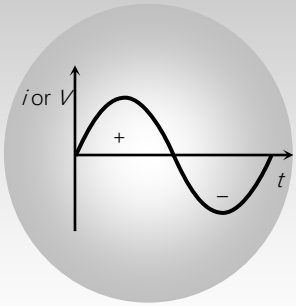
Assignment

(Basic & Advance Level Questions)



Assignment

Alternating Current, Voltage and Power

Basic Level

1. Alternating current can not be measured by dc ammeter because [AIEEE 2004]

   (a) Average value of current for complete cycle is zero (b) ac changes direction

   (c) ac can not pass through dc ammeter (d) dc Ammeter will get damaged

2. The peak value of an ac emf E given by $E = E_0 \cos\omega t$ is 10 V and its frequency is 50 Hz. At a time $t = \frac{1}{600} S$, the instantaneous value of emf is [MP PET 2004]

   (a) 10 V (b) $5\sqrt{3}\ V$ (c) 5 V (d) 1 V

3. A lamp consumes only 50% of peak power in an ac circuit. What is the phase difference between the applied voltage and the circuit current [MP PMT 2004]

   (a) $\frac{\pi}{6}$ (b) $\frac{\pi}{3}$ (c) $\frac{\pi}{4}$ (d) $\frac{\pi}{2}$

4. For high frequency, a capacitor offers [CPMT 1999; CBSE 1999; AFMC 2001; J & K CET 2004]

   (a) More reactance (b) Less reactance (c) Zero reactance (d) Infinite reactance

5. The power loss in an ac circuit will be minimum, when [J & K CET 2004]

   (a) Resistance is high, inductance is high (b) Resistance is high, inductance is low

   (c) Resistance is low, inductance is low (d) Resistance is low, inductance is high

6. An ac source is rated at 220 V, 50 Hz. The time taken for voltage to change from its peak value to zero is [Orissa JEE 2003]

   (a) 50 sec (b) 0.02 sec (c) 5 sec (d) 5×10^{-3} sec

7. The $r.m.s.$ value of an ac of $50\ Hz$ is 10 amp. The time taken by the alternating current in reaching from zero to maximum value and the peak value will be [MP PET 1993; KCET 2003]

   (a) 2×10^{-2} sec and $14.14\,amp$ (b) 1×10^{-2} sec and $7.07\,amp$

   (c) 5×10^{-3} sec and $7.07\,amp$ (d) 5×10^{-3} sec and $14.14\,amp$

8. The ratio of peak value and $r.m.s.$ value of an alternating current is [MP PMT 2002]

(a) 1 (b) $\frac{1}{2}$ (c) $\sqrt{2}$ (d) $1/\sqrt{2}$

9. An alternating voltage is represented as $E = 20 \sin 300\, t$. The average value of voltage over one cycle will be **[MP PMT 2002]**

(a) Zero (b) 10 *volt* (c) $20\sqrt{2}\ volt$ (d) $\frac{20}{\sqrt{2}} volt$

10. If an ac main supply is given to be 220 *V*. What would be the average *e.m.f.* during a positive half cycle **[MH CET 2002]**

(a) 198 *V* (b) 386 *V* (c) 256 *V* (d) None of these

11. The inductive reactance of an inductor of $\frac{1}{\pi}$ *henry* at 50 *Hz* frequency is **[MP PET 2001, 2002]**

(a) $\frac{50}{\pi} ohm$ (b) $\frac{\pi}{50} ohm$ (c) 100 *ohm* (d) 50 *ohm*

12. The frequency of an alternating voltage is 50 *cycles/sec* and its amplitude is 120 *V*. Then the *r.m.s.* value of voltage is **[BHU 1999; MH CET (Med.) 2001; KCET (Med.) 2001]**

(a) 101.3 *V* (b) 84.8 *V* (c) 70.7 *V* (d) 56.5 *V*

13. An ac supply gives 30 *V r.m.s.* which passes through a 10 Ω resistance. The power dissipated in it is

(a) $90\sqrt{2} W$ (b) 90 *W* (c) $45\sqrt{2} W$ (d) 45 *W*

14. The reactance of a coil when used in the domestic ac power supply (220 *volts*. 50 cycles per second) is 50 *ohms*. The inductance of the coil is nearly **[MP PMT 2000]**

(a) 2.2 *henry* (b) 0.22 *henry* (c) 1.6 *henry* (d) 0.16 *henry*

15. The capacity of a pure capacitor is 1 *farad*. In dc circuits, its effective resistance will be **[MP PMT 2000]**

(a) Zero (b) Infinite (c) 1 *ohm* (d) 1/2 *ohm*

16. If instantaneous current is given by $i = 4\cos(\omega t + \phi)$ *amperes*, then the *r.m.s.* value of current is

(a) 4 *amperes* (b) $2\sqrt{2}$ *amperes* (c) $4\sqrt{2}$ *amperes* (d) Zero *amperes*

17. The potential difference *V* across the current *i* flowing through an instrument in an ac circuit of frequency *f* are given by $V = 5\cos\omega t$ volts and $i = 2 \sin \omega t$ amperes (where $\omega = 2\pi f$). The power dissipated in the instrument is

(a) Zero (b) 10 *watt* (c) 5 *watt* (d) 2.5 *watt*

18. In an ac circuit with voltage *V* and current *i*, the power dissipated is

(a) *Vi* (b) $\frac{1}{2} Vi$

(c) $\frac{1}{\sqrt{2}} Vi$ (d) Depends on the phase between *V* and *i*

19. In an ac circuit, the instantaneous values of *e.m.f.* and current are $e = 200 \sin 314\, t\, volt$ and $i = \sin\left(314\, t + \frac{\pi}{3}\right) amp.$ The average power consumed in *watt* is **[NCERT 1990; RPMT 1997]**

(a) 200 (b) 100 (c) 50 (d) 25

20. An electric lamp is connected to 220 *V*, 50 *Hz* supply. Then the peak value of voltage is **[AFMC 1996]**

(a) 210 *V* (b) 211 *V* (c) 311 *V* (d) 320 *V*

21. The voltage of domestic ac is 220 *volt*. What does this represent **[MP PMT 1996]**

(a) Mean voltage (b) Peak voltage

(c) Root mean voltage (d) Root mean square voltage

22. If a current *i* given by $i_0 \sin\left(\omega t - \frac{\pi}{2}\right)$ flows in an ac circuit across which an ac potential of $E = E_0 \sin \omega t$ has been applied, then the power consumption *P* in the circuit will be **[CPMT 1986; Roorkee 1992; MP PMT 1994; SCRA 1996; [CPMT 1986; Roorkee 1992; SCRA 1996; MP PMT 1994; RPET 2001; MP PET 2001, 02]**

(a) $P = \frac{E_0 i_0}{\sqrt{2}}$ (b) $P = \sqrt{2} E_0 i_0$ (c) $P = \frac{E_0 i_0}{2}$ (d) $P = 0$

23. What will be the phase difference between virtual voltage and virtual current, when the current in the circuit is wattless **[RPET 1996]**

(a) 90^o (b) 45^o (c) 180^o (d) 60^o

24. An alternating current is given by the equation $i = i_1 \cos \omega t + i_2 \sin \omega t$. The *r.m.s.* current is given by **[MP PMT 1994]**

(a) $\frac{1}{\sqrt{2}}(i_1 + i_2)$ (b) $\frac{1}{\sqrt{2}}(i_1 + i_2)^2$ (c) $\frac{1}{\sqrt{2}}(i_1^2 + i_2^2)^{1/2}$ (d) $\frac{1}{2}(i_1^2 + i_2^2)^{1/2}$

25. In general in an alternating current circuit **[MP PMT 1994]**

(a) Average value of current is zero (b) Average value of square of current is zero

(c) Average power dissipation is zero (d) Phase difference between voltage and current is zero

26. A generator produces a voltage that is given by $V = 240 \sin 120\, t$, where *t* is in seconds. The frequency and *r.m.s.* voltage are **[MP PMT 1990; MP PET 1993]**

(a) 60 *Hz* and 240 *V* (b) 19 *Hz* and 120 *V* (c) 19 *Hz* and 170 *V* (d) 754 *Hz* and 70 *V*

27. The ratio of the mean value over half cycle to the *r.m.s.* value of an ac is

(a) $2:\pi$ (b) $2\sqrt{2}:\pi$ (c) $\sqrt{2}:\pi$ (d) $\sqrt{2}:1$

28. An ac voltage $e = 240 \sin 2\pi \times 50 \times t$ has a peak-to-peak value of

(a) 240 *V* (b) $240\sqrt{2}V$ (c) 480 *V* (d) $240/\sqrt{2}V$

29. The time required for a 50 *Hz* alternating current to increase from zero to 70.7% of its peak value is

(a) 2.5 *ms* (b) 10 *ms* (c) 20 *ms* (d) 14.14 *ms*

30. An ac circuit draws 5*A* at 160 *V* and the power consumption is 600 *W*. Then the power factor is

(a) 1 (b) 0.75 (c) 0.50 (d) Zero

31. What is the equation of an alternating current of frequency 60 *Hz* and *r.m.s.* value 10 *A* ? Given that current *i* = 0 at *t* = 0

(a) $i = 10 \sin (120\, \pi t)$ (b) $i = 10 \cos (120\, \pi t)$ (c) $i = 10\sqrt{2} \sin(120\, \pi t)$ (d) $i = 10\sqrt{2} \cos(120\, \pi t)$

32. Indicate the correct statements

(1) 50 *Hz* ac changes its direction 100 times in a second

(2) A 200 *V*, 60 *W* bulb can withstand upto 281 *V* dc

(3) In ac circuits voltage across an element may greater than supply

(4) To increase the frequency of ac number of poles should be increased

(a) 1, 2, 3 (b) 2, 3, 4 (c) 3, 4, 1 (d) All

33. If instantaneous value of current is $i = 10\sin(314\,t)\,A$ then the average current for the half cycle will be

(a) 10 *A* (b) 7.07 *A* (c) 6.37 *A* (d) 3.53 *A*

34. The voltage of an ac source varies with time according to the equation $V = 120\sin 100\pi t\cos(100\,\pi t)$ then **[MP PMT 1996]**

(a) The peak voltage of the source is 120 *volts* (b) The peak voltage of the source is 60 *volts*

(c) The peak voltage of the source is $\frac{120}{\sqrt{2}}$ *volts* (d) The frequency of the source is 50 *Hz*

35. An ac source is of 120 *volts* – 60 *Hz*. the value of the voltage after $\frac{1}{720}$ *sec* from the start will be

(a) 84.8 *volts* (b) 42.4 *volts* (c) 106.8 *volts* (d) 20.2 *volts*

36. The phase difference between the alternating current and voltage represented by the following equation $i = i_0\sin\omega t$, $E = E_0\cos\left(\omega t + \frac{\pi}{3}\right)$, will be

(a) $\frac{\pi}{3}$ (b) $\frac{4\pi}{3}$ (c) $\frac{\pi}{2}$ (d) $\frac{5\pi}{6}$

37. What should be the value of capacitive reactance for a capacitance of 10^{-6} *farad* while the angular frequency of alternating current becomes 10^6 *rad/sec*

(a) 2 Ω (b) 1 Ω (c) 100 Ω (d) 10 Ω

38. The reactance of a capacitor is X_1 for frequency n_1 and X_2 for frequency n_2 then $X_1 : X_2$ is

(a) 1 : 1 (b) $n_1 : n_2$ (c) $n_2 : n_1$ (d) $n_1^2 : n_2^2$

39. By how much percentage the impedance be increased in an ac circuit keeping the resistance constant so that the power factor changes from $\frac{1}{2}$ to $\frac{1}{4}$

(a) 100% (b) 200% (c) 50% (d) 25%

40. If the *r.m.s.* value of ac is i_{rms} then peak to peak value is

(a) $\sqrt{2}\,i_{rms}./\,2$ (b) $i_{rms}/\sqrt{2}$ (c) $2\sqrt{2}\,i_{rms}$ (d) $2\,i_{rms}$

Advance Level

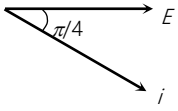
41. A group of electric lamps having a total power rating of 1000 *watt* is supplied by an ac voltage $E = 200\sin(310\,t + 60^o)$. Then the *r.m.s.* value of the circuit current is

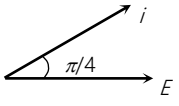
(a) 10 *A* (b) $10\sqrt{2}\,A$ (c) 20 *A* (d) $20\sqrt{2}\,A$

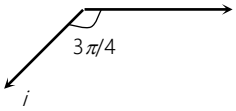
42. The instantaneous values of alternating current and *e.m.f.* in an ac circuit are $i = \frac{1}{\sqrt{2}} \sin 314\, t.\ A$ and $E = \sqrt{2} \sin(314\, t - \frac{\pi}{6})$ *volt* respectively. The phase difference between *E* and *i* will be

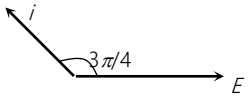
(a) $\frac{\pi}{6}$ *radian* (b) $-\frac{\pi}{6}$ *radian* (c) $\frac{\pi}{3}$ *radian* (d) $-\frac{\pi}{3}$ *radian*

43. In a certain circuit $E = 200 \cos(314\ t)$ and $i = \sin(314\ t + \pi / 4).$ Their vector representation is

(a) 

(b) 

(c) 

(d) 

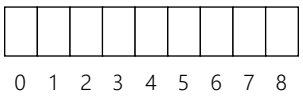
44. In a certain circuit current changes with time according to $i = 2\sqrt{t}.$ *r.m.s.* value of current between $t = 2$ to $t = 4s$ will be

(a) $3A$ (b) $3\sqrt{3}A$ (c) $2\sqrt{3}A$ (d) $(2 - \sqrt{2})A$

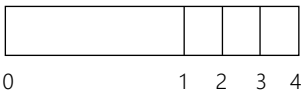
45. An ac current is given by $i = i_0 + i_1 \sin \omega t$ then its *r.m.s.* value will be

(a) $\sqrt{i_0^2 + 0.5 i_1^2}$ (b) $\sqrt{i_1^2 + 0.5 i_0^2}$ (c) 0 (d) $i_0 / \sqrt{2}$

46. The correctly marked ammeter for ac current is shown in

(a) 

(b) 

(c) 

(d) None of these

47. Heat is produced in a wire by allowing the ac of peak value 14 *A* to flow in it. If dc of *i* ampere is used for producing the same amount of heat, then the value of *i* will be approximately

(a) 7 *A* (b) 10 *A* (c) 12 *A* (d) 14 *A*

48. If the instantaneous value of current is *i* = 10 sin 314*t amp.* then the average value of i^2 will be

(a) 100 (b) 70.7 (c) 50.0 (d) 25.0

49. A square wave current switching rapidly between 0.4 *A* and – 0.4 *A* is passed through an ac ammeter. The reading of the ammeter will be

(a) 0 *A* (b) $0.4\sqrt{2}A$ (c) 0.8 *A* (d) 0.4 *A*

50. Match the following

Currents	r.m.s. values
(1) $x_0 \sin \omega t$	(i) x_0
(2) $x_0 \sin \omega t \cos \omega t$	(ii) $\frac{x_0}{\sqrt{2}}$

(3) $x_0 \sin \omega t + x_0 \cos \omega t$ (iii) $\frac{x_0}{(2\sqrt{2})}$

(a) 1. (i), 2. (ii), 3. (iii) (b) 1. (ii), 2. (iii), 3. (i) (c) 1. (i), 2. (iii), 3. (ii) (d) None of these

51. Consider two cables *A* and *B*. In *A*, a single copper wire of cross-sectional area *x* is used, while in *B*, a bunch of 15 wires each of cross-sectional are $\frac{x}{15}$ is used. Then for the flow of high frequency ac, the

(a) Cable *A* is more suitable than *B* (b) Cable *B* is more suitable then *A*

(c) Both cables are equally suitable (d) Nothing specific can be predicted

Different ac circuits (Series)

Basic Level

52. In an *LCR* series ac circuit, the voltage across each of the components, *L, C* and *R* is 50 *V*. The voltage across the *LC* combination will be

(a) 100 *V* (b) $50\sqrt{2}$ *V* (c) 50 *V* (d) 0 *V* (zero)

53. In a *LCR* circuit capacitance is changed from *C* to 2*C*. For the resonant frequency to remain unchanged, the inductance should be changed from *L* to **[AIEEE 2004]**

(a) *L*/2 (b) 2 *L* (c) 4 *L* (d) *L*/4

54. Radio frequency choke uses core of **[AFMC 2004]**

(a) Air (b) Iron (c) air and iron (d) None of these

55. In *LR* circuit, resistance is 8Ω and inductive reactance is 6Ω, then impedance is **[MP PMT 2003; Bihar CECE 2004]**

(a) 2Ω (b) 14Ω (c) 4Ω (d) 10Ω

56. The current in *LCR* series circuit will be maximum when ω is **[Kerala PMT 2004]**

(a) As large as possible (b) Equal to natural frequency of *LCR* system

(c) $\sqrt{LC}$ (d) $\sqrt{\frac{1}{LC}}$

57. A coil has *L* = 0.04 *H* and *R* = 12Ω. When it is connected to 220 *V*, 50 *Hz* supply the current flowing through the coil, in amperes is **[Kerala PMT 2004]**

(a) 10.7 (b) 11.7 (c) 14.78 (d) 12.7

58. In a ac circuit of capacitance the current from potential is **[CPMT 2003]**

(a) Forward (b) Backward (c) Both are in the same phase (d) None of these

59. There is a 5 Ω resistance in an ac circuit. Inductance of 0.1 *H* is connected with it in series. if equation of ac *e.m.f.* is $5 \sin 50t$ then the phase difference between current and *e.m.f.* is **[RPET 2003]**

(a) $\frac{\pi}{2}$ (b) $\frac{\pi}{6}$ (c) $\frac{\pi}{4}$ (d) 0

60. A coil of 200 Ω resistance and 1.0 *H* inductance is connected to an ac source of frequency $200/2\pi Hz$. Phase angle between potential and current will be **[MP PMT 2003]**

(a) 30^o (b) 90^o (c) 45^o (d) 0^o

61. A 280 *ohm* electric bulb is connected to 200 *V* electric line. The peak value of current in the bulb will be **[MP PET 2002]**

(a) About one ampere (b) Zero (c) About two ampere (d) About four ampere

62. An inductive circuit contains a resistance of 10 *ohm* and an inductance of 2.0 *henry*. If an ac voltage of 120 *volt* and frequency of 60 *Hz* is applied to this circuit, the current in the circuit would be nearly **[CPMT 1990; MP PET 2002]**

(a) 0.32 *amp* (b) 0.16 *amp* (c) 0.48 *amp* (d) 0.80 *amp*

63. The power factor of an ac circuit having resistance (*R*) and inductance (*L*) connected in series and an angular velocity ω is **[AIEEE 2002; MP PET 2000]**

(a) $R/\omega L$ (b) $R/(R^2+\omega^2L^2)^{1/2}$ (c) $\omega L/R$ (d) $R/(R^2-\omega^2L^2)^{1/2}$

64. Reactance of a capacitor of capacitance $C\mu F$ for ac frequency $\frac{400}{\pi}Hz$ is 25 Ω. The value *C* is

(a) $50\,\mu F$ (b) $25\,\mu F$ (c) $100\,\mu F$ (d) $75\,\mu F$

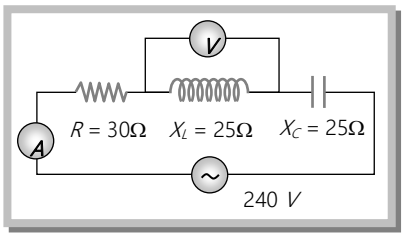
65. A circuit has resistance of 11 Ω an inductive reactance of 25 Ω and a capacitate reactance of 18Ω. It is connected to an ac source of 260 *V* and 50 *Hz*. The current through the circuit (in amperes) is **[Kerala PMT 2002]**

(a) 11 (b) 15 (c) 18 (d) 20

66. In a circuit, the current lags behind the voltage by a phase difference of $\pi/2$. The circuit contains which of the following **[AIIMS 2001]**

(a) Only *R* (b) Only *L* (c) Only *C* (d) *R* and *C*

67. In the circuit shown in fig. neglecting source resistance the voltmeter and ammeter reading will respectively will be **[KCET (Engg.) 2001]**



(a) 0 *V*, 3 *A*

(b) 150 *V*, 3 *A*

(c) 150 *V*, 6 *A*

(d) 0 *V*, 8 *A*

68. A resistance of 40 *ohm* and an inductance of 95.5 *millihenry* are connected in series in a 50 *cycle/sec* ac circuit. The impedance of this combination is very nearly

(a) 30 *ohm* (b) 40 *ohm* (c) 50 *ohm* (d) 60 *ohm*

69. In an ac circuit, the power factor **[Roorkee 2000]**

(a) Is zero when the circuit contains an ideal resistance only (b) Is unity when the circuit contains an ideal resistance only

(c) Is zero when the circuit contains an ideal inductance only (d) Is unity when the circuit contains an ideal inductance only

70. The value of the current through an inductance of 1*H* and of negligible resistance, when connected through an ac source of 200 *V* and 50 *Hz* is **[AFMC 2000]**

(a) 0.637 *A* (b) 1.637 *A* (c) 2.637 *A* (d) 3.637 *A*

71. An inductance *L* having a resistance *R* is connected to an alternating source of angular frequency ω. The quality factor (*Q*) of the inductance is **[CBSE PMT 2000; AFMC 2000]**

(a) $\frac{R}{\omega L}$ (b) $\left(\frac{R}{\omega L}\right)^{1/2}$ (c) $\left(\frac{\omega L}{R}\right)^{2}$ (d) $\frac{\omega L}{R}$

72. In an ac circuit the reactance of a coil is $\sqrt{3}$ times its resistance, the phase difference between the voltage across the coil to the current through the coil will be

(a) $\pi/3$ (b) $\pi/2$ (c) $\pi/4$ (d) $\pi/6$

73. Power factor is maximum in an *LCR* circuit when **[RPET 2000]**

(a) $X_L = X_C$ (b) $R = 0$ (c) $X_L = 0$ (d) $X_C = 0$

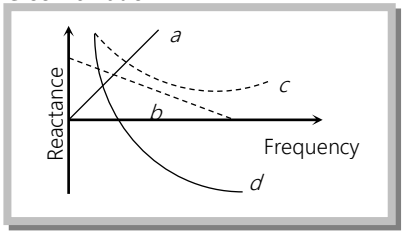
74. A coil of inductance *L* has an inductive reactance of X_L in an A.C circuit in which the effective current is *i*. The coil is made from a superconducting material and has no resistance. The rate at which power is dissipated in the coil is

(a) 0 (b) LX_L (c) i^2X_L (d) LX_L^2

75. The phase difference between the current and voltage at resonance in *RLC* series circuit is **[CPMT 1999]**

(a) 0 (b) $\frac{\pi}{2}$ (c) π (d) $-\pi$

76. Which of the following plots may represent the reactance of a series *LC* combination **[MP PMT 1999]**



(a) *a*

(b) *b*

(c) *c*

(d) *d*

77. A series ac circuit consist of an inductor and a capacitor. The inductance and capacitance is respectively 1 *henry* and 25 μF. If the current is maximum in circuit then angular frequency will be **[RPMT 1999]**

(a) 200 (b) 100 (c) 50 (d) $200/2\pi$

78. An alternating *e.m.f.* of frequency $\nu\left(=\frac{1}{2\pi\sqrt{LC}}\right)$ is applied to a series *LCR* circuit. For this frequency of the applied *e.m.f.*

[Roorkee 1999]

(a) The circuit is at resonance and its impedance is made up only of a reactive part

(b) The current in the circuit is in phase with the applied *e.m.f.* and the voltage across *R* equals this applied *e.m.f.*

(c) The sum of the p.d.'s across the inductance and capacitance equals the applied *e.m.f.* which is 180^o ahead of phase of the current in the circuit

(d) The quality factor of the circuit is $\omega L/R$ or $1/\omega CR$ and this is a measure of the voltage magnification (produced by the circuit at resonance) as well as the sharpness of resonance of the circuit

79. In a series *LCR* circuit, resistance $R=10\Omega$ and the impedance $Z=20\Omega$. The phase difference between the current and the voltage is

[KCET (Engg./Med.) 1999]

(a) 30^o (b) 45^o (c) 60^o (d) 90^o

80. The average power dissipated in a pure inductor of inductance *L* when an ac current is passing through it, is (Inductance of the coil = *L* and current *i*)

[CPMT 1974; RPMT 1997; MP PET 1999]

(a) $\frac{1}{2}Li^2$ (b) $\frac{1}{4}Li^2$ (c) $2Li^2$ (d) Zero

81. In an ac circuit, a resistance of *R ohm* is connected in series with an inductance *L*. If phase angle between voltage and current be 45^o, the value of inductive reactance will be

[MP PMT/PET 1998]

(a) $\frac{R}{4}$ (b) $\frac{R}{2}$

(c) *R* (d) Cannot be found with the given data

82. In an ac circuit, the potential difference across an inductance and resistance joined in series are respectively 16 *V* and 20 *V*. The total potential difference across the circuit is

[AFMC 1998]

(a) 20.0 *V* (b) 25.6 *V* (c) 31.9 *V* (d) 53.5 *V*

83. A 220 *V*, 50 *Hz* ac source is connected to an inductance of 0.2 *H* and a resistance of 20 *ohm* in series. What is the current in the circuit

[MNR 1998]

(a) 10 *A* (b) 5 *A* (c) 33.3 *A* (d) 3.33 *A*

84. The phase angle between *e.m.f.* and current in *LCR* series ac circuit is

[MP PMT /PET 1998]

(a) 0 to $\pi/2$ (b) $\pi/4$ (c) $\pi/2$ (d) π

85. For series *LCR* circuit, wrong statement is

[RPMT 1997]

(a) Applied *e.m.f.* and potential difference across resistance are in same phase

(b) Applied *e.m.f.* and potential difference at inductor coil have phase difference of $\pi/2$

(c) Potential difference at capacitor and inductor have phase difference of $\pi/2$

(d) Potential difference across resistance and capacitor have phase difference of $\pi/2$

86. A 20 *volts* ac is applied to a circuit consisting of a resistance and a coil with negligible resistance. If the voltage across the resistance is 12 *V*, the voltage across the coil is

(a) 16 *volts* (b) 10 *volts* (c) 8 *volts* (d) 6 *volts*

87. An *e.m.f.* $E = 4\cos(1000\,t)$ *volt* is applied to an LR-circuit of inductance 3 *mH* and resistance 4 *ohms*. The amplitude of current in the circuit is **[MP PMT 1997]**

(a) $\frac{4}{\sqrt{7}}A$ (b) $1.0A$ (c) $\frac{4}{7}A$ (d) 0.8 *A*

88. In a *LR* circuit, the value of *L* is $\left(\frac{0.4}{\pi}\right)$ *henry* and the value of *R* is 30 *ohm*. If in the circuit, an alternating *e.m.f.* of 200 *volt* at 50 *cycles per sec* is connected the impedance of the circuit and current will be **[MP PET 1996]**

(a) 11.4 Ω, 17.5 *A* (b) 30.7 Ω, 6.5 *A* (c) 40.4 Ω, 5 *A* (d) 50 Ω, 4*A*

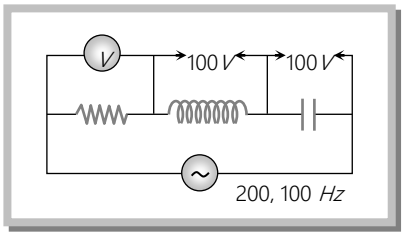
89. The resonant frequency of a circuit is *f*. If the capacitance is made 4 times the initial values, then the resonant frequency will become **[RPET 1996]**

(a) $f/2$ (b) $2f$ (c) f (d) $f/4$

90. In a series *LCR* circuit, operated with an ac of angular frequency ω, the total impedance is **[MP PET 1996]**

(a) $[R^2+(L\omega-C\omega)^2]^{1/2}$ (b) $\left[R^2+\left(L\omega-\frac{1}{C\omega}\right)^2\right]^{1/2}$ (c) $\left[R^2+\left(L\omega-\frac{1}{C\omega}\right)^2\right]^{-1/2}$ (d) $\left[(R\omega)^2+\left(L\omega-\frac{1}{C\omega}\right)^2\right]^{1/2}$

91. In the circuit given below. What will be reading of the voltmeter **[RPET 1996]**



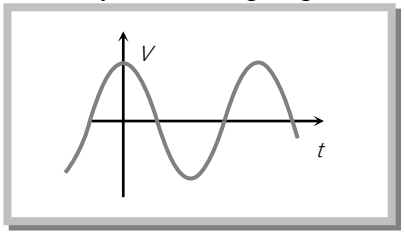
(a) 300 *V*

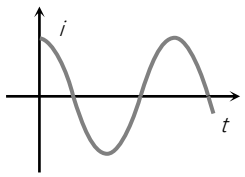
(b) 900 *V*

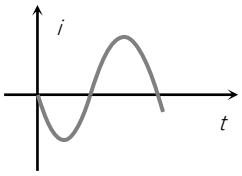
(c) 200 *V*

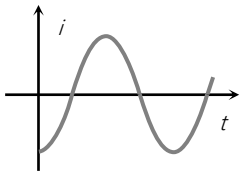
(d) 400 *V*

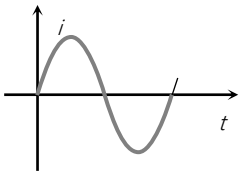
92. The voltage across a pure inductor is represented by the following diagram. Which one of the following diagrams will represent the current **[MP PMT 1995]**



(a) 

(b) 

(c) 

(d) 

93. An *LCR* circuit contains $R = 50\Omega, L = 1\,mH$ and $C = 0.1\mu F$. The impedance of the circuit will be minimum for a frequency of

[Bihar MEE 1995]

(a) $\frac{10^5}{2\pi}s^{-1}$ (b) $\frac{10^6}{2\pi}s^{-1}$ (c) $2\pi\times10^5 s^{-1}$ (d) $2\pi\times10^6 s^{-1}$

94. An alternating current source of frequency 100 *Hz* is joined is a combination of a resistance, a capacitance and a coil in series. The potential difference across the coil, the resistance and the capacitor is 46, 8 and 40 *volt* respectively. The electromotive force of alternating current source in *volt* is

(a) 94 (b) 14 (c) 10 (d) 76

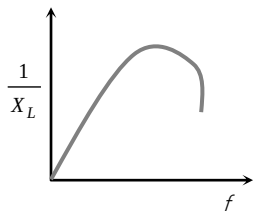
95. A 10 *ohm* resistance, 5 *mH* coil and 10 μF capacitor are joined in series. When a suitable frequency alternating current source is joined to this combination, the circuit resonates. If the resistance is halved, the resonance frequency

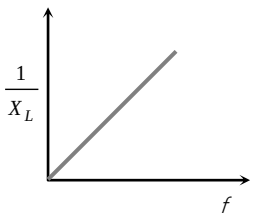
(a) In halved (b) In doubled (c) Remains unchanged (d) In quadrupled

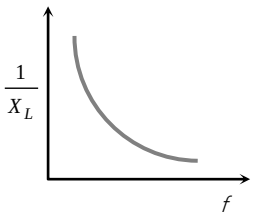
96. The power factor of *LCR* circuit at resonance is **[MP PMT 1991; CPMT 1993]**

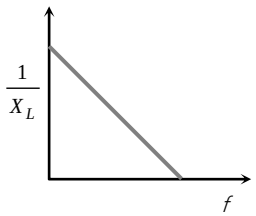
(a) 0.707 (b) 1 (c) Zero (d) 0.5

97. In pure inductive circuit, the curves between frequency *f* and reciprocal of inductive reactance $1/X_L$ is

(a) 

(b) 

(c) 

(d) 

Advance Level

98. The ac current through a capacitor $C = \frac{10^{-4}}{314}$ *farad* is given by $i = 25\cos(314\,t + 30^o)mA$ then the *e.m.f.* across the capacitor will be given by

(a) e = 250 cos (314 t – 60°) *volt*

(b) $e = 250\ \sin(314\,t + 30^o)volt$

(c) Both of the above

(d) None of the above

99. One 10 *V*, 60 *W* bulb is to be connected to 100 *V* line. The required induction coil has self inductance of value (f = 50 *Hz*)

[RPET 1997]

(a) 0.052 *H*

(b) 2.42 *H*

(c) 16.2 *mH*

(d) 1.62 *mH*

100. Al alternating *e.m.f.* of angular frequency ω is applied across an inductance. The instantaneous power developed in the circuit has an angular frequency **[Roorkee 1999]**

(a) $\frac{\omega}{4}$

(b) $\frac{\omega}{2}$

(c) ω

(d) 2ω

101. In a circuit current leads the voltage by a phase of $\pi/3$. The components of the circuit are (where R is resistance, L is inductance and C is capacitance)

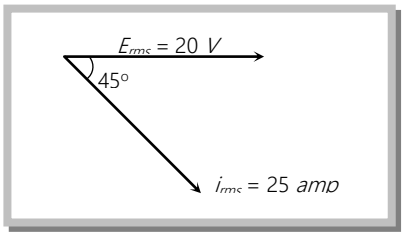
(a) R and L

(b) Only R

(c) R and C

(d) L and C

102. The vector diagram of current and voltage for a circuit is as shown. The components of the circuit will be



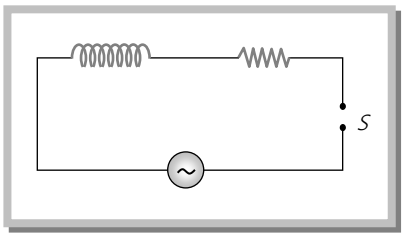
(a) *L*-*C*-*R*

(b) *L*-*R*

(c) *L*-*C*-*R* or *L*-*R*

(d) None of these

103. In the circuit shown here a 30 *V* dc source gives a current 2.0 *A*, and a 30 *V* ac source of frequency 100 *Hz* gives a current 1.2 *A*. The inductive reactance is



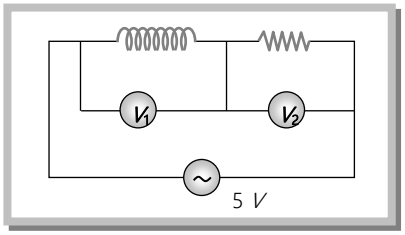
(a) 10 *ohm*

(b) 20 *ohm*

(c) $5\sqrt{34}\,ohm$

(d) 40 *ohm*

104. What is the reading of the voltmeter V_2 in the circuit below, if the reading of V_1 is 3 *V*



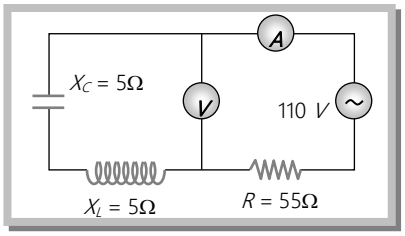
(a) 2 *V*

(b) 3 *V*

(c) $4V$

(d) $5V$

105. The reading of ammeter in the circuit shown will be



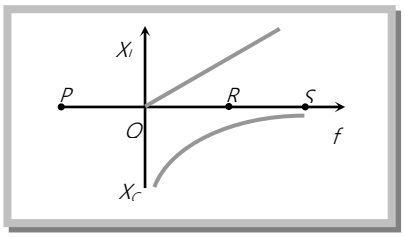
(a) $2A$

(b) $2.4\ A$

(c) Zero

(d) $1.7\ A$

106. The resonance point in $X_L - f$ and $X_C - f$ curves is



(a) P

(b) Q

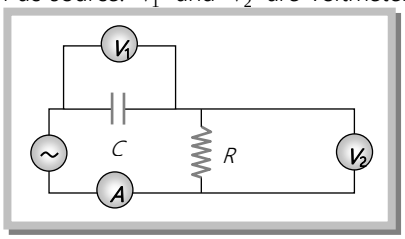
(c) R

(d) S

107. An ac source of angular frequency ω is fed across a resistor r and a capacitor C in series. The current registered is I. If now the frequency of source is changed to $\omega / 3$ (but maintaining the same voltage), the current in then circuit is found to be halved. Calculate the ratio of reactance to resistance at the original frequency ω

(a) $\sqrt{\frac{3}{5}}$ (b) $\sqrt{\frac{2}{5}}$ (c) $\sqrt{\frac{1}{5}}$ (d) $\sqrt{\frac{4}{5}}$

108. The diagram shows a capacitor C and a resistor R connected in series to an ac source. V_1 and V_2 are voltmeters and A is an ammeter



Consider now the following statements

I. Readings in A and V_2 are always in phase

II. Reading in V_1 is ahead in phase with reading in V_2

III. Readings in A and V_1 are always in phase which of these statements are/is correct **[AMU (Med.) 2001]**

(a) I only (b) II only (c) I and II only (d) II and III only

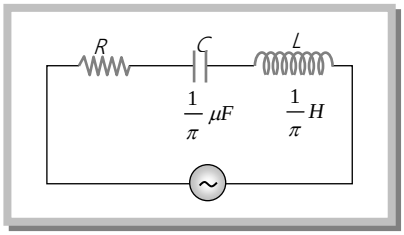
109. A circuit drawn a power of 550 *watt* from a source of 220 *volt*, 50 *Hz*. The power factor of the circuit is 0.8 and the current lags in phase behind the potential difference. To make the power factor of circuit as 1.0 , the capacitance required to be connected with it, will be

(a) 70.4 μF (b) 75 μF (c) 7.5 μF (d) 750 μF

110. The sharpness of resonance increases on

(a) Decreasing R (b) Increasing R (c) Decreasing X_L (d) Increasing X_L

111. In the circuit shown in fig. the supply has constant *r.m.s.* value V but variable frequency f. Calculate the frequency at which the voltage drop across R is maximum



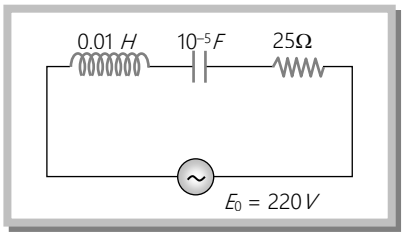
(a) 100 *Hz*

(b) 500 *Hz*

(c) 300 *Hz*

(d) None of these

112. In the following circuit the values of L, C, R and E_0 are 0.01 H, $10^{-5} F$, 25Ω and 220 *volt* respectively. The value of current flowing in the circuit at $\nu = 0$ and $f = \infty$ will respectively be



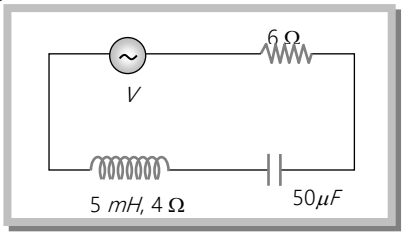
(a) 8 A and 0 A

(b) 0 A and 0 A

(c) 8 A and 8 A

(d) 0 A and 8 A

113. In the circuit shown below, the ac source has voltage $V = 20\cos(\omega t)$ volts with $\omega = 2000\ rad/sec.$ the amplitude of the current will be nearest to **[AMU (Engg.) 2000]**



(a) 2A

(b) 3.3A

(c) $2/\sqrt{5}A$

(d) $\sqrt{5}A$

114. An LCR series circuit with a resistance of 100 *ohm* is connected to an ac source of 200 V (*r.m.s.*) and angular frequency 300 *rad/s*. When only the capacitor is removed, the current lags behind the voltage by $60°$. When only the inductor is removed the current leads the voltage by $60°$. The average power dissipated is

(a) 50 W (b) 100 W (c) 200 W (d) 400 W

115. A $2.5/\pi\ \mu F$ capacitor and a 3000 *ohm* resistance are joined in series to an ac source of 200 *volt* and 50 sec^{-1} frequency. The power factor of the circuit and the power dissipated in it will respectively be

(a) 0.6, 0.06 *W* (b) 0.06, 0.6 *W* (c) 0.6, 4.8 *W* (d) 4.8, 0.6 *W*

116. A virtual current of 4*A* and 50 *Hz* flows in an ac circuit containing a coil. The power consumed in the coil is 240 *W*. If the virtual voltage across the coil is 100 *V* its inductance will be

(a) $\frac{1}{3\pi}H$ (b) $\frac{1}{5\pi}H$ (c) $\frac{1}{7\pi}H$ (d) $\frac{1}{9\pi}H$

117. A bulb and a capacitor are connected in series to a source of alternating current. If its frequency is increased, while keeping the voltage of the source constant, then

(a) Bulb will give more intense light (b) Bulb will give less intense light

(c) Bulb will give light of same intensity as before (d) Bulb will stop radiating light

118. A 110 *V*, 60 *W* lamp is run from a 220 *V* ac mains using a capacitor in series with the lamp, instead of a resistor then the voltage across the capacitor is about

(a) 110 *V* (b) 190 *V* (c) 220 *V* (d) 311 *V*

119. When an ac generator of 100 *V* is connected in series with a capacitor and a resistor of 30 *ohm*, the circuit carries a current 2 *A*. The potential difference across the capacitor will be

(a) 100 *V* (b) 80 *V* (c) Zero (d) 120 *V*

120. An alternating voltage $V = 200\sqrt{2}$ sin 100 *t* where *V* is in *volts* and *t* in seconds, is connected to a series combination of 1 μF capacitor and 10 $k\Omega$ resistor through an ac ammeter. The reading of the ammeter will be **[CPMT 1991]**

(a) $\sqrt{2}\ mA$ (b) $10\sqrt{2}\ mA$ (c) 2 *mA* (d) 20 *mA*

121. The band width of a series resonant circuit is 500 *Hz* and the resonant frequency is 5000 *Hz*. The quality factor of the circuit will be

(a) 40 (b) 20 (c) 10 (d) 5

122. For a series *RLC* circuit $R = X_L = 2X_C$. The impedance of the circuit and phase difference (between) *V* and *i* and

(a) $\frac{\sqrt{5}R}{2}, \tan^{-1}(2)$ (b) $\frac{\sqrt{5}R}{2}, \tan^{-1}\left(\frac{1}{2}\right)$ (c) $\sqrt{5}X_C, \tan^{-1}(2)$ (d) $\sqrt{5}R, \tan^{-1}\left(\frac{1}{2}\right)$

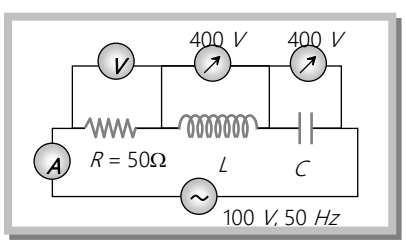
123. If the voltages across resistor *R*, capacitor *C* and inductor *L* are $V_C = 2V_R$ and $V_L = 3V_R$ respectively, then the supply voltage in terms of V_R will be

(a) $\sqrt{2}\ V_R$ (b) V_R (c) $\frac{V_R}{\sqrt{2}}$ (d) $5V_R$

124. An *LCR* circuit with 100 *ohm* resistance is connected to an ac source of 200 *volt* and angular frequency 300 *rad/sec*. On removing the capacity from the circuit, the current lags behind the voltage by 60°. On removing the inductance from the circuit, the current leads the voltage by 60°. The current flowing in the circuit will be

(a) 1 *amp* (b) 1.5 *amp* (c) 2.5 *amp* (d) 2 *amp*

125. In the *LCR* series circuit the voltmeter and ammeter reading are **[CPMT 1988]**



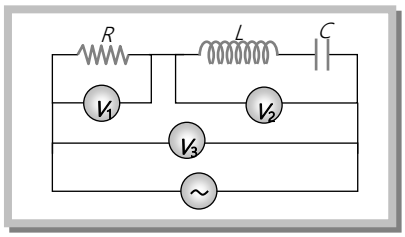
(a) *V* = 100 *volt*, *i* = 2 *amp*

(b) $V = 100$ *volt*, $i = 5$ *amp*

(c) $V = 300$ *volt*, $i = 2$ *amp*

(d) $V = 300$ *V*, $i = 1$ *amp*

126. A resistor *R*, an inductor *L*, a capacitor *C* and voltmeters V_1, V_2 and V_3 are connected to an oscillator in the circuit as shown in the adjoining diagram. When the frequency of the oscillator is increased, then at resonant frequency the reading of voltmeter V_3 is equal to



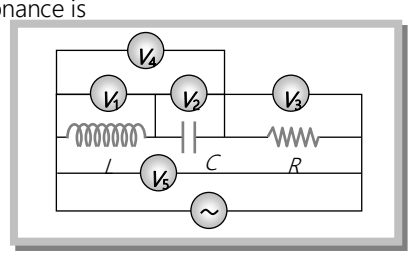
(a) That of voltmeter V_1

(b) That of voltmeter V_2

(c) Both of the voltmeters V_1 and V_2

(d) None of these

127. In the adjoining ac circuit the voltmeter whose reading will be zero at resonance is



(a) V_1

(b) V_2

(c) V_3

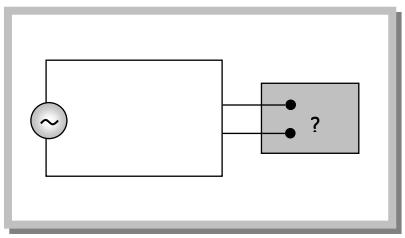
(d) V_4

128. When $V = 100 \sin \omega t$ is applied across a series (*RLC*) circuit at resonance the current in resistance ($R = 100\ \Omega$) is $i = i_0 \sin \omega t$, then power dissipation in circuit is

(a) 50 *W** (b) 100 *W** (c) 25 *W** (d) Can't be calculated

129. Following figure shows an ac generator connected to a "block box" through a pair of terminals. The box contains possible *R*, *L*, *C* or their combination, whose elements and arrangements are not known to us. Measurements outside the box reveals that

$e = 75 \sin (\sin \omega t)$ *volt*, $i = 1.5 \sin (\omega t + 45^\circ)$ *amp*



then, the wrong statement is

(a) There must be a capacitor in the box

(b) There must be an inductor in the box

(c) There must be a resistance in the box

(d) The power factor is 0.707

130. An ideal choke takes a current of 10 *amp* when connected to an ac supply of 125 *volt* and 50 *Hz*. A pure resistor under the same conditions takes a current of 12.5 *amp*. If the two are connected to an ac supply of $100\sqrt{2}$ *volt* and 40 *hertz*, then the current in a series combination of the above resistor and inductor is

(a) 1 *amp* (b) 12.5 *amp* (c) 20 *amp* (d) 25 *amp*

131. An iron choke and an electric bulb are connected in series with ac mains. On introducing a soft iron bar in the coil, the intensity of light bulb will

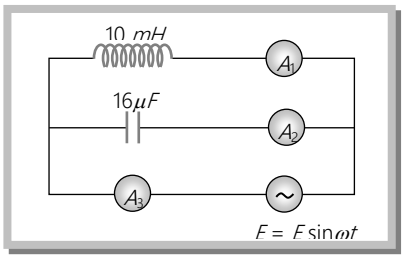
(a) Decrease (b) Increase (c) Fluctuate (d) Remain unchanged

Parallel ac circuit

132. A *LC* circuit is in the state of resonance. If $C = 0.1\mu F$ and $L = 0.25$ *henry*. Neglecting ohmic resistance of circuit what is the frequency of oscillations **[BHU 2003]**

(a) 1007 *Hz* (b) 100 *Hz* (c) 109 *Hz* (d) 500 *Hz*

133. An inductor of 10 *mH* and a capacitor of 16 μF are connected in the circuit as shown in the fig. The frequency of the power supply is equal to the resonant frequency of the circuit. Which ammeter will read zero ampere



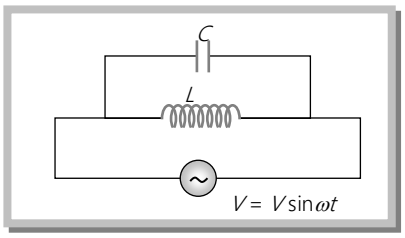
(a) A_1

(b) A_2

(c) A_3

(d) None of these

134. For the circuit shown in the fig. the current through the inductor is 0.9 *A* while the current through the condenser is 0.4 *A*



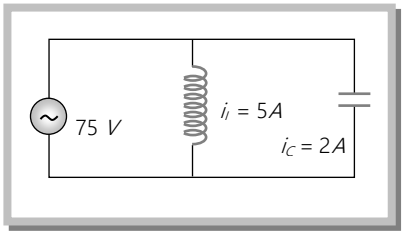
(a) The current drawn from the generator is $i = 1.3A$

(b) $\omega = \dfrac{1}{1.5\,LC}$

(c) $i = 0.5A$

(d) $i = 0.6A$

135. What will be the impedance of the circuit shown below



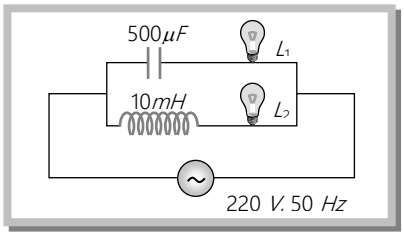
(a) 5 Ω

(b) 10 Ω

(c) 25 Ω

(d) 75 Ω

136. In the circuit shown in the fig. if both the lamps L_1 and L_2 are identical



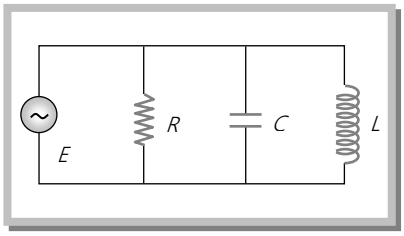
(a) Their brightness will be the same

(b) L_2 will be brighter than L_1

(c) As frequency of supply voltage is increased, brightness of L_1 will increase and that of L_2 will decrease

(d) Only L_2 will glow because the capacitor has infinite resistance

137. In a parallel *L*-*C*-*R* circuit shown in the fig, at resonance



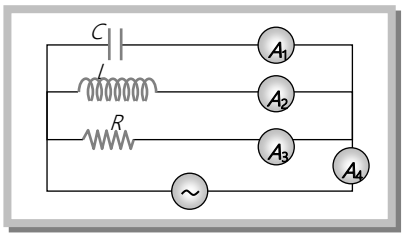
(a) The source current is maximum

(b) The impedance of the circuit is minimum and is equal to *R*

(c) The resonance frequency will be the same as for a series resonance circuit with the same values of *L*, *C* and *R*

(d) The voltage across *L* and *C* are in phase

138. A resistor *R*, an inductor *L*, a capacitor *C* and ammeter A_1, A_2, A_3 and A_4 are connected to an oscillator as shown in diagram. When the frequency of the oscillator is increased, then at resonant frequency, the reading of ammeter A_4 is equal to



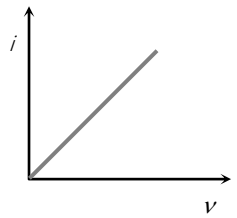
(a) That of ammeter A_3

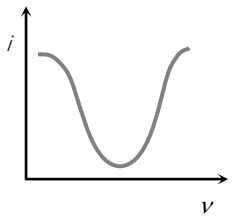
(b) That of ammeter A_2

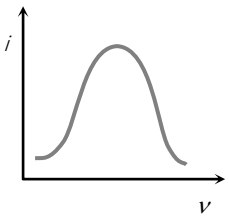
(c) That of ammeter A_1

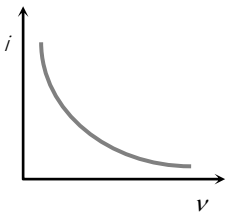
(d) All the three ammeters A_1, A_2 and A_3

139. The *i* - ν curve for anti-resonant circuit is

(a) 

(b) 

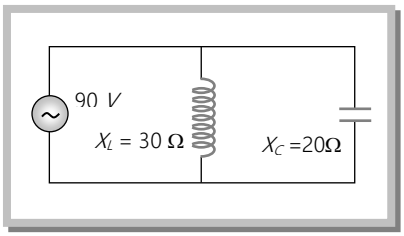
(c) 

(d) 

140. In the non-resonant circuit, what will be the nature of the circuit for frequencies higher than the resonant frequency **[RPET 1996]**

(a) Resistive (b) Capacitive (c) Inductive (d) None of these

141. In the adjoining figure the impedance of the circuit will be



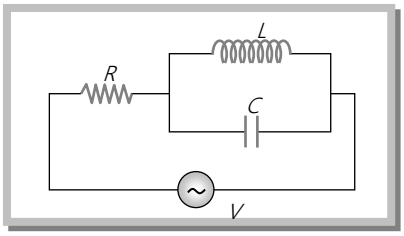
(a) 120 *ohm*

(b) 50 *ohm*

(c) 60 *ohm*

(d) 90 *ohm*

142. Current through *R* at resonance

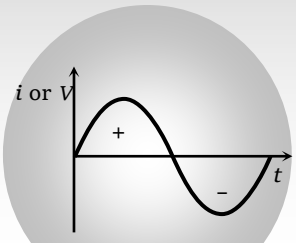


(a) Infinite

(b) Zero

(c) $\frac{V}{R}$

(d) Can't be calculated



Answer Sheet

Assignment (Basic & Advance Level)

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
a	b	b	b	d	d	d	c	a	a	c	b	b	d	b	b	a	d	c	c
21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40
d	d	a	c	a	c	b	c	a	b	c	d	c	b	a	d	b	c	a	c
41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60
b	b	a	c	a	b	b	c	d	b	b	d	b	b	d	d	d	a	c	c
61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80
a	b	b	a	d	b	d	c	b,d	a	d	a	a	a	a	d	a	b,d	c	d
81	82	83	84	85	86	87	88	89	90	91	92	93	94	95	96	97	98	99	100
c	b	d	a	c	a	d	d	a	b	c	d	a	c	c	b	c	c	a	d
101	102	103	104	105	106	107	108	109	110	111	112	113	114	115	116	117	118	119	120
c	c	b	c	c	c	a	b	b	a	b	b	a	d	c	b	a	b	b	b
121	122	123	124	125	126	127	128	129	130	131	132	133	134	135	136	137	138	139	140
c	b	a	d	a	a	d	a	b	a	a	a	c	c	c	b,c	c	a	b	b
141	142																		
c	b																		