ELECTRICAL ENGINEERING DEPARTMENT
EEL101: PRINCIPLES OF ELECTRICAL ENGINEERING
MAJOR TEST

Date: November 21, 2008 Time: 3:30PM to 5:30PM

Q1. In the circuit of Fig. Q1, find the current I_c as a function of time for t>0. The switch S_2 is closed at time t=0.0 while switch S_1 is opened at time t = 0.0. Before being opened switch S_1 was closed for a long time.

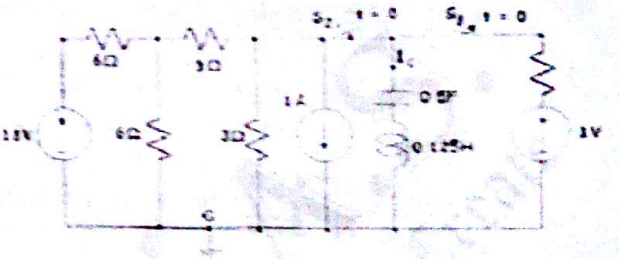

Fig. Q1

Q2. For the op-amp circuit in Fig.Q2, find the output voltage V_{out}/V_{in}.

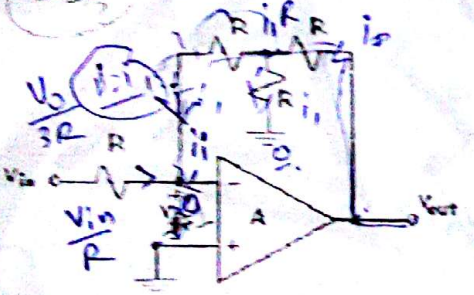

Fig. Q2

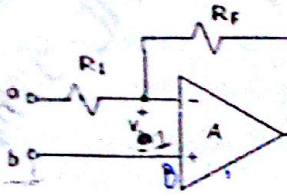

Fig. Q3

Q3. In the op-amp circuit shown in Fig.Q2, $A=5\times10^5$, $R_1=1\ \Omega$, $R_f = 100\ \Omega$, $v_i=50\ \mu V$.

(i) What is the output voltage V_o?

(ii) Which of the terminals *a* or *b* ought to be grounded and which given the input?

(iii) What is the input voltage to be applied.

Q4. A magnetic circuit comprises of three parts in series, each of uniform cross sectional area. They are,

1. A length of 80 mm and cross sectional area 50mm^2
2. A length of 60 mm and cross sectional area 90mm^2
3. An air gap of length of 0.5 mm and cross sectional area 150mm^2

Assuming that all flux flow through the given circuit and the μ_r of the magnetic material is 1200, estimate the current required to produce a flux density of 0.3T across the air gap. The coil of 4000 turns is wound on the leg with cross sectional area 90mm^2.

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Q5. (a) A 200:800V 50Hz, 200VA transformer has the following readings for OC and SC tests:

OC Test: $V_1 = 200V$, $I_1 = 0.5A$, $P_1 = 34.2W$ and $V_2 = 800V$.

SC Test: $V_1 = 10V$, $W_1 = 50W$

Find the current in the primary I_1 for the short circuit test and obtain the various parameters for the equivalent circuit based on hybrid parameter model.

(b) The above transformer is to drive a pure resistive load of 250Ω and obtain a voltage of 800V. Find out the primary voltage required to obtain this and also find out the current drawn in the primary winding.

(c) For the circuit shown in Fig. Q5(a), find out the value of power delivered to the load R = 8Ω. Consider the transformer to be ideal, i.e. $R_1 = X_1 = R_2 = X_2 = 0$. Compare the result with the power delivered to the load R = 8Ω and also the maximum power possible in the load R in Fig. Q5(a).

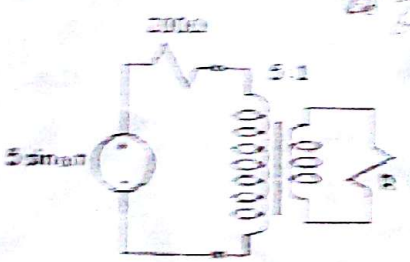

Fig. Q5(a)

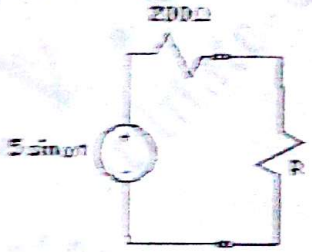

Fig. Q5(b)

BEST WISHES FOR THIS EXAM AND ALL THE REST

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