

ELECTRICAL ENGINEERING DEPARTMENT

EEL 101

Major Test

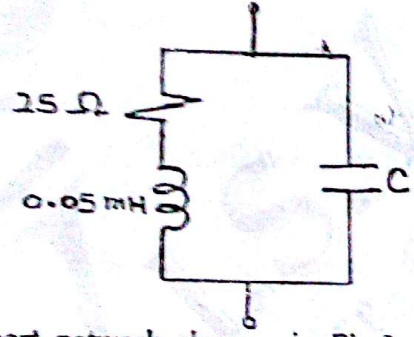
Time: 2 hr
Marks: 35

Attempt all question and each question carries five marks.

Q.1 The Thevmin equivalent of an ac circuit has $V_{OC}=12\angle-45^\circ$ and $Z_0=8+j8 \Omega$.

(a) When load impedance Z_L absorbed maximum average power and what is the value of this power?, (b) When $Z_L=|Z_L|=11.3 \Omega$ is simply a resistance, what is the value of this power? 8-88

Q.2 For the circuit shown in Fig.2, (a) Derive an expression for admittance as a function of ω , (b) For $R=25 \Omega$ and $L=0.05 \text{ mH}$, specify C for resonance at 10^7 rad/sec and (c) Estimate the Q for the inductor.



$Y(\omega) = j\omega C + \frac{1}{25 + j\omega L}$

Fig.2

Q.3 For the two port network shown in Fig.3, determine the admittance parameters (Y_{11} , Y_{12} , Y_{21} and Y_{22}). Further for the same network, determine the parameters of an equivalent Π network.

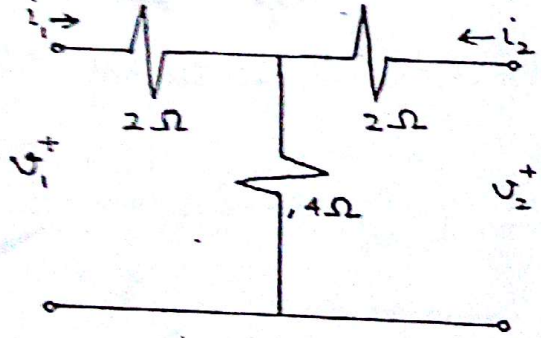


Fig.3

Q.4 Draw the block diagram of an analog computer program to solve:

$$x = \sin \omega t - 2y$$

$$y = (x-5)/3.$$

One -5 V battery is available for the implementation.

Q.5 Presuming v_i to be a sinusoidal signal with variable frequency ω in Fig.5, derive the expression for (v_o/v_i) . Further, sketch $|v_o/v_i|$ as a function of ω and identify the function performed by the circuit.

$b_p + \angle i = 0$

$$\frac{V_o}{100} + \frac{V_i}{10} + \frac{dV_o}{dt} = 0$$

$$\frac{V_o}{100} + \frac{V_i}{10 + \frac{1}{j\omega C}}$$

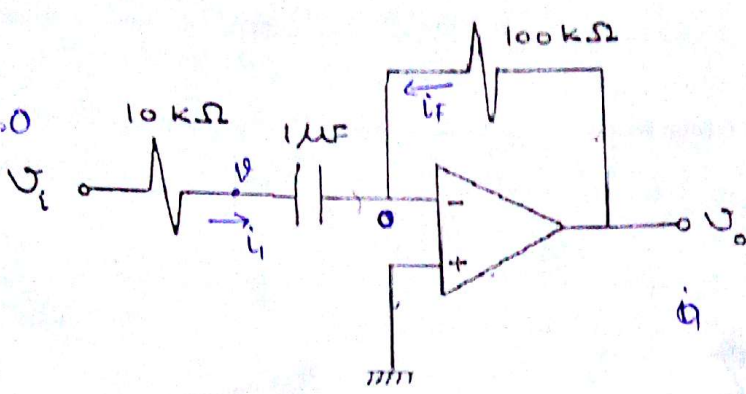


Fig. 5

Q.6 A 2400:240 V, 60 Hz, 48 kVA transformer has parameters $R_m=15\text{ K}\Omega$, $X_m=7\text{ K}\Omega$, $R_s=1\ \Omega$ and $X_s=2\ \Omega$. The high voltage winding is the primary. Find the voltmeter, ammeter, and wattmeter reading when (a) open circuit test and (b) short circuit test are performed.

Q.7 An ammeter and a voltmeter are connected to a $5\text{ K}\Omega$ resistor. When the connection is as shown in Fig. 7(a), the ammeter and voltmeter readings are 9.98 mA and 50 V respectively. When the connection is as shown in Fig.7(b), the respective readings are 10.03 mA and 49.9 V. find the resistance of ammeter and voltmeter.

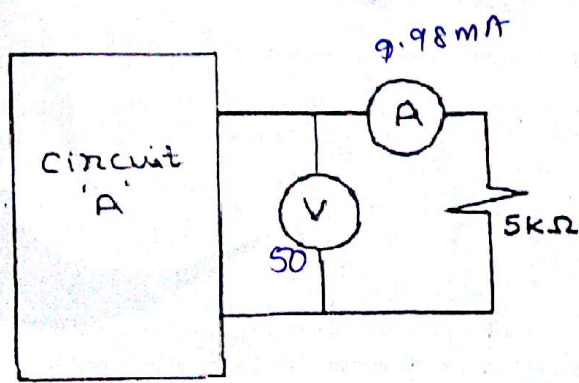


Fig. 7 (a)

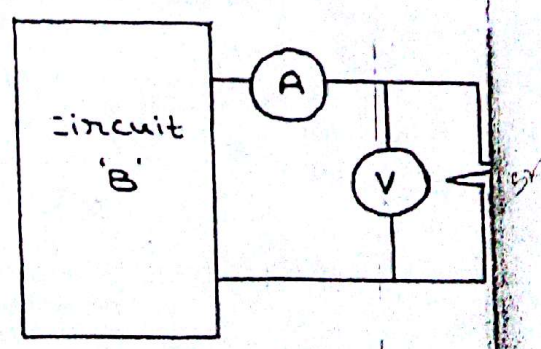


Fig. 7 (b)

Handwritten calculations for Q.7:

$$\frac{10.03}{2} = 5.015$$

$$\frac{49.9}{5} = 9.98$$