EE101 - Electrical Engineering - Specimen Questions 2

Answer All Questions. Very short answers are expected. Use the correct unit. *delete whatever is inapplicable*

Time 2 hours.

Relative permittivity of free space = 8.854×10^{-12} F/m, Permeability of free space = $4\pi \times 10^{-7}$ H/m

1. For the current waveform given by $10 \sin (300\, t + 1.57)$ A the
   (a) the peak value of current is ………..
   (b) the rms value of current is ………
   (c) the average value of current is …….
   (d) angular frequency of the supply is …….
   (e) frequency of the supply is ……….
2. The value that is usually specified for a three phase alternating voltage supply is the   …….………value of the …….………voltage.
3. The form factor is defined as the ratio   ……………/…………….
4. If the current waveform is given by $i(t) = 5 \cos (250\, t - 30^{o})$ A, then
   (a) the rms value of voltage across a resistance of value 24 Ω is given by ………………
   (b) the waveform of the voltage across a capacitance of value 10 μF is given by ……………
5. The real part of $500\, e^{j350\, t}$ is given as …………..
6. In the rotating phasor diagram, the *rms value/peak value/average value* * is usually used.
7. The cartesian (complex number) form of the voltage $230\angle 30^{o}$ V is …………………………….
8. If $i(t) = 5.2 \sin (314.16\, t - 20^{o})$ and $v(t) = 155 \sin (314.16\, t + 10^{o})$, the current *leads/lags** the voltage by an angle of …………
9. The complex impedance of a resistor R at an angular frequency of ω is ………..
10. The complex impedance of an inductor L at an angular frequency of ω is ………..
11. The impedance of a capacitor C in polar form at an angular frequency of ω is ………..
12. If the impedance of a certain circuit is $(30 + j\, 40)$ Ω, then its admittance is equal to ………………
13. The letter **Y** in ac theory is usually used to denote ………………
14. Sketch the phasor diagram showing the voltage across each element and the current in the circuit in a series circuit consisting of a resistor R and an inductance L connected in series.
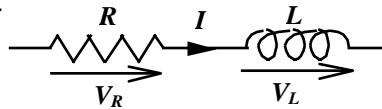
15. In an R-L-C series circuit (r = 3 Ω, L = 10 mH and C = 20 μF), series resonance occurs at an angular frequency equal to …………..
16. At the resonance frequency of an R-L-C series circuit (r = 3 Ω, L = 10 mH and C = 20 μF), the magnitude of the impedance is equal to …………..
17. Sketch the phasor diagram of the voltage across the circuit and the current in each element in a parallel circuit consisting of a resistor R and an inductance C connected in parallel.
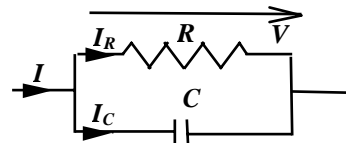
18. In a parallel R-L-C circuit (R = 3 kΩ, L = 20 mH and C = 10 μF), parallel resonance occurs at an angular frequency equal to …………..
19. If $V = 240\angle 30^{o}$ V, $I = 2.5\angle -30^{o}$ A,
(a) the active power is equal to ………..
(b) the reactive power is equal to ………..
(c) the apparent power is equal to ………..
(d) the power factor is equal to ………..
20. If the phase to neutral voltage in a balanced three phase supply is 200 V, the corresponding line voltage is equal to …………..
21. Sketch the phasor diagram showing the 3 currents I_R, I_Y, I_B, in a balanced three phase load, if I_R has a lagging phase angle of 15°.

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22. A 400 V, 50 Hz, three phase supply has a balanced load taking a line current of 3.0 A at a power factor of 0.8 lag. The total three phase power is equal to ………… and the total apparent power is equal to ………….

23. A certain 3 phase load has an apparent power of 500 VA and an active power of 400 W. The reactive power of the load is given by ………. and the power factor of the load is given as ……….. ……..

24. A certain three phase load has a power consumption of 5 kW at a power factor of 0.8 lag. If the power factor is to be improved to 1.0, the amount of capacitive reactive power required is …………..

25. If the reactive power requirement of a certain capacitor is 1.5 k var, then the value of the capacitance required at a voltage of 400 V across each capacitor at a frequency of 50 Hz is …………

26. The arms of a 4 arm Wheatstone Bridge are AB = 400 Ω, BC = 300 Ω, CD = 200 Ω, and an unknown resistor R is connected across DA. If the bridge is balanced, the value of R is equal to ………….

27. A permanent magnet moving coil meter normally measures the *rms/average/mean/peak value*[*]

28. A moving iron meter can be used to measure *a.c. quantities only/d.c. quantities only/a.c. and d.c. quantities*[*]

29. The dynamometer instrument is different from the permanent magnet moving coil instrument because ………………………………………………………..

30. A good voltmeter should have a *very low/low/medium/high/very high*[*] internal resistance

31. A good ammeter should have a *very low/low/medium/high/very high*[*] internal resistance

32. A voltmeter is always connected in …………………..and an ammeter in …………….in a circuit.

33. A wattmeter should have a …………. coil and a ………….coil.

34. A practical wattmeter can never give the correct power taken by the load because of ………………………………………………………………………………..

35. In an energymeter having a potential coil and a current coil, the integration of energy occurs because ………………………………………………………………………………..

36. Very high resistances are usually measured using a …………………………………….

37. Very low resistances are usually measured using a …………………………………….

38. A meter with a basic range of 500 μA and internal resistance 400 Ω can be used to measure currents of range 5 A by connecting a resistance of value ………… in ………………………….meter

39. A voltmeter with a basic range of 100 V and internal resistance 500 kΩ can be used to measure currents of range 10 A by connecting a resistance of value ………… in ………………………….meter

40. The two categories of instrument transformers are ………………….. and …………………………….

41. The critical component in a digital voltmeter is ……………………conversion.

42. Sketch the symbols usually marked on (a) permanent magnet moving coil meter, (b) moving iron meter

43. The symbols on meters to denote (a) a.c. only and (b) horizontal position for normal use are

44. The three general types of fuses are ……………….., ………………………. and ……………………….

45. The two principles of operation normally found in a miniature circuit breaker are …………………………………… and …………………………………………..

46. The two types of circuit breakers to detect electrical faults to earth are …………………………………….. and ……………………………………………

47. The three broad categories of earthing systems defined for electrical installations are ……system, …….system and ……..system

48. The system of earthing used in the Sri Lanka power system is the …… system.

49. Sketch the circuit for a simple two way switch system supplying a lamp when the lamp is turned off.

50. Circuits for 13 A socket outlets may be connected either in ………. or in ………. circuits.

51. The severity of an electric shock depends on
    (a) *only the magnitude of the frame voltage of the equipment*[*]
    (b) *only on the magnitude of the leakage current through the body*
    (c) *on both the magnitude of the frame voltage of the equipment and the leakage current through the body*
    (d) *only on the duration of contact of the faulty object*
    (e) *on both the magnitude of the leakage current through the body and the duration of contact*

52. There are …… zones of effects of 50 Hz current on the human body

53. Zone 3 of the effect on the human body corresponds to *a region with difficulty in breathing/a region with no feeling of the electricity/the threshold of let-go*[*]

54. A typical operating current of a usual RCCB for safety of persons is *10 mA/30 mA/300 mA/30 A*

55. Ventricular fibrillation is most likely to occur in the zone ……