

- $$2 + 3 + 5$$

2 x 5

-

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- ii) A sinusoidal voltage is represented by $v = 141.4 \sin(314.16t - 90^\circ)$. The r.m.s. value of the voltage, its frequency and phase angle are respectively

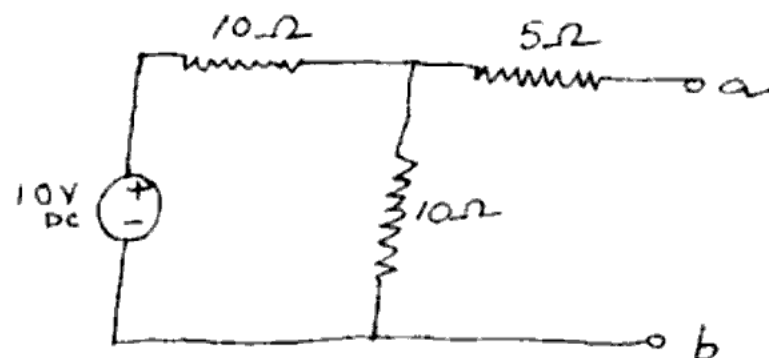
- a) 141.42 V, 314.16 Hz, 90°
 b) 100 V, 50 Hz, -90°
 c) 87.92 V, 60 Hz, 90°
 d) 200 V, 56 Hz, -90°

- iii) The reluctance of a magnetic circuit is given by

- a) $l/\mu_0\mu_r a$ b) ϕ/Nl
 c) $l/\mu_r a$ d) $l/\mu_0 a$

with usual nomenclature.

- iv) For the circuit shown, the Thevenin's voltage and resistance as seen at a - b are



- a) 5 V, 10Ω b) 10 V, 10Ω
 c) 5 V, 5Ω d) 15 V, 15Ω

- v) Three resistors 4Ω, 6Ω and 8Ω are connected in parallel. In which resistor power dissipated will be maximum?

- a) 4 Ω b) 6 Ω
 c) 8 Ω d) Equal in all resistors.

- vi) Time constant of LR circuit is given by

- a) L/R b) R/L
 c) $1/LR$ d) LR

GROUP - B

(Short Answer Type Questions)

Answer any two of the following. $2 \times 5 = 10$

- State and prove Ampere's Circuital law.
- What is resonance? Deduce the expression of frequency in a parallel RLC circuit at resonance.
- Draw comparison between electrical and magnetic circuit.
- A two element series circuit consumes 700 W of power and has power factor of 0.707 leading when energized by a voltage source of waveform $v = 141 \sin(314t + 30^\circ)$. Find out the circuit elements.

GROUP - C

(Long Answer Type Questions)

Answer any two of the following. $2 \times 10 = 20$

- a) Derive the expression of quality factor of a series R-L-C circuit at resonance. 4

b) A coil of resistance 10Ω and inductance 0.02 H is connected in series with another coil of resistance 6 Ω and inductance 15 mH across a 230 V, 50 Hz supply. Calculate :

 - impedance of the circuit
 - voltage drop across each coil
 - the total power consumed by the circuit $2 + 2 + 2$
- a) state and prove maximum power transfer theorem. Show that under maximum power transfer condition, efficiency is 50%. 4

- b) A Wheatstone bridge consists of $AB = 4\Omega$, $BC = 3\Omega$, $CD = 6\Omega$ and $DA = 5\Omega$. A 24 V battery is connected between points B and D . A galvanometer of 8Ω resistance is connected between A and C . Using Thevenin's theorem find the current through the galvanometer.
8. a) Derive an expression for lifting power of a magnet.
- b) An iron ring of mean length 50 cm , has an air-gap of 1 mm and winding of 200 turns. The relative permeability of iron is 300 . When 1 A current flows through the coil, determine flux density.
9. a) Derive an expression for energy stored in a magnetic field.
- b) A circuit consists of series combination of elements as resistance of 6Ω , inductance of 0.4 H and a variable capacitor across 100 V , 50 Hz supply.
- Calculate :
- (i) value of capacitance at resonance
- (ii) voltage drop across capacitor
- (iii) Q -factor of the coil.
- 2 + 2 + 2

USE SEPARATE ANSWER BOOK TO ANSWER PART-II
QUESTIONS.

PART - II

(Marks : 35)

GROUP - A

(Multiple Choice Type Questions)

- I. Choose the correct alternatives for any five of the following :
- $5 \times 1 = 5$
- i) Avalanche breakdown is primarily depend on the phenomenon of
- a) Collision b) Doping
c) Ionization d) Recombination.
- ii) Barrier potential of Si diode is
- a) 0.3 V b) 0.7 V
c) 0.4 V d) 0.2 V.
- iii) The three terminals of a p-n-p transistor are
- a) Emitter-Base-Drain
b) Source-Base-Drain
c) Anode-Cathode-Neutral
d) Emitter-Base-Collector.
- iv) An n-type semiconductor is formed when which one of the following elements is doped in Si ?
- a) Aluminium b) Boron
c) Phosphorous d) None of these.

- v) A Bipolar Junction Transistor is a
- Voltage controlled device
 - Current controlled device
 - Power controlled device
 - none of these
- vi) Without a DC source, a clipper acts like a
- Rectifier
 - Clamper
 - Chopper
 - Demodulator.
- vii) A $10\ \Omega$ resistor is stretched to increase its length double. Its resistance will now be
- $40\ \Omega$
 - $20\ \Omega$
 - $10\ \Omega$
 - $5\ \Omega$.

GROUP - B**(Short Answer Type Questions)**Answer any two of the following. $2 \times 5 =$

- With the help of energy-band diagram, differentiate among conductor, semi-conductor and insulator.
- Construct a circuit of a full wave bridge rectifier and draw the DC output waveform.
 - What do you mean by ripple ? $4 \times$
- Derive relation between α and β of a transistor.
 - Find α and I_C of a transistor with $\beta = 49$ at $I_E = 12\text{ mA}$. $3 \times$

GROUP - C**(Long Answer Type Questions)**Answer any two of the following $2 \times 10 = 20$

- What is biasing ?
 - Draw the Circuit Diagram of self biased n-p-n transistor and explain how bias stability is achieved in this case.
 - Derive the stability factors of self bias. $2 + 4 + 4$
- Compare the characteristics of transistors in CE, CC and CB mode.
 - Draw and explain the Input and Output characteristics of CE connection of transistors.
 - What is reverse saturation current ? $5 + 3 + 2$
- What is rectifier ?
 - Explain bridge rectifier with relevant circuit diagram and output waveform