impedance:

The combined opposing effect of resistance and reactances to A.C is called impedance it is denoted by Z. Its unit is ohm.

$$Z = \frac{V_{rms}}{I_{rms}}.$$

R-L SERIES CIRCUIT

In R-L series circuit impedance is given by;

$$\text{Impedance } Z = V/I = \sqrt{R^2 + (\omega L)^2}$$

PAST PAPER SHORT QUESTIONS

(38) How does doubling the frequency affect the reactance of an inductor and a capacitor.
DGK-2017 (G-I), LHR-2021 (G-I), BWP-2022 (G-I), ESD-2022 (G-I)

(39) Define impedance and write the impedance expression for R-L series circuit.
MTN-2019 (G-I)

(40) A choke coil placed in series with an electric lamp in A.C circuit causes the lamp to become dim, why is it so? **BWP-2022 (G-I)**

16.8 POWER IN A.C. CIRCUITS

(41) What is power factor? What are its values for pure resistor, capacitor and inductor circuits?

Ans: Power factor is equal to the cosine of phase angle between the voltage and current vectors i.e power factor = $\cos q$

As, we know that power in A.C circuit is given as

$$P = V_{rms}\ I_{rms} \cos q$$

$$\cos q = \frac{P}{V_{rms}\ I_{rms}}$$

For resistor, since $q = 0^o$ its value is one, as cos 0° = 1.

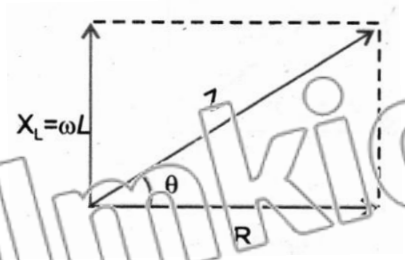
For inductor, since q = 90°, thus cos 90° = 0 = power factor and for capacitor, aging since q = 90°, the cos 90° = 0 = power factor.

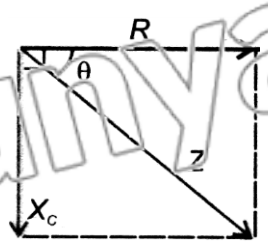
(42) How power is calculated in an A.C circuit? Write its formula.

Ans: Electrical power can be calculated by using P = VI. This relation is applicable only when V and I are in phase as in case of pure resistive circuit. An average power dissipated in inductor and capacitor is zero because of phase difference of $\frac{\pi}{2}$ between V and I so in these cases voltage has no component along I.

(43) Compare the impedance diagram of R-C and R-L circuits.

Ans: By comparing the impedance diagram of R-C and R-L circuits it can be seen that the vector lines of reactance X_c and X_L are directed opposite to each other with R as reference





PAST PAPER SHORT QUESTIONS

(44) How power is calculated in an A.C circuit? Write its formula. **LHR-2017 (G-I)**

(45) Explain the power factor in A.C circuit. **RWP-2022 (G-I)**

16.9 SERIES RESONANCE CIRCUIT

(46) Write the properties of a series resonant circuit.

Ans: Following are the important properties of a series resonant circuit.

(i) The resonance frequency is given by

$f_r = 1/2\pi \sqrt{LC}$ when $X_L = X_c$

(ii) The impedance of the circuit at resonance is minimum and it is equal to R.

(iii) At resonance frequency 'f' the voltage drop across inductor and capacitor may be greater than the source voltage.

(iv) The power factor of resonance series circuit is '1' since the impedance of the circuit at resonance is resistive so the current and voltage are in phase.

(v) If the amplitude of the source voltage 'V' is constant, the current is maximum at the resonance frequency.

(47) What is resonance condition in RLC series circuit? Give its equation? LHR-2014

Ans: In between low and high frequency there will be frequency for which $X_L = X_C$, this condition is called resonance.

As

$$X_L = X_C$$

$$\omega_r L = \frac{1}{\omega_r C} \quad or$$

$$\omega_r^2 = \frac{1}{LC}$$

$$\omega_r = \frac{1}{\sqrt{LC}} \quad or$$

$$2\pi f_r = \frac{1}{\sqrt{LC}} \quad or$$

$$f_r = \frac{1}{2\pi\sqrt{LC}}$$

PAST PAPER SHORT QUESTIONS

(48) What is resonance condition in RLC series circuit? Give its equation? **BWP-2022 (G-II)**

16.10 PARALLEL RESONANCE CIRCUIT

(49) What is the condition of resonance in parallel resonant circuit?

Ans: If R is small, then for LC parallel circuit, the resonance takes place when $X_L = X_C$. At this point frequency is called resonant frequency and is given by the relation

$$f_r = \frac{1}{2\pi\sqrt{LC}}$$

(50) Write four properties of parallel resonance circuit. RWP-2015

Ans: **(i)** The resonance frequency is $f_r = \frac{1}{2\pi\sqrt{LC}}$

(ii) At resonance the impedance is maximum equals to L/CR. Hence current is minimum at resonance and in phase with voltage

(iii) At resonance branch currents I_L and I_C may each be larger than source currents I_R.

(iv) At resonance power factor is one.

PAST PAPER SHORT QUESTIONS

(51) Write two properties of parallel resonance circuit. FSD-2022 (G-II)

16.11 THREE PHASE A.C. SUPPLY

(52) Give some advantages of three phase A.C supply?

Ans: **(1)** The total load is divided into three parts. Hence it can bear large load of a house or factory.

(2) It can be used to operate heavy machinery, which need 400 V for operation.

PAST PAPER SHORT QUESTIONS

(53) What is the main advantage of three phase A.C. supply? **LHR-2022 (G-I)**

(54) Discuss two uses of three phase A.C. supply. **LHR-2022 (G-II)**
(55) Write four properties of parallel resonance circuit. **RWP-2022 (G-I)**

16.12 PRINCIPLE OF METAL DETECTORS

(56) Explain the principle of metal detector. **SWL-2017**
Ans: The working principle of metal detector based on beats
Explanation:
Two oscillators A and B are used in the operation of common type of metal detector. In the absence of any nearby metal object the inductances L_A and L_B are the same and hence the resonance frequency of two circuits is also same. When the inductor B, called search coil comes near a metal object, its inductance L_B decreases and corresponding oscillator frequency increases and thus a beat note is heard in the attached speaker.

PAST PAPER SHORT QUESTIONS

(57) Explain the principle of metal detector. **SWL-2017**

16.13 CHOKE

(58) Define choke, give its uses.
Ans: It consists of an inductance coil and is used to adjust the current in A.C circuits. It plays the same part in A.C circuits as resistance in D.C circuits for many purposes
Use: It is use to reduce the current in a given A.C circuit without small wastage of energy, when the supply voltage is constant.
(59) What is a choke coil and why is it used in A.C circuits?
Ans: It is a coil which consists of thick copper wire wound closely in a large number of turns over a soft iron laminated cores.
It is used in A.C circuits to limit current with extremely small wastage of energy as compared to resistance or a rheostat.
(60) How much energy is consumed by a choke when an AC is passed through it? Explain.
Ans: Choke makes the inductance L of the coil quite large whereas its resistance R is very small. Thus it consumes extremely small power it is used in A.C. circuits to limit current with extremely small wastage of energy as compared to a resistance or a rheostat.

PAST PAPER SHORT QUESTIONS

(61) What is choke? Explain its use in A.C circuit.
MIRPUR (AJK) 2017, FSD-2019 (G-I), RWP-2019 (G-I), DGK-2022 (G-I), FSD-2022 (G-I)

16.14 ELECTROMAGNETIC WAVES

(62) What is the source of transmitting electromagnetic waves?
Ans: Electromagnetic waves are transmitted by radio transmitting antenna. Antenna generates Electromagnetic waves with the help of oscillation of accelerating charge.
(63) Write down the characteristics of electromagnetic waves.
Ans: **(i)** Electromagnetic waves required no medium.
(ii) Electromagnetic waves are description of Maxwell equations formulated by Maxwell in 1864.
(iii) Electromagnetic waves propagate with speed of light. i.e. 3×10^8 m/s.
(iv) Electromagnetic waves are produced by changing fields produced by changing flux i.e.
(a) Changing electric flux causes magnetic field.
(b) Changing magnetic flux causes electric field.
(v) Speed of electromagnetic waves can be given by

$$c = \frac{1}{\sqrt{\epsilon_o \mu_o}} \text{ where } \epsilon_o = 8.85\times10^{-12}\ C^2/Nm^2 \text{ and } \mu_o = 4\pi\times10^{-7}\ \text{Wb/Am}.$$

(vi) Electromagnetic waves consist of moving electric field and magnetic fields.

(vii) Electric field E, magnetic field B and direction of propagation of waves are mutually perpendicular.

(viii) Electromagnetic waves are periodic waves having specific wavelength and frequency related by $c = f\lambda$.

PAST PAPER SHORT QUESTIONS

(64) What are the electromagnetic waves? **LHR-2021 (G-II)**

16.15 PRINCIPLE OF GENERATION, TRANSMISSION AND RECEPTION OF ELECTRMAGNETIC WAVES

(65) What is the principle of generation of electromagnetic waves? SWL-2019

Ans: Electromagnetic waves generated only when there is electric and magnetic field changing. A charge at rest or moving with constant speed will not produce these waves because there is no change of electric flux and magnetic flux. A radio transmitting antenna is an example of generating electromagnetic waves by accelerated charges.

PAST PAPER SHORT QUESTIONS

(66) Write advantages of FM over AM. **GRW-2019 (G-I)**

(67) Explain the condition under which electromagnetic waves are produced from a source. **RWP-2022 (G-II)**

16.16 MODULATION

(68) What are the transmission frequencies for electromagnetic waves in (i) A.M range, (ii) F.M range.

Ans: **(i) A.M range:** The A.M. transmission frequencies range from 540 kHz to 1600 kHz.
(ii) F.M range: The F.M transmission frequencies are much higher and ranges between 88 MHz to 108 MHz.

(69) With reference to modulation, give the difference between the information and carrier.

Ans: In modulation the carrier is a high frequency radio wave and information is a low frequency signal. The low frequency signal is known as modulation signal. Modulation is achieved by changing amplitude or the frequency of the carrier wave in accordance with a modulated signal.

(70) Define modulation and write its types.

Ans: Modulation is the process of combining low frequency signal with a high frequency radio waves called carries waves. The resultant waves are called modulated carries waves. The low frequency signal is called the modulating signal.
So, modulation is of two types.

(i) Amplitude modulation (A.M)

(ii) Frequency modulation (F.M)

(71) Differentiate between amplitude modulation and frequency modulation. SWL-2017

Ans:

Amplitude Modulation (AM)	Frequency Modulation (FM)

A type of modulation is which amplitude of the carrier wave is increased or decreased as the amplitude of the superposing modulating signal increases and decreases. Its frequency range is 540 kHz – 1600 kHz. AM waves are moveable to travel around obstacle such as hills & large buildings so have a larger range.	A type of modulation in which frequency of the carrier wave is increased or decreased as the modulating signal amplitude increases or decreases but the carrier wave amplitude remains constant. Its frequency range is 88 MHz – 108 MHz. FM radio waves are affected less by electrical interference provide a higher quality transmission of sound.

PAST PAPER SHORT QUESTIONS

(72) Give advantages and disadvantages of F.M / and A.M **SGD-2017 (G-II), DGK-2022 (G-II)**

(73) How the reception of a particular radio station is selected on your radio set? **SGD-2017 (G-I), MIRPUR (AJK) 2017, SWL-2017, BWP-2017 (G-I), LHR-2022 (G-II) FSD-2022 (G-II)**

(74) Differentiate between amplitude modulation and frequency modulation. **SWL-2017**

(75) Define modulation and write its types. **DGK-2017 (G-I), BWP-2019 (G-II)**

(76) What is meant by A.M and F.M? **LHR-2022 (G-I), BWP-2022 (G-II)**