BITS Pilani
Dubai Campus

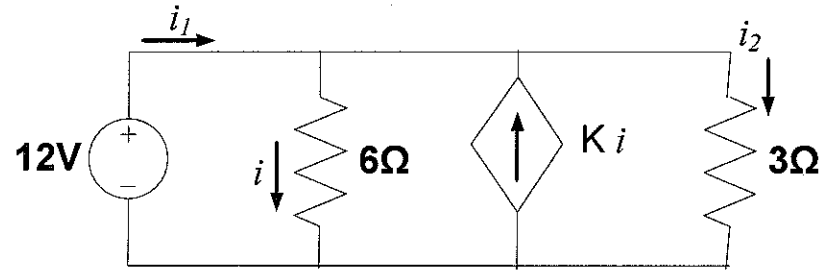
SECOND SEMESTER 2011- 2012
FIRST YEAR **COMPREHENSIVE TEST**

Course Code: EEE F111 Date: 14-06-2012
Course Title: ELECTRICAL SCIENCES Max Marks: 120
Duration: 3 Hrs Weightage: 40%

Note: Answer all the questions , ANSWER PART A, PART B AND PART C in separate answer books, Assume any missing data suitably.

PART A

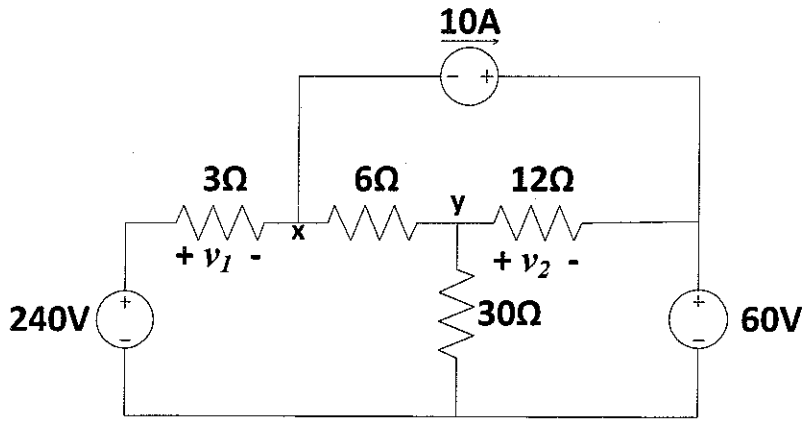
Q.1 For the circuit shown below, find i_1, when a) K=2 , b) K=3 and c) K=4 **8M**



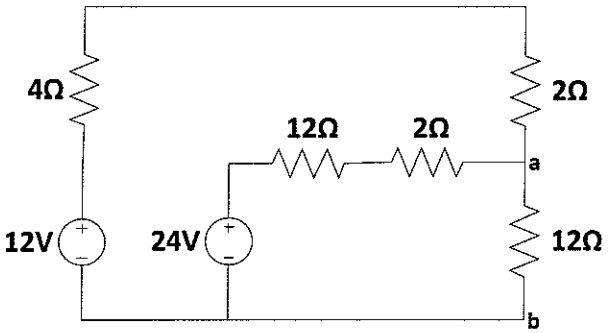
Q.2 For the circuit shown below **10M**

a) use nodal analysis to determine voltages v_1 and v_2

b) Compute the power absorbed by the 6Ω resistor.

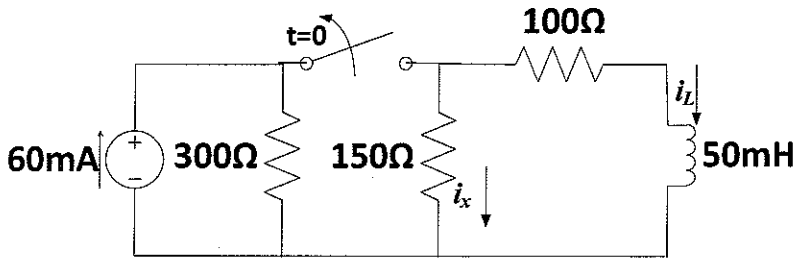


Q.3 Apply thevenen's theorem to the circuit shown below and determine the current I through the 12Ω resistance between node a and b **10M**



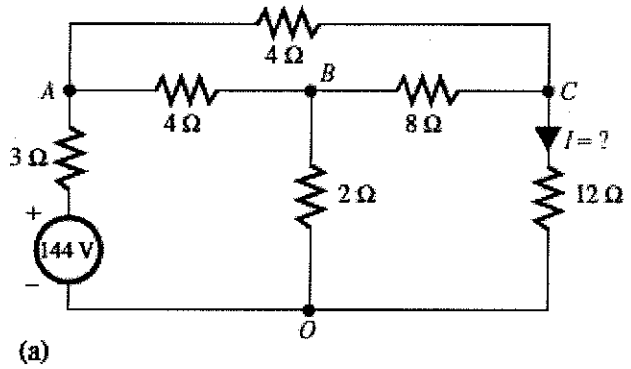
Q.4 The switch in the following figure, opens at t=0 after having been closed for an interminably for long. Find i_L and i_x at **12M**

a) t<0
b) t=0s
c) t=300μs



PART B

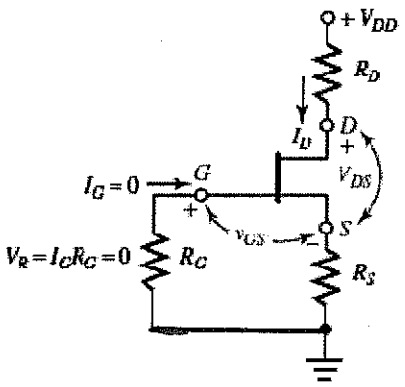
Q.1 Use delta–star transformation for network reduction and determine the current through the 12 Ω resistor in the circuit of the following Figure **12M**



Q.2 A piece of aluminum wire has a cross sectional area of 10^{-6} m^2. The aluminum has a free electron concentration of 1.81 x 10^{29} m^{-3}, and the mobility of the free electron is 10^{-3} m^2/V-s. a) Find the conductivity of the aluminum wire. b) Find the resistivity of the wire c) Find the resistance of a 1 – meter length of wire. **8M**

Q.3 Measurements made on the self-biased *n*-channel JFET shown in figure below are V_{GS} = −1V, I_D = 4 mA; V_{GS} = −0.5 V, I_D = 6.25 mA; and V_{DD} = 15 V. **20M**

(a) Determine V_P and I_{DSS}.
(b) Find R_D and R_S so that I_D = 4 mA and V_{DS} = 4 V.



PART C

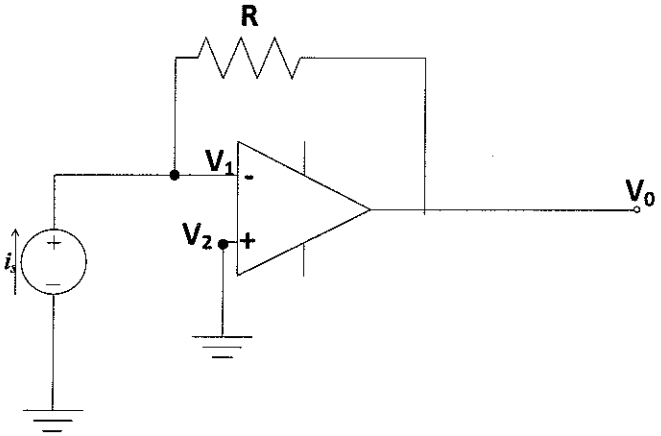
Q.1 A 220 volt dc shunt motor has an armature resistance of 0.5 ohms. When the speed of the motor is 1000rpm, the armature current is 40 A. Assuming that the resisting torque of the load stays constant, **10M**

a) When a 1.5 ohms resistance is placed in series with the armature, find the resulting current and speed.

b) Determine the armature current and speed (without the 1.5 ohms resistance) when the field flux is reduced by 20%.

Q.2 A mild steel ring has a radius of 50mm and a cross-sectional area of 400m^2. **10M**
A current of 0.5 A flows in a coil wound uniformly around the ring and the flux produced is 0.1 Wb. If the relative permeability at this value of current is 200 find the reluctance of mild steel and the number of turns on the coil.

Q.3 Find $\mathbf{v_o}$ when the ideal amplifier is an OP-AMP and when it has finite gain. **10M**



Q.4 Use algebraic manipulations to express the Boolean function: $F = \overline{A}\,\overline{B} + B\overline{C}$ as a product of max terms and implement the same using NOR Gate realization. **10M**

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SECOND SEMESTER 2011- 2012
FIRST YEAR **TEST - 2 (Open Book)**

Course Code: EEE F111 Date: 20-05-2012
Course Title: ELECTRICAL SCIENCES Max Marks: 60
Duration: 50 minutes Weightage: 20%

Note: Answer all the questions , only class notes and prescribed text book is allowed

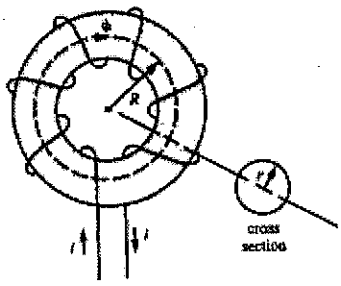
Q.1 Suppose a toroid is constructed of cast steel and is to have a magnetic flux density of 0.8 T.

a) Determine the relative permeability of the core. **10M**

b) If the core has an average radius of 0.1 m and a cross sectional radius of 0.02 m, find the current required for a 500 turn coil.

(Use the magnetization curve given in your text book)

Q.2 A 200 turn coil is to have an inductnce of 50 mH. Determine the relative permeability of the core that the coil is wound on if the core is the one shown below where the average radius is 0.1 m and the cross – sectional radius is 0.02 m. **10M**



Coil with a toroidal core.

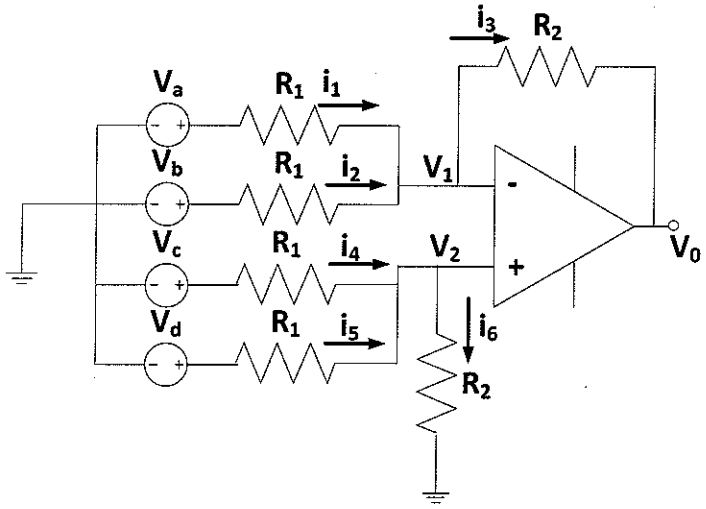
Q.3 A 220 V dc shunt motor has an armature resistance of 0.5 Ω. When the motor speed is 1000rpm, the armature current is 50 A and the developed torque is 100 N-m. Find the developed torque at 1100 rpm. **10M**

Q.4 A separately excited generator develops a no- load emf of 150 V at an armature speed of 20 rev/s and a flux per pole of 0.1 Wb. Determine the generated voltage when **10M**

a) The speed increases to 25 rev/s and the pole flux remains unchanged.
b) The speed increases to 24 rev/s and the pole flux is decreased to 0.07Wb.

Q.5 For the following OP-AMP circuit derive an expression for V_0 in terms of the inputs V_a, V_b, V_c, and V_d.

20M



Suppose for the above circuit R_2=100Ω ,R_1=10Ω, V_a=10mV, V_b=20mV, V_c=0.01V, V_d=1V, find V_0.

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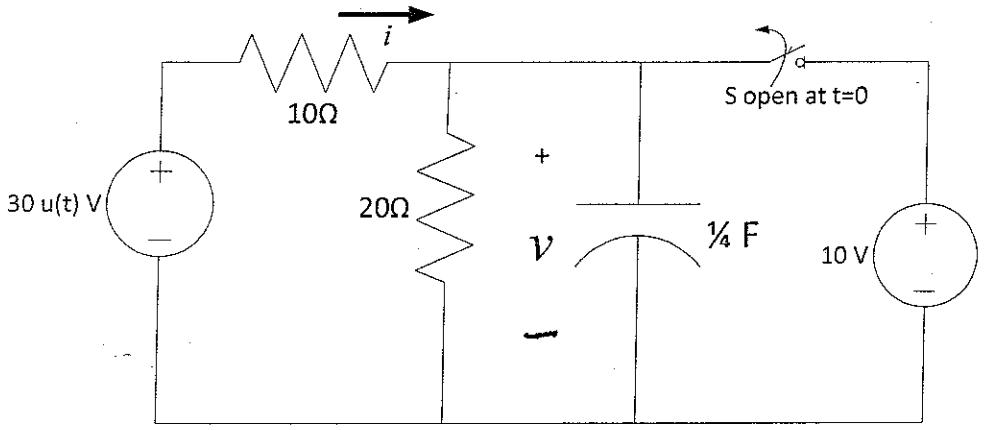
SECOND SEMESTER 2011- 2012
FIRST YEAR **TEST -I (Closed Book)**

Course Code: EEE F111 Date: 01-04-2012
Course Title: ELECTRICAL SCIENCES Max Marks: 75
Duration: 50 minutes Weightage: 25%

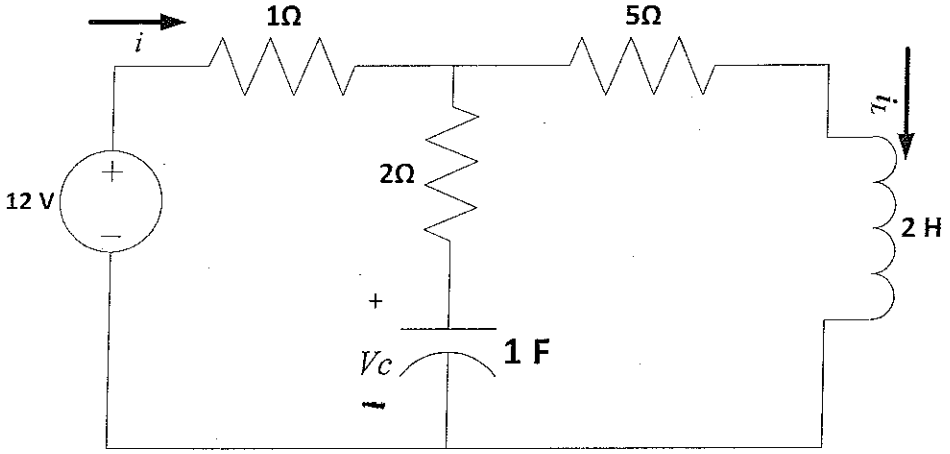
Note: Answer all the questions

Q.1 In the following circuit, the switch has been closed for a long time and is opened at t=0. Find i and v for all time. **15**

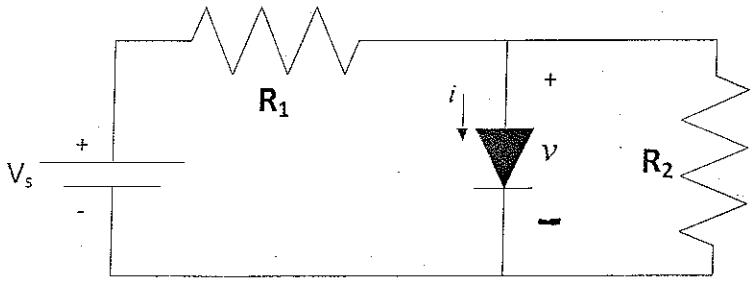


Q.2 In the circuit given below, under the dc condition find **10**

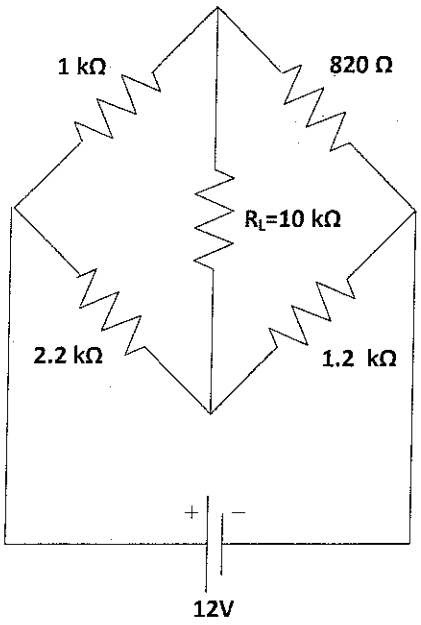
I. Current i, voltages V_c and current i_L
II. The energy stored in the capacitor and inductor



Q.3 For the diode circuit shown below Vs=2V and the silicon diode has the saturation current of 4nA at 300K. Given that v= 0.7V, find diode current i and resistance R_2 when R_1 is 1kΩ. **12**



Q.4 Given following network , find the current through the load resistor R_L using Star / Delta network conversion **13**



Q.5 Find i(t) in the circuit given below. Assume that the circuit has reached steady state at t=0. **25**