Somaiya Vidyavihar University

Answer Sheet: Online Examination

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Pargat Singh Dhanjal	Pargat

Q1) A)

I) b) $V_{AB} = +18\,V$, 3.6 Ω

II) d) 8V peak to peak and out of phase with input signal.

III) c) both P and N are lightly doped

IV) c) 30

V) a) DC cumulative compound motor

VI) c) $f_0/2$

VII) b) 6

VIII) d) a short circuit

IX) b) 90°

X) d) 30°

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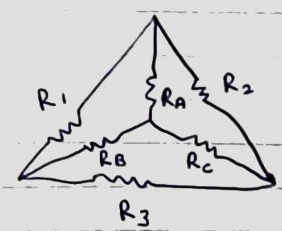
Q1) B)

IV) The advantages of zener diode are:-

- zener diode is cheaper than other diodes
- controls the flowing current.
- can be used to regulate & stabalize voltage.
- compatiblity and obtainablity.

V) Superposition theorem states that in a network of linear element containing more than one source of energy the voltage or current flowing across any load is the sum of all voltages or current which would result if each source is considered separately & all other sources are replaced with their internal resistances.

I)



$R_A = 8\ \Omega$, $R_B = 11\ \Omega$, $R_C = 15\ \Omega$

For star to delta transformation

$$R_1 = \frac{R_A R_B + R_B R_C + R_A R_C}{R_C} = \frac{8(11) + 11(15) + 15(8)}{15}$$

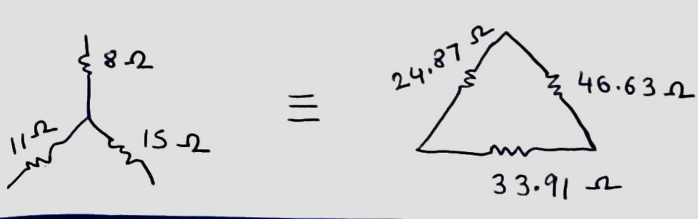
$$R_1 = 24.87\ \Omega$$

$$R_2 = \frac{R_A R_B + R_B R_C + R_A R_C}{R_B} = \frac{8(11) + 11(15) + 15(8)}{11}$$

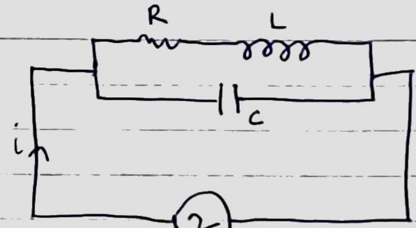
$$R_2 = 33.91\ \Omega$$

$$R_3 = \frac{R_A R_B + R_B R_C + R_A R_C}{R_A} = \frac{8(11) + 11(15) + 15(8)}{8}$$

$$R_3 = 46.63\ \Omega$$



Q1) B)
v(1))



where, $R = 9\,\Omega$ $L = 0.12\,H$ $C = 330\,\mu F$

To find Quality factor.

we know for // resonance circuit

$$\text{quality factor} = \frac{\omega_r L}{R} \rightarrow (1)$$

we also know $\omega_r = \frac{1}{\sqrt{LC}}$

$$\therefore \omega_r = \frac{1}{\sqrt{0.12 \times 330 \times 10^{-6}}} = \frac{10^3}{\sqrt{39.6}} = 0.1589 \times 10^3$$

inserting in equ (1)

$$\theta = \frac{10^3 \times 0.1589 \times 0.12}{9} = 2.12$$

$$\therefore \boxed{\theta = 2.12}$$

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~~[illegible]~~ ~~[illegible]~~.

Q1) B)

II) $I_1 = 20 \sin(\omega t + \frac{\pi}{4})$ $\quad I_2 = 14 \sin(\omega t - \frac{\pi}{6})$

$I_{1rms} = \frac{20}{\sqrt{2}} = 14.14 \text{ A}$ $\quad I_{2rms} = 9.90 \text{ A}$

$\bar{I}_1 = 14.14 \angle 45° = 9.998 + j9.998$

$\bar{I}_2 = 9.9 \angle -30° = 8.57 - j4.95$

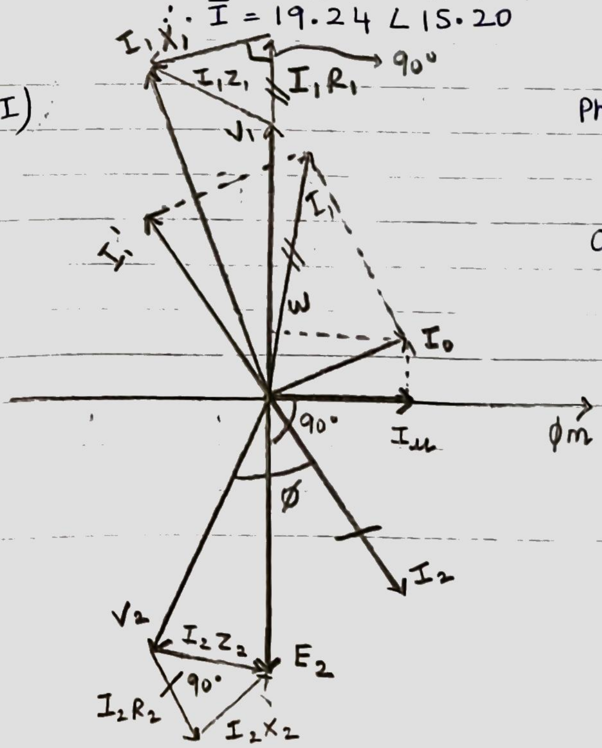
$\bar{I} = \bar{I}_1 + \bar{I}_2$

$= 9.998 + 8.57 + j(9.998 - 4.95)$

$= 18.568 + j5.048$

$\therefore \bar{I} = 19.24 \angle 15.20$

Q2) I)



Phasor diagram of single phase transformer.

Capacitive load.

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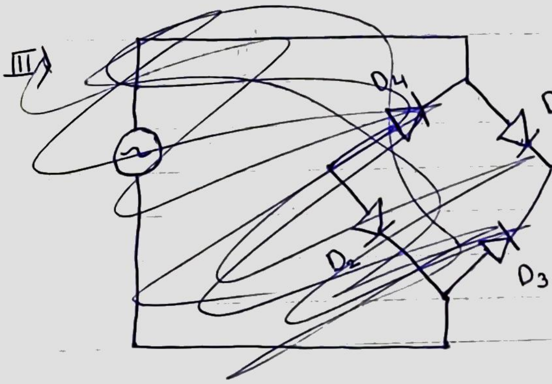


III)

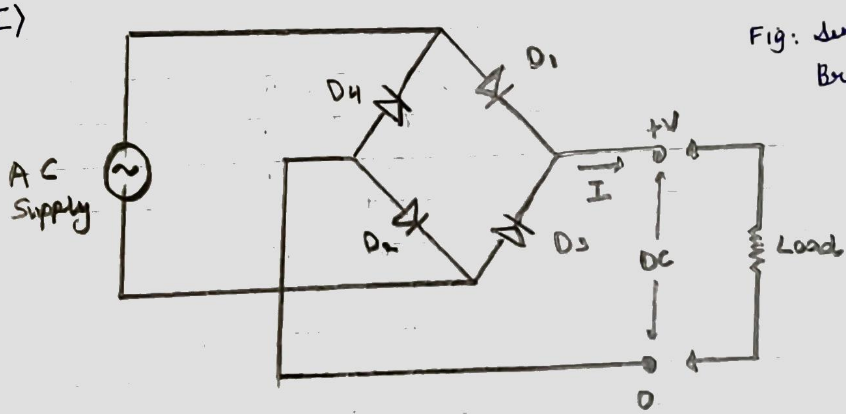


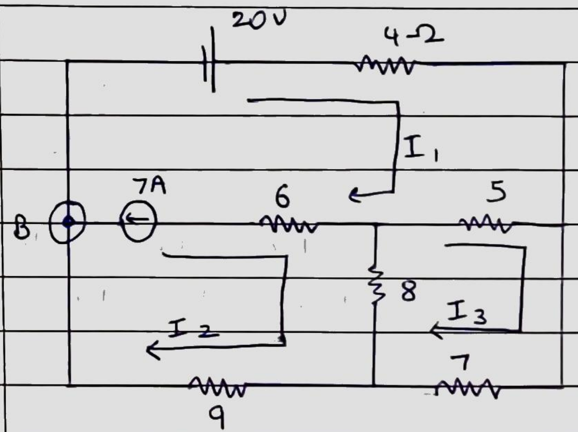
Fig: single phase Bridge rectifier.

Working

- The circuit consists of two power diodes connected to a single load resistance (R_L) with each diode taking it in turn to supply current to the ~~vo~~ load resistor.
- During positive half cycles, D_1 & D_2 are forward biased & D_3 & D_4 are reverse biased. When the voltage is greater than the threshold level of diodes D_1 & D_2 starts conducting.
- During negative half cycles, D_3 & D_4 are forward biased & D_1 & D_2 are reverse biased.
- In both cases the direction of load current is same. Hence we obtain a unidirectional current i.e DC current.

So we converted AC current → DC current.

Q3)



current source 7A on comman branch, hence supermesh

KCL at node B $I_2 + 7 = I_1$

$I_2 - I_1 = -7 \longrightarrow (1)$

KVL to supermesh

$20 - 4I_1 - 5(I_1 - I_3) - 8(I_2 - I_3) - 9I_2 = 0$

$20 - 4I_1 - 5I_1 + 5I_3 - 8I_2 + 8I_3 - 9I_2 = 0$

$20 + 13I_3 - 9I_1 - 17I_2 = 0$

$9I_1 + 17I_2 - 13I_3 = 20 \rightarrow (2)$

KVL at mesh 3

$-5(I_3 - I_1) - 7I_3 - 8(I_3 - I_2) = 0$

$-5I_3 + 5I_1 - 7I_3 - 8I_3 + 8I_2 = 0$

$5I_1 + 8I_2 - 20I_3 = 0 \rightarrow (3)$

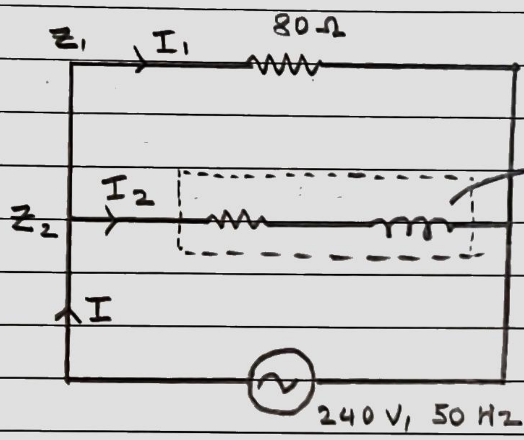
on solving (1) (2) (3)

$I_1 = 5.84A$ $I_2 = -1.15A$ $I_3 = 1A$

Power in 9Ω resistor $= I^2R = (-1.15)^2 \times 9$

Power = 11.9025 W

Q4)



$Z_1 = 80\ \Omega$

$Z_2 = R + jXL$

(consider R to be self-resistance) & L be the inductance

We know, $I = \frac{V}{Z}$

$I = 7A$, $V = 240\ V$

$\therefore Z = \frac{V}{I} = \frac{240\angle 0}{7} = 34.29\angle 0$

$Y_1 = \frac{1}{Z_1} = \frac{1}{80}$

$Y_2 = \frac{1}{Z_2} = \frac{1}{R + jXL}$

$\therefore Y = Y_1 + Y_2 = \frac{1}{80} + \frac{1}{R + jL}$

$Y = \frac{(R + 80) + jXL}{80(R + jXL)}$

$\therefore Z = \frac{1}{Y} = \frac{80(R + jXL)}{(R+80) + jXL} = 34.29\angle 0$

$\therefore \frac{R + j\,2\pi \cdot 50 \cdot L}{(R + 80) + j\,2\pi 50 L} = \frac{34.29\angle 0}{80} = 0.43\angle 0$