CODE NO: A109211402 | R09 | SET - 1

II B.TECH - I SEMESTER EXAMINATIONS – MAY, 2011
ELECTRICAL ENGINEERING
(MECHANICAL ENGINEERING)
(MECHATRONICS)

Time: 3hours **Max. Marks: 75**

Answer any FIVE questions
All Questions Carry Equal Marks
- - -

1.a) Find the voltages V_1 and V_2 in the below circuit (shown in Figure 1).

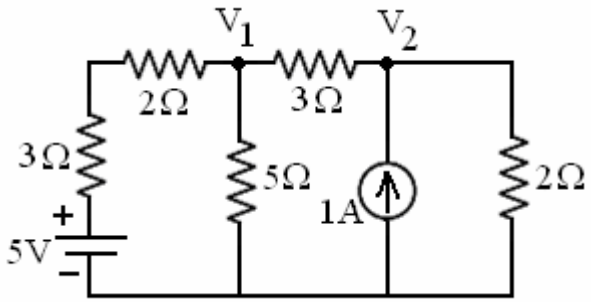

Figure 1

b) A current wave form shown below in Figure 2 is applied to a capacitor of 2μF. Find the voltage wave form. [7+8]

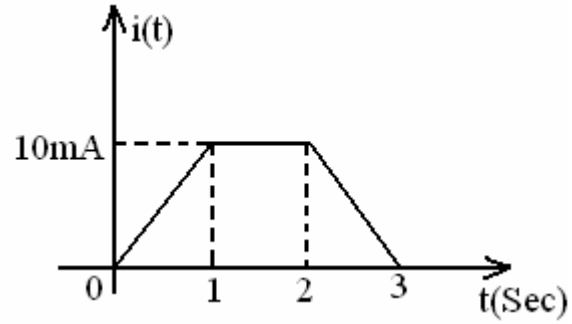

Figure 2

2.a) Find R_{eq} in the below circuit (shown in Figure 3).

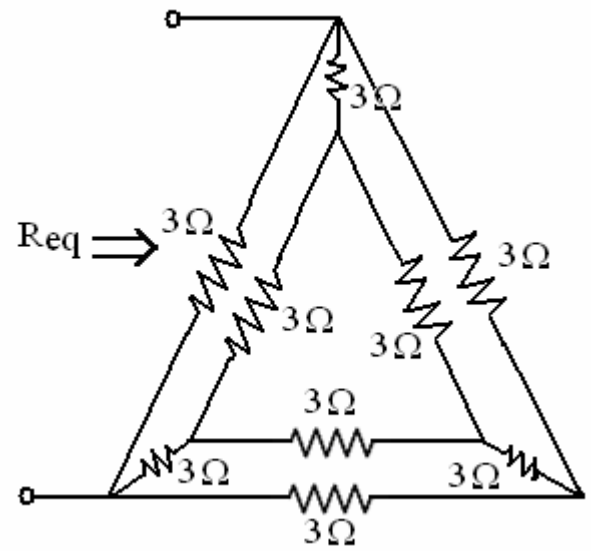

Figure 3

b) Find the thevenin's equivalent for the below network (shown in Figure 4). [7+8]

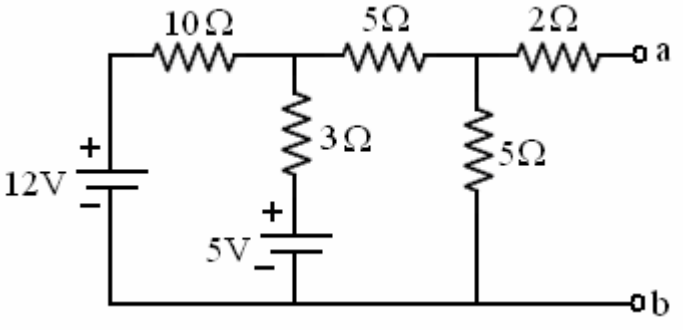

Figure 4

3.a) Find the effective value of the triangular wave form shown below in Figure 5.

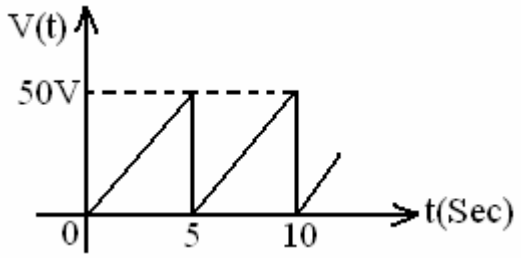

Figure 5

b) The voltage and current of a circuit are V = 200 Sin($\omega t+60^0$) and i = 50 Sin($\omega t+30^0$). Calculate average, reactive and apparent power. [7+8]

4.a) Derive the EMF equation of a single phase transformer.

b) The OC and SC test results of a single phase transformer are shown below.
OC Test: V_2 = 220V, I_0 = 14A; W_0 = 330W on lv side
SC Test: V_{SC} = 21.5V, I_1 = 45A; W_{SC} = 450W.
Calculate the various parameters of the transformer. [7+8]

5. A 4-pole compound generator supplies a load current of 100A at a terminal voltage of 400V. The armature, Series field and shunt field resistances are 0.01Ω, 0.05Ω and 200Ω respectively. Calculate the generated emf of the machine. [15]

6. A 6-pole dc motor has a lap connected armature with 90 slots, each slot containing 5 conductors. The flux per pole is 10mwb. The armature resistance is 0.2Ω. Calculate the speed when the motor is connected to a 240V supply and taking an armature current of 60A. Also calculate the torque developed by the armature. [15]

7.a) Draw the Torque – slip characteristics of three phase induction motor.

b) A 8-pole, 3Ø Induction motor operates from a supply frequency of 50 Hz. Calculate
i) Synchronous Speed ii) Speed of the rotor for a slip of 0.02.
iii) The frequency of the rotor current when slip is 0.03.
iv) Frequency of the rotor current when rotor is at stand-still. [7+8]

8. Explain in detail the construction and operation of moving Iron ammeters. [15]

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ELECTRICAL ENGINEERING
(MECHANICAL ENGINEERING)
(MECHATRONICS)

Time: 3hours **Max. Marks: 75**

Answer any FIVE questions
All Questions Carry Equal Marks
- - -

1.a) An inductor of inductance 2H is supplied with a current wave form shown below in Figure 1. Draw the waveforms for voltage and energy in the inductor.

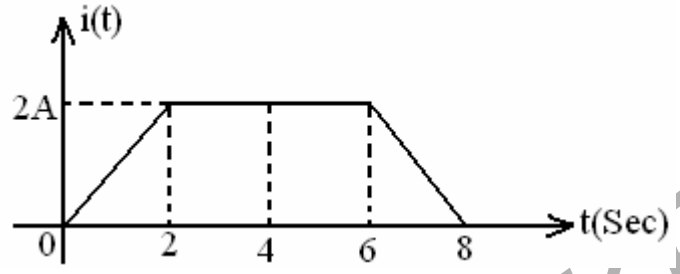

Figure 1

b) Find the node voltages in the below circuit (shown in Figure 2). [8+7]

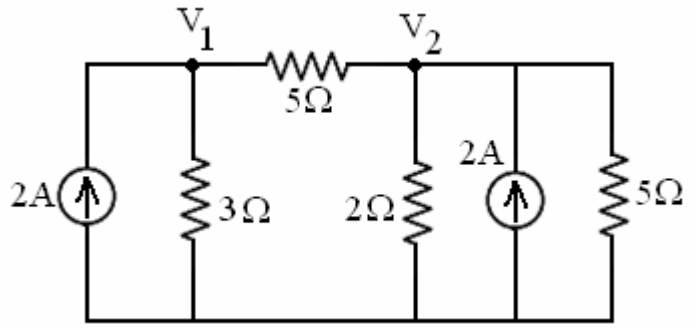

Figure 2

2.a) State and explain Norton's theorem.

b) What load resistance must be connected across the terminals $l - l'$ of the below circuit (shown in Figure 3) to get maximum power. [7+8]

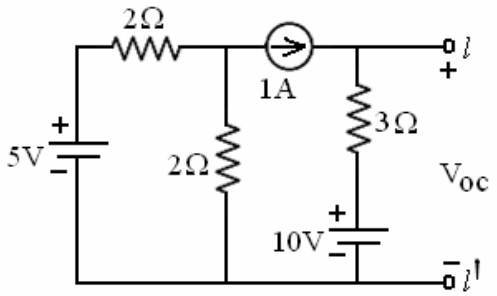

Figure 3

3.a) Calculate the form factor of the waveform shown below in Figure 4.

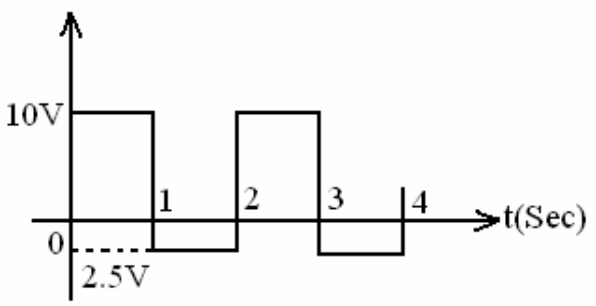

Figure 4

b) Find the total impedance, total current and phase angle for the below circuit (shown in Figure 5). [7+8]

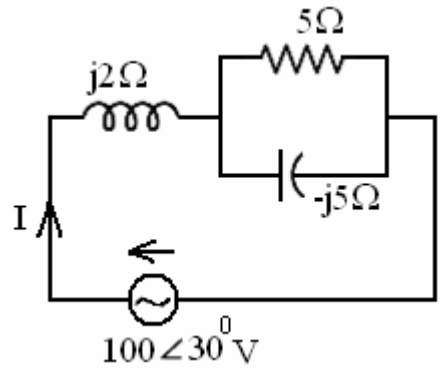

Figure 5

4. A 5KVA, 220/400V, 50Hz, single phase transformer gave the following results.
OC Test: 220V, 2A, 150W (lv side)
SC Test: 35V, 12A, 270W (lv side)
Determine the efficiency and regulations at full load, 0.9p.f. lagging. [15]

5. Explain in detail the principle of operation and constructional details of a DC generator. [15]

6.a) Derive the torque expression of a DC motor.

b) A dc shunt motor runs at 750 rpm from a 250V supply and takes a full-load line current of 60A. $R_a = 0.2\Omega$ and $R_f = 125\Omega$. Assuming a 2V brush drop. Calculate the speed for a no-load current of 6A. [15]

7. Derive the condition for maximum torque and the value of maximum torque of a three phase induction motor. [15]

8. Explain the construction and principle of operation of moving coil permanent magnet instruments. [15]

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II B.TECH - I SEMESTER EXAMINATIONS – MAY, 2011
ELECTRICAL ENGINEERING
(MECHANICAL ENGINEERING)
(MECHATRONICS)

Time: 3hours **Max. Marks: 75**

Answer any FIVE questions
All Questions Carry Equal Marks
- - -

1.a) Calculate the equivalent resistance in the below circuit (shown in Figure 1).

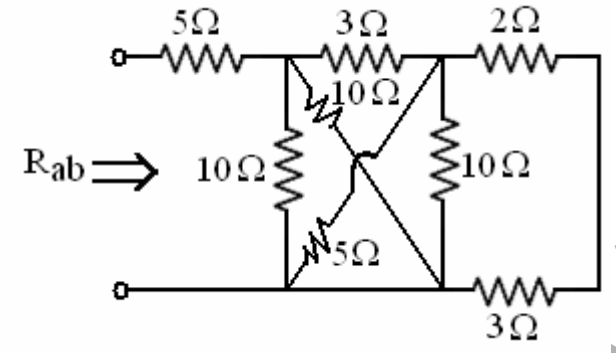

Figure 1

b) Find current 'I' in the below circuit (shown in Figure 2). [8+7]

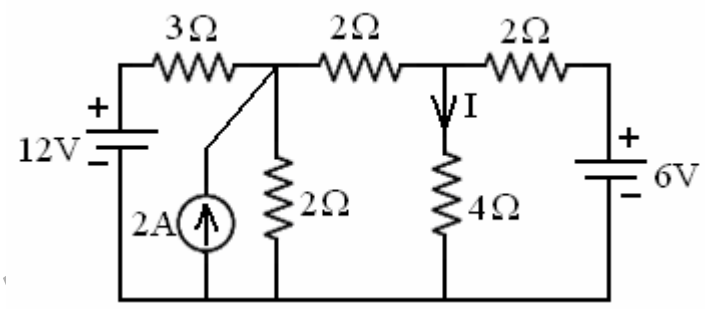

Figure 2

2.a) State and explain maximum power transfer theorem.

b) Find the voltages across the two current sources in the below circuit (shown in Figure 3) using super position theorem. [7+8]

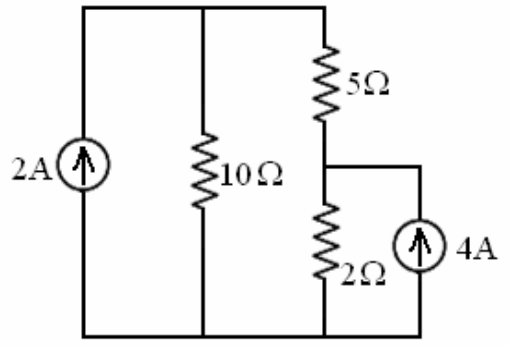

Figure 3

3.a) Find the form factor for the below wave form (shown in Figure 4).

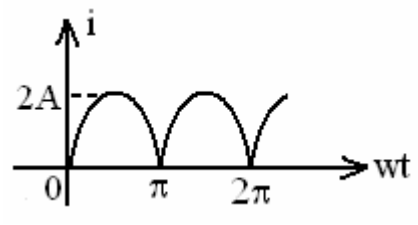

Figure 4

b) Find V(t) and i(t) in the below circuit diagram (shown in Figure 5). [7+8]

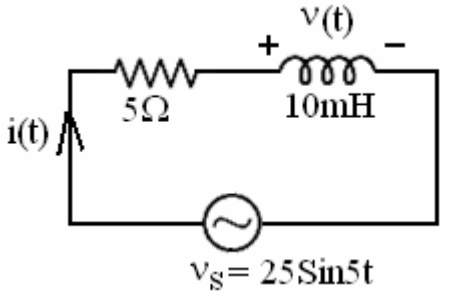

Figure 5

4. A 125 KVA transformer having primary voltage of 2500V at 50 Hz has 270 primary and 50 secondary turns. Neglecting losses, calculate
i) The no-load secondary induced emf
ii) Full load primary and secondary currents. [15]

5.a) Derive the EMF equation of a DC generator.
b) In a given DC generator P = 6, Z = 400, N = 500 rpm and Ø = 150 mwb, then calculate the generated EMF when the armature winding in
i) lap ii) wave. [7+8]

6. A 50KVA, 1Ø, 2300V/230V transformer has the primary and secondary winding resistances are 2Ω and 0.02Ω respectively. The iron losses are 450W. Calculate the efficiency of the transformer at half load and full load at p.f. of 0.8. [15]

7. Explain the principle of operation and constructional details of three phase induction motor. [15]

8.a) Write the essential features of measuring instruments.
b) With a neat diagram explain the operation of moving Iron attraction type instrument. [7+8]

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II B.TECH - I SEMESTER EXAMINATIONS – MAY, 2011
ELECTRICAL ENGINEERING
(MECHANICAL ENGINEERING)
(MECHATRONICS)

Time: 3hours **Max. Marks: 75**

Answer any FIVE questions
All Questions Carry Equal Marks
- - -

1.a) State and explain KCL and KVL.
b) Find V_1 and V_2 in the below circuit (shown in Figure 1). [7+8]

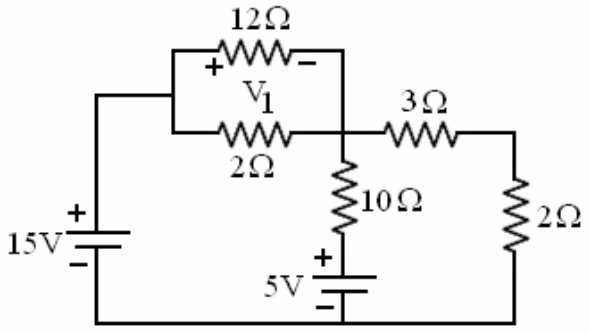

Figure 1

2.a) State and explain Super position theorem.
b) Determine the Thevenin's equivalent circuit across the terminals 'ab' (shown in Figure 2). [7+8]

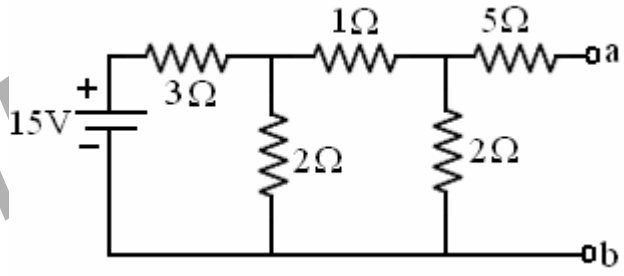

Figure 2

3.a) Calculate the RMS value of the voltage wave form shown below in Figure 3.

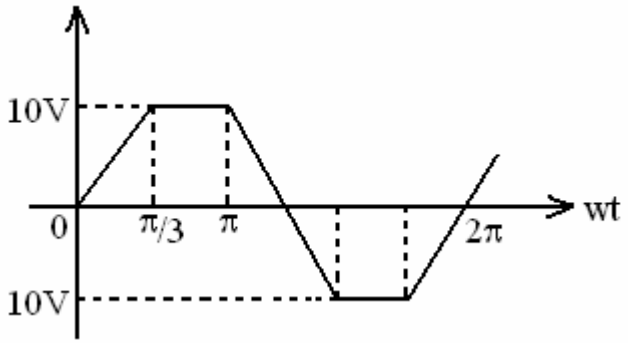

Figure 3

b) Determine the impedance, phase and current in the below circuit (shown in Figure 4). [7+8]

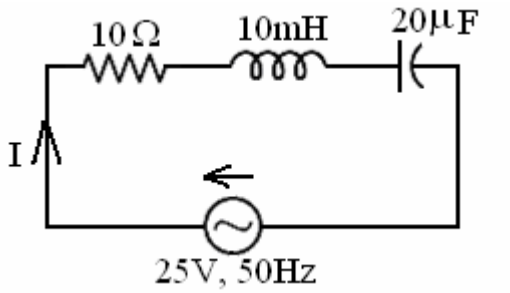

Figure 4

4.a) Draw the phasor diagram of a single phase transformer under lagging load conditions.
b) In a 1Ø, 50Hz, 11000/400V transformer the maximum flux density is 1.5 wb/m^2 and number of primary turns is 1400. Then calculate
i) the number of secondary turns
ii) the area of cross section of core. [7+8]

5. Explain the principle of operation of DC generators and also derive its generated emf equations. [15]

6. Explain the various speed controlling methods of DC motor. [15]

7.a) Draw the Torque-Speed characteristics of a 3Ø Induction motor.
b) A 3Ø, 50 Hz induction motor with 6-poles runs at 970rpm. Calculate
i) percentage slip ii) frequency of rotor induced emf. [7+8]

8. Explain the classification and essential features of measuring instruments. [15]

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