BITS, PILANI – DUBAI, ACADEMIC CITY, DUBAI
FIRST SEMESTER 2012 – 2013
EEE F111 ELECTRICAL SCIENCES
COMPREHENSIVE EXAMINATION (CLOSED BOOK)

MAXIMUM MARKS: 80 WEIGHTAGE: 40%
DATE: 29/12/12 DURATION: 3 HOURS

Write PART A & B in separate answer sheets
Answer all questions

PART A

1. Consider the circuit shown in Figure.1, Determine (a) V_s and (b) $R_{eq}=V_s/I_s$. **[10 Marks]**

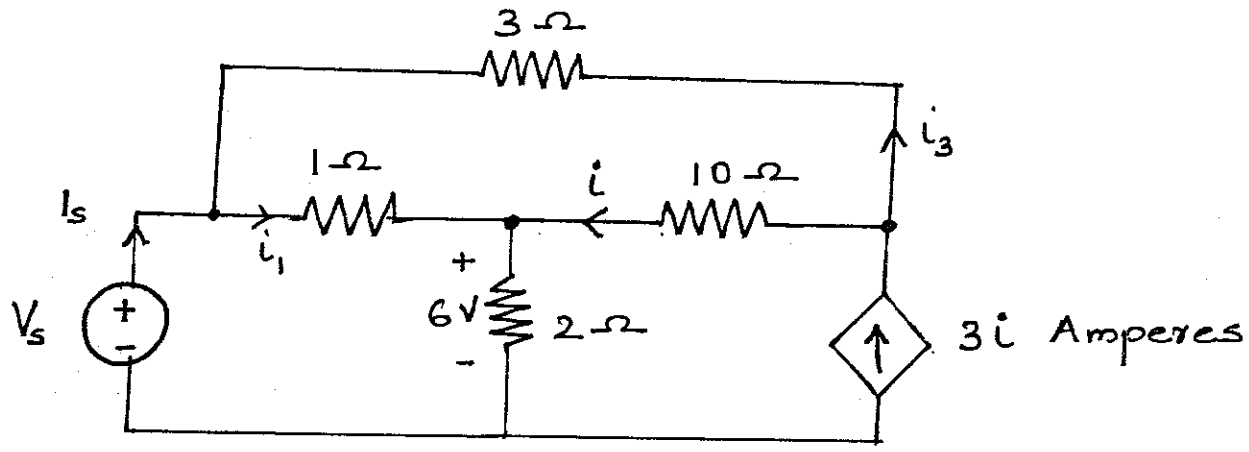

Figure 1

2. For the circuit shown in Figure 2, the switch opens at t=0 seconds, Find $V_1(t)$, $V_2(t)$, $i_1(t)$, and $i_2(t)$. **[10 Marks]**

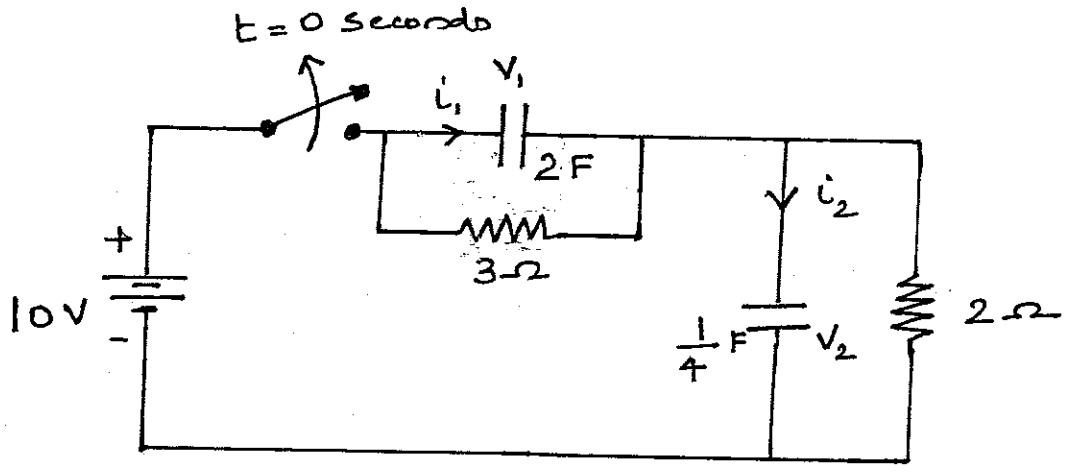

Figure 2

3. For the circuit shown in Figure 3, apply nodal analysis to find current I, for the condition that $V_1 = 0$ Volts. **[8 marks]**

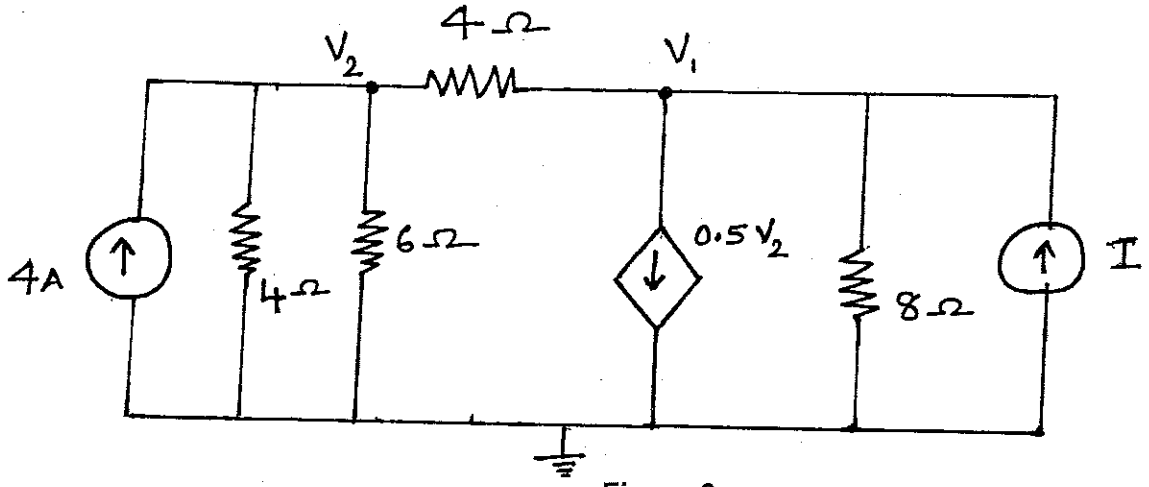

Figure 3

4. For the balanced three phase load shown in Figure.4, Zy= (6- j5) Ω and Z_Δ= (7+j10) Ω.
   4. (a) find an equivalent single Δ connected load.
   4. (b) if the circuit obtained in 4. (a) is supplied with 415 V (rms-line to line), determine the line and phase currents. **[8 marks]**

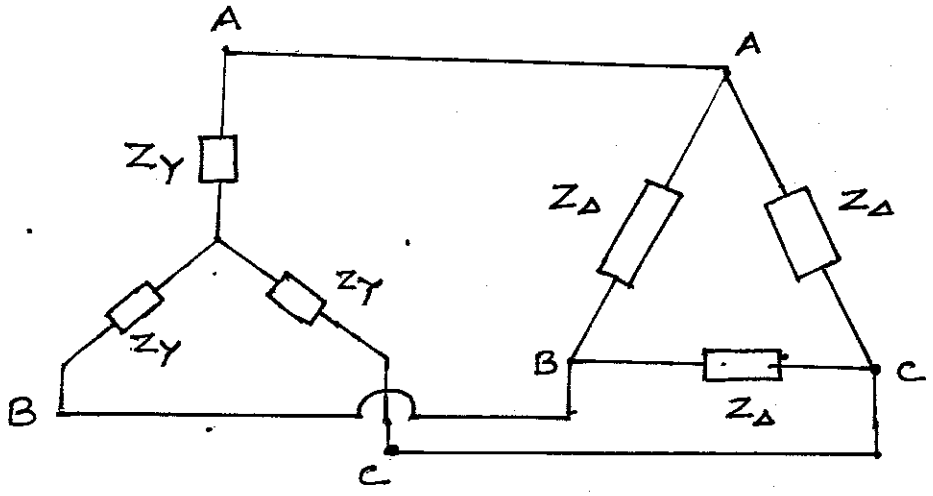

Figure 4

5. Tabulate the analogy between various parameters of electric and magnetic circuit. **[4 Marks]**

PART B

6. For the circuit shown in Figure 5, find the following
   6. (a) i_1 (t)
   6. (b) i_2(t)
   6. (c) v_2(t)

[10 Marks]

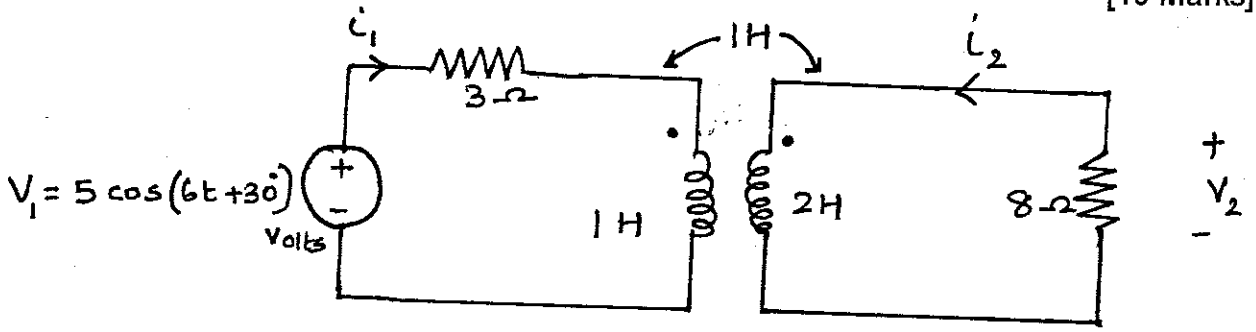

Figure 5

7. A 10-kW, 200-V dc generator has a full-load current of 50 A at 1500 rpm. At 1800 rpm, the full-load voltage is 245 V. Find the following:
   7. (a) the armature resistance
   7. (b) the no-load voltage at 1500 rpm
   7. (c) the no-load voltage at 1800 rpm. **[8 marks]**

8. Draw the drain characteristics of n-channel depletion MOSFET, clearly indicating the boundaries for each region of operation. Write also the equation for drain current in active region. The graph should include typical values for the device. **[8 marks]**

9. For the ideal diode circuit given in Figure 6, the input voltage is given by the equation, V_S = 12 sinωt Volts. Determine the output voltage V_0 for all V_S. **[8 marks]**

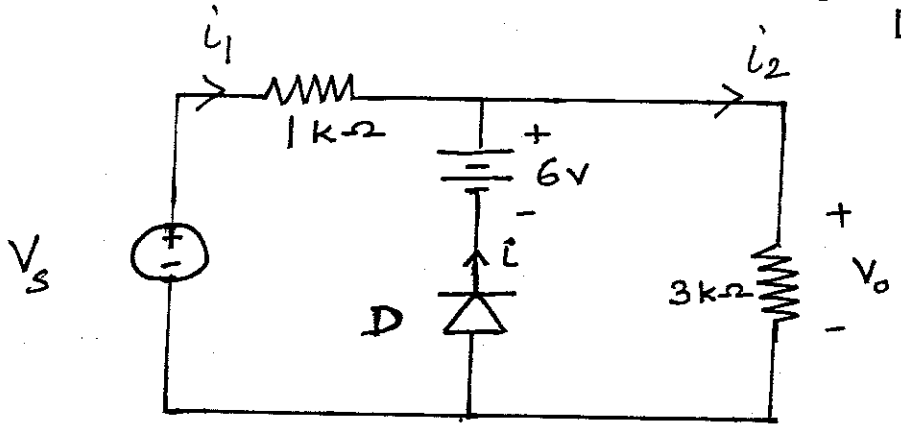

Figure 6

10. Design a non-inverting op-amp circuit for which the gain is 6 and the total resistance used is 120 kΩ. Draw the configuration for the designed values. **[6 marks]**

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EEE F111 ELECTRICAL SCIENCES
TEST 2(OPEN BOOK)

MAXIMUM MARKS: 40 **WEIGHTAGE: 20%**
DATE: 11/11/12 **DURATION: 50 MINUTES**

1. Upon transforming the delta (Δ) network ABD into equivalent star(Y), find the voltage V_{BD} in the Wheatstone bridge shown in Figure 1.

[15 marks]

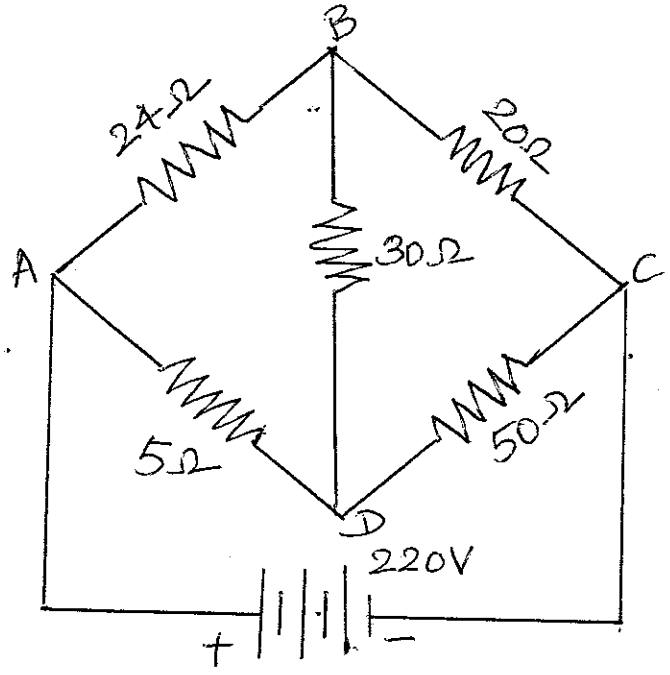

Figure 1

2. For the circuit shown in Figure 2, find the following.
   a) Frequency in Hz.
   b) Current supplied by the source in polar form.
   c) The above current in time domain notation.
   d) Voltage across the capacitance in polar form.

[1+2+1+1 marks]

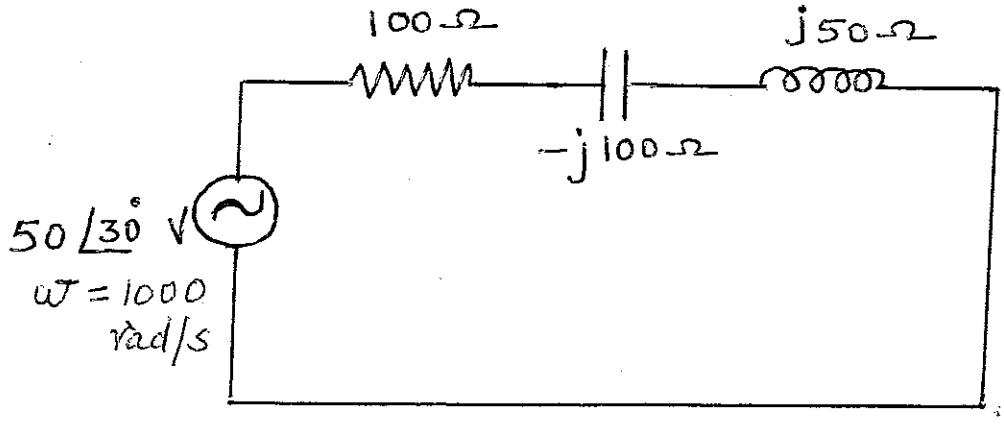

Figure 2

3. For the circuit shown in Figure 3, the switch 'S', has been in position 'a' for a very long time. At t = 0 second, the switch is thrown to position 'b'. Determine the response for i_L (t) for all 't'. **[15 marks]**

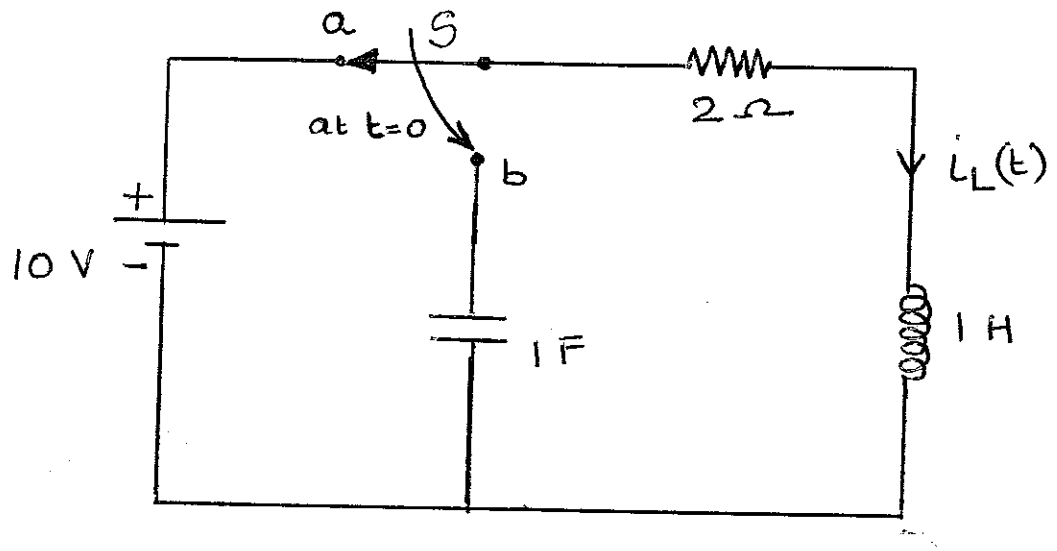

Figure 3

4. Find the steady state values of current 'i' and voltage 'v' for the circuit shown in Figure 4.

[5 marks]

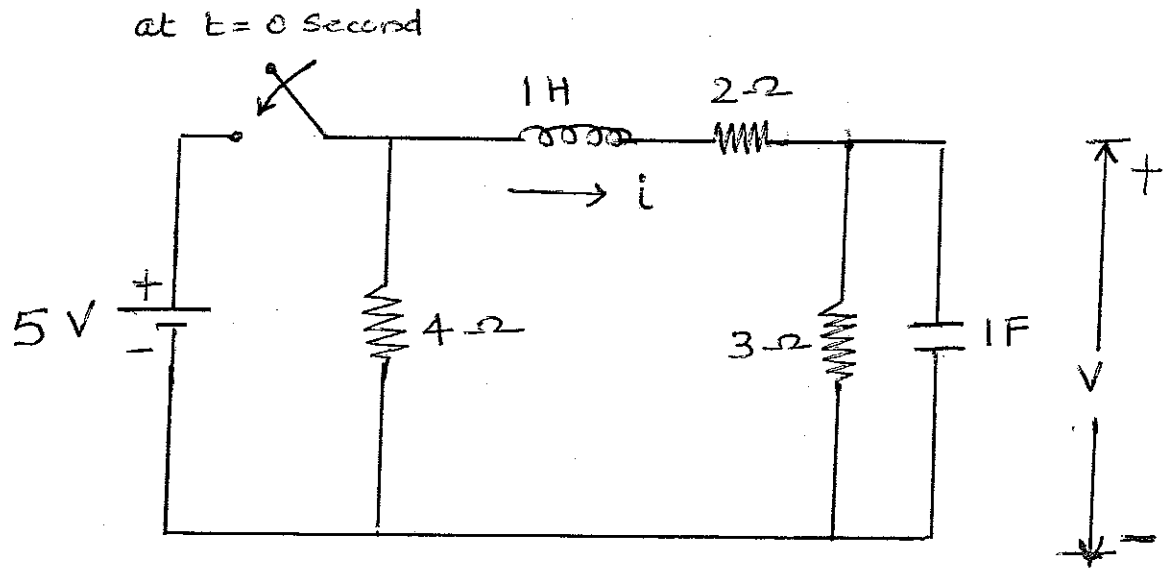

Figure 4

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TEST 1(CLOSED BOOK)

MAXIMUM MARKS: 50 **WEIGHTAGE: 25%**
DATE: 23/09/12 **DURATION: 50 MINUTES**

1. For the circuit shown in Figure 1, find the node voltages using the Nodal analysis. Determine the value of current 'i'. **[18 marks]**

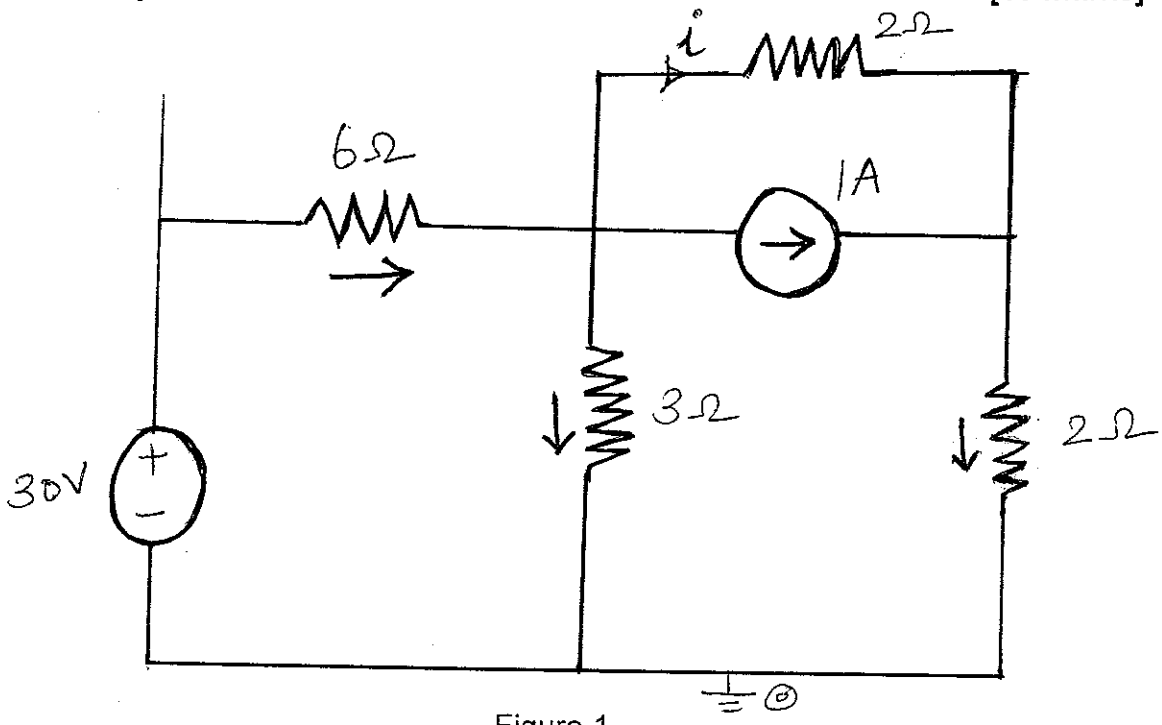

Figure 1

2. For the circuit shown in Figure 2, find the value of Current (i) and Voltage (V) by circuit simplification.

[07 marks]

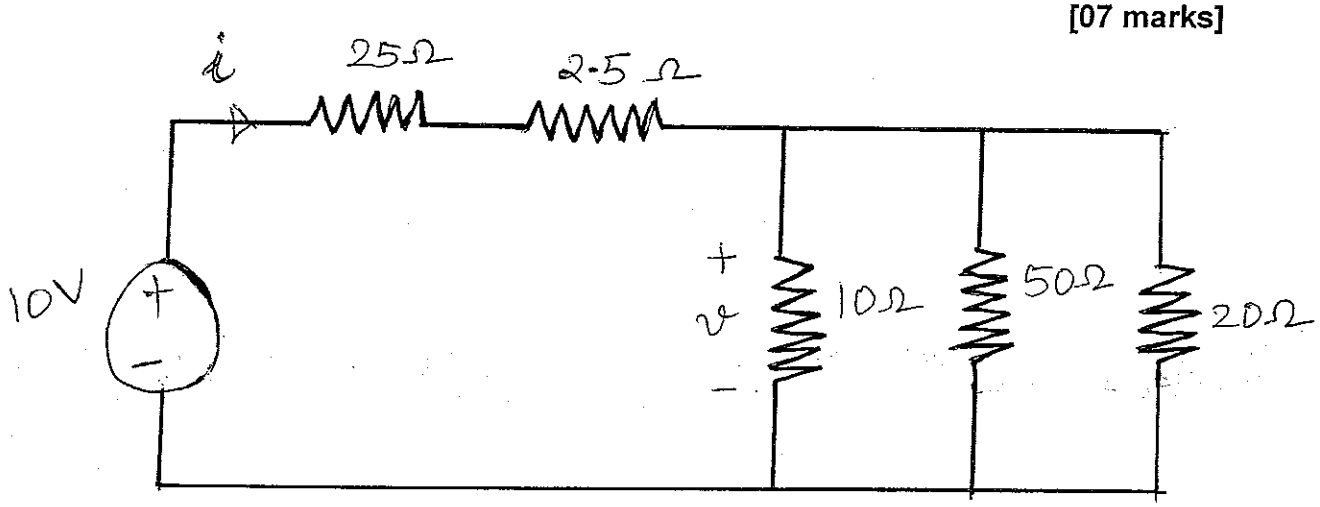

Figure 2

3. Determine the value of current (i) delivered by the source in the circuit shown in Figure 3. **[10 marks]**

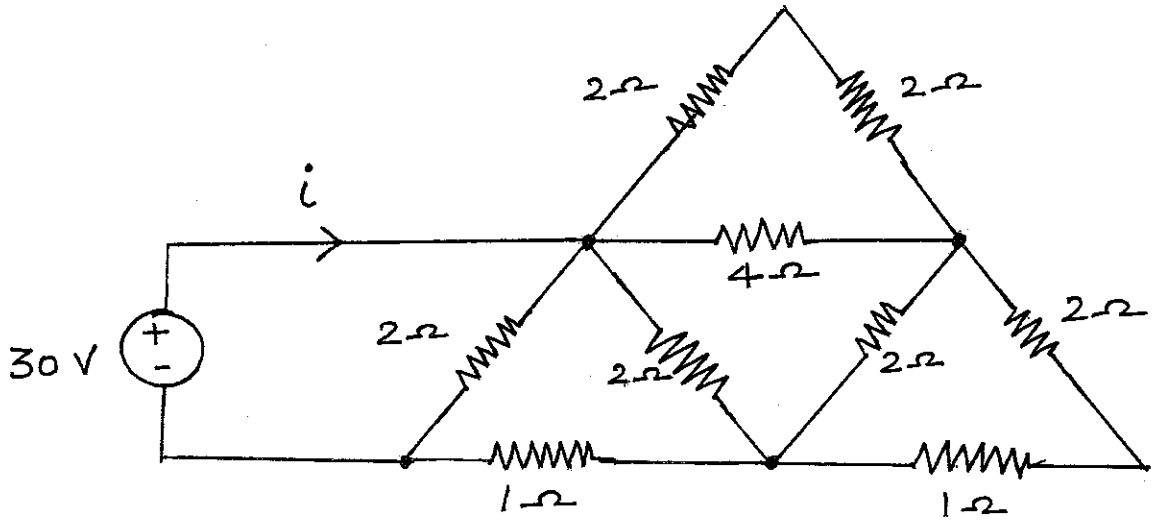

Figure 3

4. Using Mesh analysis find the mesh currents for the circuit shown in Figure4. **[15 marks]**

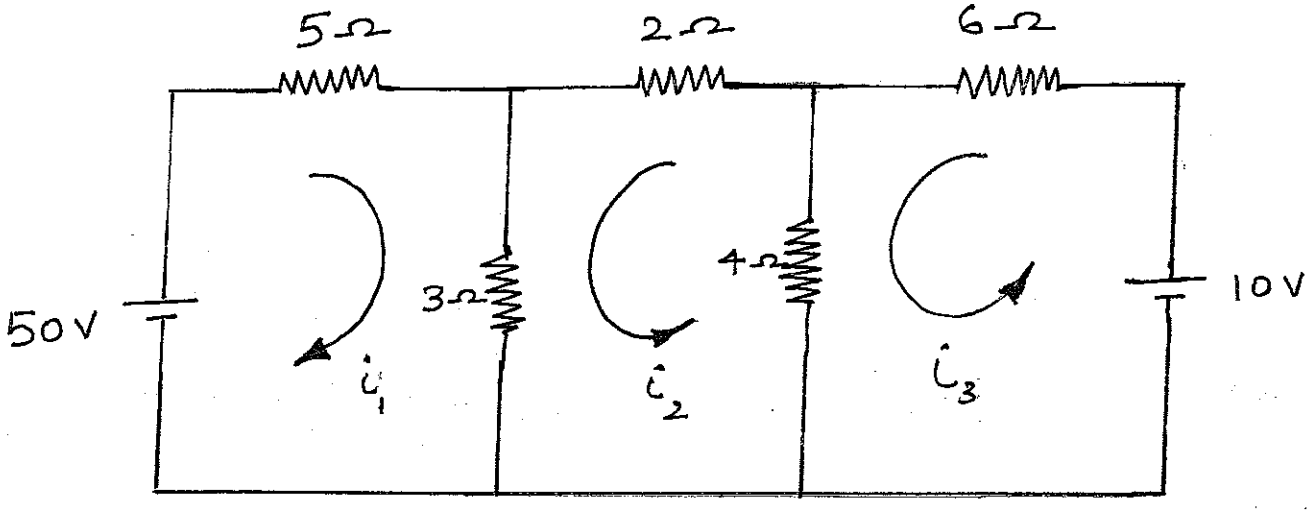

Figure 4

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EEE F111 ELECTRICAL SCIENCES
QUIZ 2 (CLOSED BOOK)

MAXIMUM MARKS: 14 | **SET 1** | **WEIGHTAGE: 7 %**
DATE: 28.11.12 | **DURATION: 20 MINUTES**

NAME:	**Id. No.:**

1. The unit of magnetic flux density is _____ [1M]

2. Flux in magnetic circuit is analogous to_____ in electric circuit. [1M]

3. A coil is wound uniformly with 300 turns over a steel ring of relative permeability of 900, having a mean circumference of 40cm and a cross-sectional area of $5cm^2$ .If the coil has a resistance of 100 Ω and is connected to a 250 V dc supply, calculate
   a) M.M.F of the coil.
   b) Magnetic field intensity of the coil.
   c) Total Flux in the coil.
   d) Reluctance of the circuit. [4 M]

4. Two coils of inductance L_1 and L_2 are placed close together such that the magnetic flux in one coil completely links the other. The mutual inductance between the coil is_____ [1 M]

5. The relative permeability of air is approximately _____ [1 M]

6. The number of turns for a magnetic circuit having an inductance of 5 H and reluctance of 26500 AT/ wb is _____ [2 M]

7. When magnetic flux linking a conductor changes
   (i) An e.m.f is always induced
   (ii) A current is always induced
   (iii) Both current and e.m.f are always induced
   (iv) Neither e.m.f nor current is induced. [1 M]

8. The current through a coil of inductance 5H is decreasing at the rate of 2 A/sec. The e.m.f induced in the coil is_____ [2M]

9. The equation for energy stored in a transformer is _____ [1 M]

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QUIZ 1 (CLOSED BOOK)

MAXIMUM MARKS: 16 SET 2 **WEIGHTAGE: 8 %**
DATE: 10.10.12 **DURATION: 20 MINUTES**

NAME:	**Id. No.:**

1. Identify the incorrect statements with respect to the Norton theorem [1M]

I. Connect the load to find open circuit voltage
II. Short circuit the load to find the Isc
III. Open circuit all voltage sources to find Thevenin's equivalent resistance R_0
IV. Short all the voltage sources to find Thevenin's equivalent resistance R_0

A. III , IV
B. I,III
C. I,II
D. All are incorrect

2. A capacitor behaves as an open circuit to DC._____ (True/False) [1M]

3. An electrical fan and a heater are marked 100 Watts, 220 Volts and 1000 Watts, 220 Volts respectively. The resistance of the heater is [1M]

(a) ZERO (b) Greater than that of Fan

(c) Less than that of Fan (d) Equal to that of Fan

4. The smallest resistance obtained by connecting 50 resistances of 0.25 ohm each is _____ [2M]

5. The expression for natural response for current through an Inductor _____ [1 M]

6. For the circuit shown in Fig.1 ,the Thevenin equivalent resistance R_{TH} is _____ and the Voltage Source (V_{TH}) value is _____ [3 M]

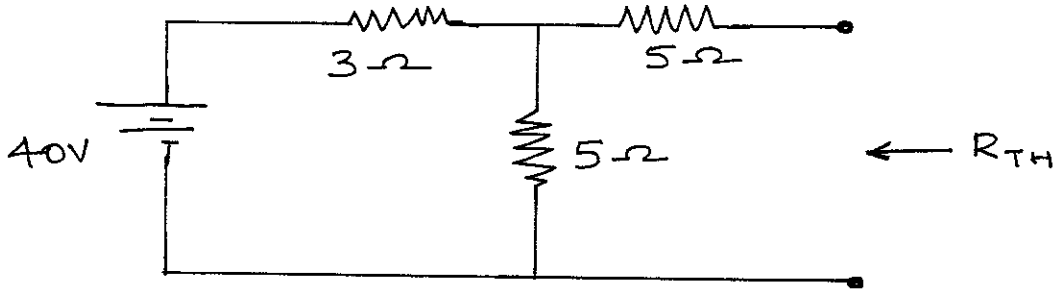

Fig.1

7. For the circuit in Fig.2, find the expression for voltage across capacitor for time, t> 0 Seconds _____ [2 M]

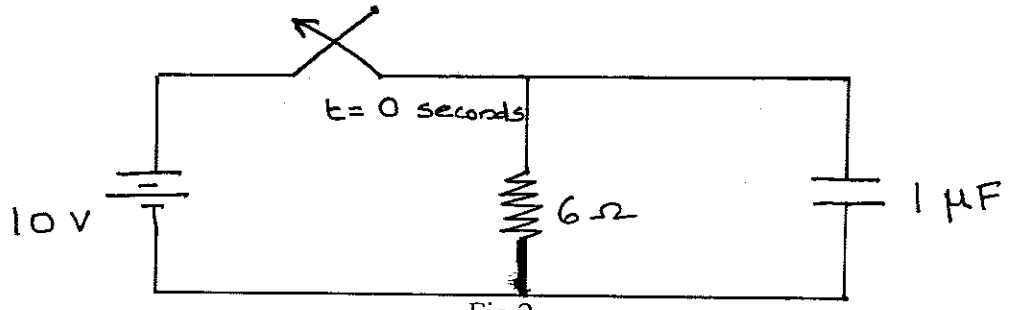

Fig.2

8. For the circuit shown in Fig.3, if resistor R2 becomes open circuited, the reading of the Voltmeter will become_____ [2M]

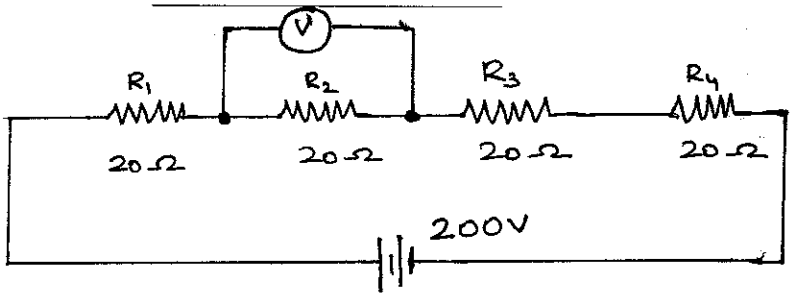

Fig.3

9. Three equal resistors are connected as shown in Fig.4.The equivalent resistance between points A and B is _____ [3M]

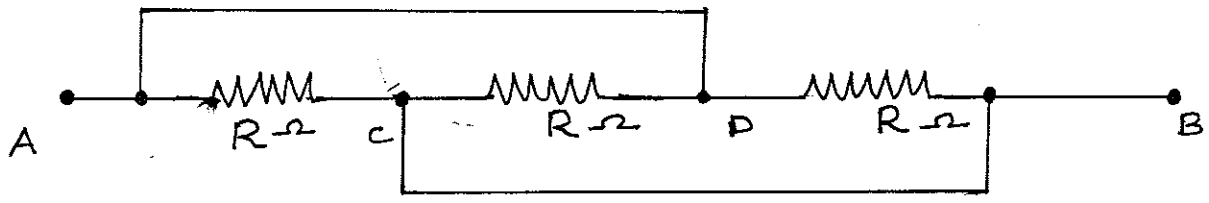

Fig.4