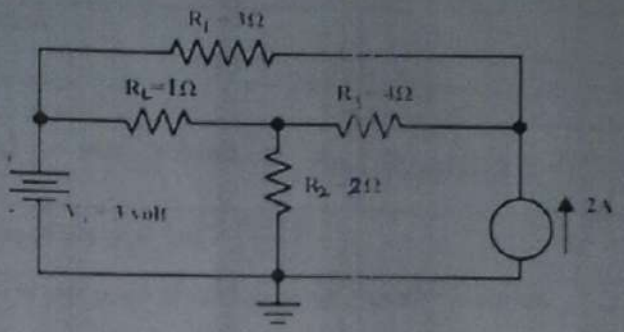
Examination: I-Semester B Tech (COM) Session: 2012-13 Semester: Monsoon(special)
Subject: *Electrical Technology* Max. Marks: 100 Time: 3 Hours

GROUP - A (Attempt any two questions)

1 (a) Derive the emf equation for a dc generator.
(b) Derive the equation of torque for a dc motor. [5]
(c) A 220 V DC shunt motor at no-load takes 5A and runs at 1000 rpm. The armature and the field resistances are 0.2 Ω and 220 Ω, respectively. Calculate the speed of the motor when it is loaded and takes a current of 50A. [5]
[10]

2 (a) Draw Phasor diagram of a transformer under the condition of leading and lagging load. [10]
(b) Show that total ohmic loss, in terms of the equivalent resistance referred to either side is same. [10]

3 (a) State Norton's theorem for electrical circuit. Derive relationship between Norton's source and Thevnin's source. [5+5]
b)Determine the current through 1 Ω resistance of the following electrical circuit using Norton's theorem. [10]



GROUP – B (Attempt all questions)

4 (a) Deduce the relationship between the phase and line voltages in a 3-ph star connected circuit.
(b) Three equal impedance of $Z = (4+j3)\Omega$ are connected in each arm of a star connected circuit. For balanced line to line voltage of 208 Volts, determine line current, power factor, active power and reactive power of the circuit. [4+6]

5. Derive expression of electromagnetic torque of a 3-phase induction motor. Draw and explain torque-slip characteristics of a 3-phase induction motor. [10]

6. Prove that power consumed in a balanced 3-phase load can be measured using two wattmeter and derive expression of load power factor angel from reading of these two wattmeter. [10]

7. (a)Draw phasor diagram of series RLC circuit in resonant condition. Determine expression of resonant frequency in terms of the constants of series RLC circuit.
(b) Derive an expression of the difference between two half power frequencies in terms of the constants of series RLC circuit. [3+7]

8. A DC shunt generator delivers 50 kW at 250 V when revolves with a speed of 400 rpm. The armature and field resistances are 0.025 Ω and 62.5 Ω, respectively. Calculate the speed of the machine running as a shunt motor and taking 50kW input at 250V. Allow 1V per brush for contact drop. [10]

9. A resistance and a capacitance are in series with an inductance. When the circuit is connected to a 230V, 50 Hz mains, the maximum current obtained by varying the inductance is 0.35 A, the voltage across the capacitance being 300 V. Find the values of the circuit components. [10]

Examination: **II-Semester B. Tech (COM)** Session: **2010- 2011** Semester: **Winter Semester**
Subject: **Electrical Technology (EEC12101)** Max. Marks: **100** Time: **3 Hours**

Instructions:
1) Answers should be brief and to the point with legible handwriting.
2) Diagrams should have labelling.
3) All terms in an expression should be defined/described.
4) Answers to all parts of a question should appear together.

Group-A
Attempt any two questions

1. a. Draw the torque-speed characteristics of DC shunt motor. Mention any one application of such motor. [3]

   b. Deduce the expression for generated e.m.f in a DC generator clearly stating all the significances of symbols used and the assumptions if any. [7]

   c. A shunt machine, connected to a 250V main has an armature resistance of 0.02Ω and the resistance of the field circuit is 80Ω. The machine delivers 120kW when it acts as a generator and draws 20kW when it acts as motor. Find the ratio of its speed as a generator to its speed as motor. Ignore armature reaction and assume contact drop under each brush to be 1.5V. [10]

2. a. Derive a simplified expression for voltage regulation of a transformer in terms of its parameters and line current under lagging and leading load power factor conditions. Clearly state all the approximations used. [10]

   b. A 4kVA, 200/400V, 50Hz, single-phase transformer gave the following test figures:

Low voltage data for no load:	200V	0.7A	60.0W
High voltage data for short circuit:	9.0V	6.0A	21.6W

[10]

Calculate: (i) the magnetizing current and the component corresponding to iron loss at normal voltage and frequency, and (ii) the efficiency of the transformer on half load and unity power factor.

3. a. Draw the torque-slip characteristics of an induction motor and show the stable region of operation. Why the induction motor is called an 'asynchronous motor'? [10]

   b. Find the expression for maximum internal torque developed in an induction motor in terms of its parameters. Clearly state all the significances of the symbols used and the assumptions if any. [10]

Group-B
Attempt all the questions

4. a. Why starter is required to start a DC motor? Explain. [3]

   b. Draw a neat diagram of a three-point starter for starting a DC shunt motor indicating all the parts and explain its operation under motor overload condition. [7]

5. a. For the voltage waveform $i=70\sin(628t+45^0)$ *A*, find the maximum current and phase angle, rms value, average value and supply frequency. [4]

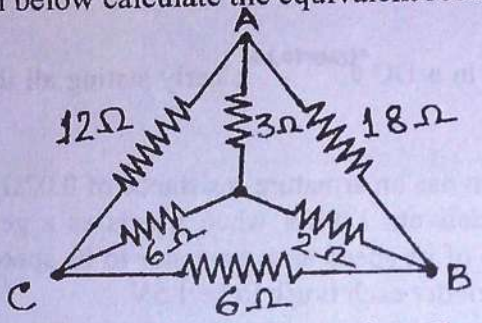
   b. With the help of a neat circuit diagram, describe the operation of star-delta starter for starting a three-phase induction motor. [6]

6. a. Explain the principle of operation of a synchronous motor.

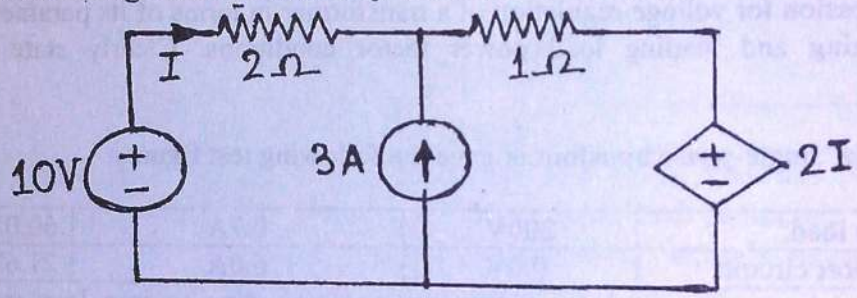
b. What is power triangle? Find the expression for active power consumption by a lagging power factor load connected to a single-phase AC voltage supply.

7. A series circuit has a resistance of 2Ω, an inductance of 0.25H and a variable capacitance. This series combination is connected across a 230V, variable frequency supply. Calculate: (i) the value of capacitance at resonance, (ii) the voltage across the inductance and capacitance at resonance, (iii) the Q-factor of the circuit, and (iv) draw the phasor diagram at resonance condition. The maximum current in the series circuit occurs at 50Hz supply frequency.

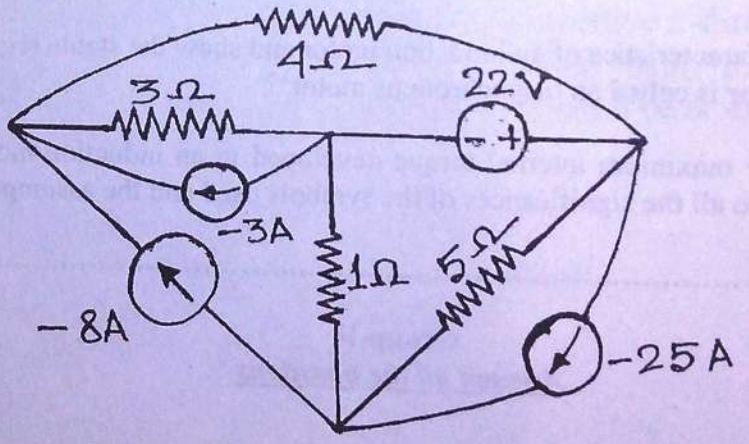
8. a. For the network shown below calculate the equivalent resistance between 'A' and 'B'.



b. Find the current through 2Ω resistance by Thevenin's Theorem.



9. Find the node voltages for the network shown below.

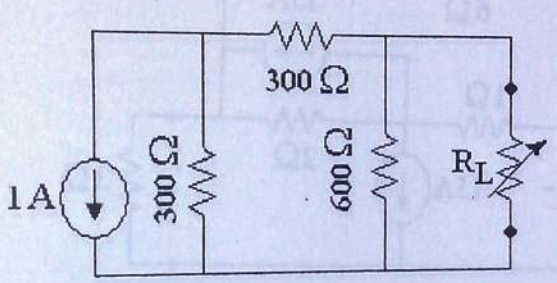


Examination: **II-Semester B Tech (COM)** Session: 2009- 2010 Semester: Winter Semester
Subject: ***Electrical Technology*** Max. Marks: 100 Time: 3 Hours

Instructions: 1) Answers should be brief and to the point with legible handwriting.
2) Diagrams should have labeling.
3) All terms in an expression should be defined/described.
4) Answers to all parts of a question should appear together.

GROUP - A (Attempt any two questions)

1. (a) State and prove the maximum power transfer theorem applicable for DC circuits. [5]
(b) Determine the maximum power that can be delivered to the load resistance R_L by the following circuit. [10]



(c) A circuit takes a current $i = 50\sin(314t - \pi/2)$ when the supply voltage is $v = 400\sin 314t$ Find the impedance, resistance and the inductance of the circuit. [5]

2. (a) Derive the emf equation of a dc generator. [4]
(b) Derive the torque equation of a dc motor. Draw the speed-torque characteristic of a dc series motor. [4]
(c) A 460 V series motor runs at 500 rpm taking a current of 40 A. Calculate the speed and percentage change in torque if the load is reduced so that the motor is taking 30 A. Total resistance of the armature and field circuit is 0.8 Ω. Assume flux and field current to be proportional. [8]
(d)Write the various methods of speed control of a dc shunt motor. [4]

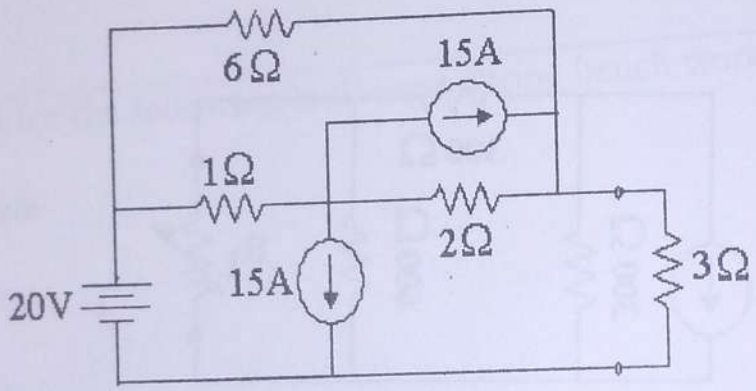
3. a) Explain the basic principle of rotation of an Induction motor. [4]
b) Draw and explain torque slip characteristics of an induction motor. Discuss the effect of addition of resistance in the rotor circuit of the slip ring induction motor. [8]
c) The power input to a 3 phase, 440 V, 50 Hz, 6 pole induction motor is 60 kW. The total stator losses are 1 kW. Find the mechanical power developed with a slip of 3%. Determine the efficiency, rotor frequency and the rotor speed. Neglect frictional and windage losses of the rotor. [8]

Continued to next page

GROUP – B (Attempt all questions)

4. A resistance and a capacitance are in series with an inductance. When the circuit is connected to a 240 V, 50 Hz, single phase mains, the maximum current obtained by varying the inductance is 0.35 A, the voltage across the capacitance being 300 V. Find the values of the circuit components. [10]

5. Determine the current through 3Ω resistance of the following electrical circuit using Thevenin's theorem.



[10]

6. A 110 V, 60 Hz, 3-phase supply is connected to a delta-configured balanced three-phase load. The load is inductive and has a resistance of 6.3 Ω in its each branch. If the load consumes 1818 W, find the readings of the two wattmeters connected to measure three-phase power by two-wattmeter method. [10]

7. What are the different methods of starting of three phase induction motor. Describe with the help of neat circuit diagram the operation of star delta starter for the three phase Induction motor. [10]

8. The efficiency of a 500 kVA single phase transformer is 98%, when delivering full load at 0.8 power factor leading, and 99% at half full load at unity power factor. Calculate i) iron loss ii) full load copper loss. [10]

9. **(a)** Why the short circuit and the open circuit tests are performed on a transformer? [6]
(b) How slip ring induction motor is different from squirrel cage induction motor? [4]

V. Hrushikesh

Examination: **Winter Semester (Special)** Session: **2010- 2011** Semester: **II B. Tech (COM)**
Subject: **Electrical Technology (EEC12101)** Max. Marks: **100** Time: **3 Hours**

Instructions:
1) Answers should be brief and to the point with legible handwriting.
2) Diagrams should have labelling.
3) All terms in an expression should be defined /described.
4) Answers to all parts of a question should appear together.

Group-A
Attempt any two questions

1. a. Draw a neat equivalent circuit of a long-shunt and short-shunt cumulatively compound DC generator. Mention all the significances of symbols used. [5]

   b. Deduce the expression for electromagnetic torque developed by the armature of a DC motor clearly stating all the significances of symbols used and the assumptions if any. [7]

   c. A separately excited generator running at 1500rpm supplies 250A at 125V to a circuit of constant resistance. What will the current be when the speed is dropped to 1200rpm with field current unaltered? The armature resistance is 0.05Ω and the total drop at the brushes is 1.5V. Ignore armature reaction. [8]

2. a. Draw the equivalent circuits for open circuit test and short circuit test of a single-phase transformer. Mention all the significances of symbols used. [8]

   b. A 17.5kVA, 450/121V, 50Hz, single-phase transformer gave the following data on test:

Open circuit test:	450V	1.5A	115W
Short circuit test:	15.75V	38.9A	312W

[12]

Calculate: (i) the magnetizing current and the component corresponding to iron loss at normal voltage and frequency, (ii) the efficiency of the transformer on full load and 0.8 lagging power factor, and (iii) the load in kVA at which maximum efficiency occurs?

3. a. Draw the torque-speed characteristics of an induction motor and show the stable region of operation. [10]

   b. Write short-note on "Synchronous motor: Operating principle and use". [10]

Group-B
Attempt all the questions

4. a. Mention at least three conditions for voltage build up in DC shunt generator? [3]

   b. Draw a neat diagram of a three-point starter for starting a DC shunt motor. Label all the parts and explain its operation under motor overload condition. [7]

5. a. A coil of resistance 25Ω and inductance 0.159 H is in parallel with a circuit having 60Ω resistor and 125μF capacitor. This parallel circuit is connected to a 230V, 50Hz supply. Calculate: (i) the supply current, (ii) the equivalent resistance and reactance, (iii) the power factor and (iv) draw the phasor diagram. [10]

Continued.....

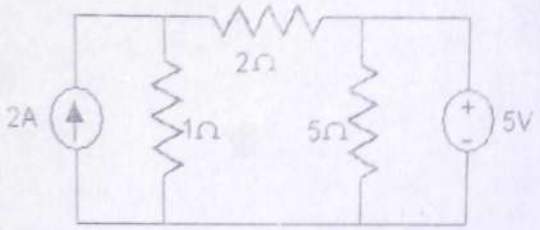
6. a. Mention various methods of starting of induction motor. [4]

b. The power input to a 2200V, 50Hz, three-phase induction motor, running on full load at an efficiency of 90%, is measured by two wattmeters, which indicate 500kW and 200kW respectively. Calculate (i) the phase difference, (ii) the line current, (iii) the total power input and (iv) the horse power output. [6]

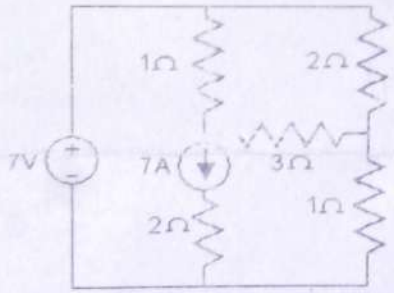
7. Neatly draw the connection diagram of two wattmeter method for three-phase power measurement assuming balanced load and find the load power factor angle in terms of wattmeter readings. [2+8]

8. a. State and explain Norton's Theorem for DC network. [5]

b. Find the current through 5Ω resistance by Thevenin's Theorem. [5]



9. Find the mesh currents for the network shown below. [10]



Examination: I-Semester B Tech (COM) Session: 2010-11 Semester: Monsoon
Subject: ***Electrical Technology*** Max. Marks: 100 Time: 3Hours

Instructions: 1) Answers should be brief and to the point with legible handwriting.
2) Diagrams should have labeling.
3) All terms in an expression should be defined/ described.
4) Answers to all parts of a question should appear together.

GROUP - A (Attempt any two questions)

1. **(a)** Derive the emf equation for a dc generator. [5]
(b) Derive the equation of torque for a dc motor. [5]
(c) A 230 V shunt motor is taking a current of 50 A. The resistance of shunt field is 46 Ω and that of the armature is 0.02 Ω. There is a resistance of 0.6 Ω in series with the armature and the speed is 800 rpm. What alteration must be made in the armature circuit to raise the speed to 850 rpm, while torque is remaining the same. [10]

2. a) Draw Phasor diagram of a transformer under the condition of leading and lagging load. [8]
b) The O.C and S.C test data are given below for a single phase, 5 kVA, 200V/400V, 50Hz transformer.

O.C test from LV side: 200V 1.25A 150W
S.C test from HV side: 20V 12.5A 175W

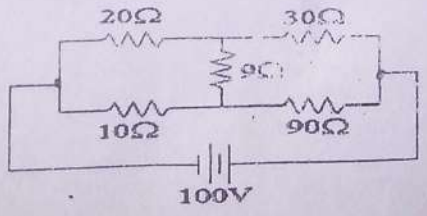
Draw the equivalent circuit of the transformer referred to LV side inserting all the parameter values. Also calculate the efficiency of the transformer at 75% loading with load power factor 0.7 (lag). [7+5]

3. a) Derive expression of electromagnetic torque of a 3-phase induction motor. Draw and explain torque-slip characteristics of a 3-phase induction motor. [5+5]
b) A 3-phase induction motor has a starting torque of 25 Nm with rotor resistance to reactance ratio as unity. For negligible stator impedance and no load current determine starting torque in case rotor circuit resistance per phase is doubled? [10]

GROUP – B (Attempt all questions)

4. State and prove the maximum power transfer theorem applicable for electrical circuits. Determine the efficiency of power transfer through an resistive load of an electrical circuit under the maximum power transfer condition? [6+4]

5. Determine the current through 9Ω resistance of the following electrical circuit using Thevenin's theorem. [10]



6. Three inductive coils each of 10 ohm resistance and inductance 0.019H are connected in Delta to a 3- phase, 415V, 50 Hz supply. Calculate i) the line current ii) Power Factor iii) Power input to the circuit. [10]

7. An inductive coil is connected in series with an 8 μF capacitor. With a constant supply voltage of 400 V the circuit takes maximum current of 80 A when the supply frequency is 50 Hz. Calculate the (a) resistance and inductance of the coil and (b) voltage across the capacitor. [10]

8. A dc shunt motor running at 1200 rpm has armature resistance of 0.15 Ω. The current taken by the armature is 60 A when the applied voltage is 220 V. If the load is increased by 30%, find the variation in speed. [10]

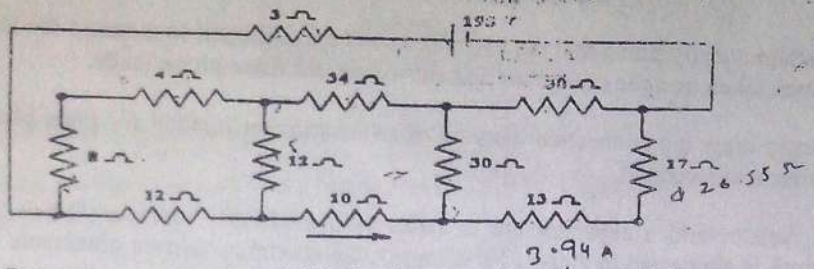
9. (a) In the two-wattmeter method of measuring power in a three-phase circuit, the two wattmeters are showing equal readings. What is the power factor angle at that condition? Justify your answer. [3]

(b) Define voltage regulation of a transformer? Determine expression of regulation of a transformer with lagging load. [2+5]

Examination : I– B.Tech. Semester : Monsoon Session : 2008 - 2009
Subject : ELECTRICAL TECHNOLOGY Time : 3 Hours Max Marks : 100
Instruction, if any : Answers must be brief and to the point

Group – A (Attempt any two questions)

(a). State and explain Thevenin's theorem. [6]

(b). 

[14]

Determine current through 10 Ω resistance using Thevenin's theorem.

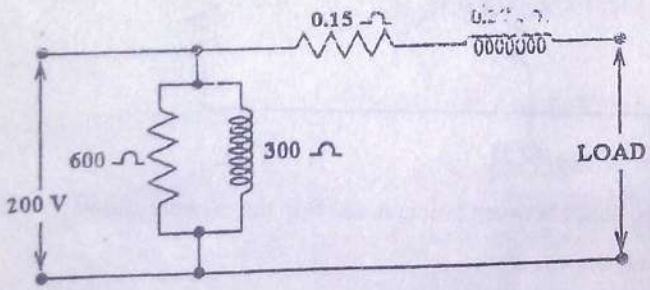
2(a). Develop the emf equation of d.c. generator from fundamentals. [6]

(b). A separately excited dc generator, when running at 1200 RPM supplies 200 A at 125 V to a circuit of constant resistance. What will be the current when the speed is dropped to 1000 rpm if the field current is unaltered? Armature resistance is 0.04 Ω; Total drop at brushes 2 V. Ignore change in armature reaction. [6]

(c). Give connection diagram for each type of d.c. generator and neatly draw the external characteristic (terminal voltage V_s load current) curve. [4]

(d). A shunt wound d.c. machine has an armature resistance of 0.12 Ω and a field resistance of 100 Ω. The machine's rated terminal voltage is 250 V. Find the ratio of speeds as a generator and motor if line current is 80 A in each case. [4]

3(a). Explain, how rated copper loss and core loss of a transformer are determined experimentally. Draw the relevant circuit diagrams. [10]

(b). 

[10]

The equivalent circuit shown above refers to a 200 / 400 V , 1 – Phase, 50 Hz, 4 kVA transformer, the values given being referred to the low voltage side. For a high-voltage load current of 10 A at a lagging power factor of 0.8, calculate (a) the low-voltage input current, (b) the efficiency, (c) the terminal voltage of high-voltage side.

Continued

Group – B (Attempt all questions)

4. (a) Mathematically prove that the two wattmeters are sufficient to measure the total power taken by delta-connected and star-connected three-phase loads. [8]

(b) Neatly draw the connection diagram of two wattmeter method for three-phase power measurement. [2]

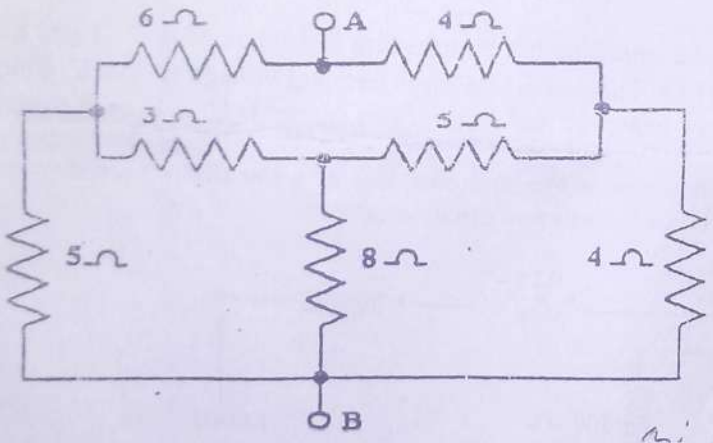
5. A resistor and a capacitor are in series with a variable inductor. When the circuit is connected to 200-V, 50Hz supply, the maximum current obtainable by varying the inductance is 0.314 amp. The voltage across the capacitor is then 800 volt. Find the circuit constants. [10]

6. A 6pole , 3 phase induction motor develops 30 h.p., including mechanical losses total 2 h.p, at a speed of 950 rev per min on 550-V, 50 Hz mains. The power factor is 0.88. Calculate for this load (a) the slip; (b) the rotor copper loss; (c) the total input if the stator losses are 2000 Watt (d) efficiency [10]

7. (a) Mention various methods of starting of induction motor. [3]

(b) With the help of a neat circuit diagram, describe the operation of star-delta starter for starting of three-phase induction motor. [7]

8. [10]



Determine the resistance between points A and B in the network shown.

9. Write short-note on any one of the following : [10]

(I) 3 – Point starter for d.c. motor

(II) Synchronous motor.

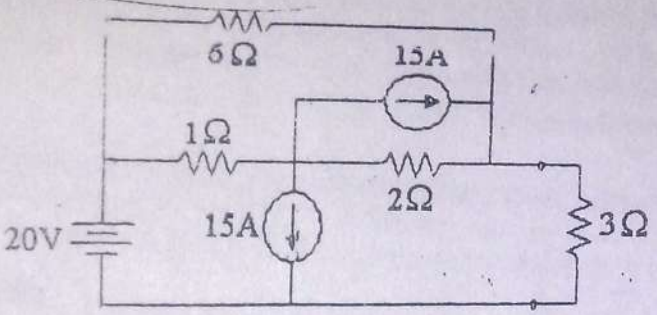
Exam: II- B.Tech (D, E,F section) Session: 2008-2009 Semester: Winter

Sub: Electrical Technology Full Marks:100 Time : 3Hours

Section A
Attempt any two questions

1. (a) State and explain maximum power transfer theorem. [4]

(b) Determine current through 3 Ω resistance of the following electrical circuit using principles of Thevenin's theorem. [10]



(c) Mathematically prove that the two wattmeters are sufficient to measure the total power taken by delta-connected and star-connected three-phase loads. [6]

2. (a) Draw and explain torque slip characteristics of the three phase induction motor. [7]

(b) What are the different starting methods of three phase induction motor? [4]

(c) Calculate the efficiency at full load, half-full load at 0.71 power factor lagging for a 80 KVA, 1100/250 V, 50Hz, single phase transformer, whose losses are as follows : Iron losses =800 watt. Total copper losses with 160 A in the low voltage winding is 200 Watt. [9]

3. (a) Develop the emf equation of d.c. generator from fundamentals. [6]

(b) A separately excited dc generator, when running at 1200 RPM supplies 200 A at 125 V to a circuit of constant resistance. What will be the current when the speed is dropped to 1000 rpm if the field current is unaltered? Armature resistance is 0.04 Ω. Total drop at brushes 2 V. Ignore change in armature reaction. [6]

(c) Give connection diagram for each type of d.c. generator and neatly draw the external characteristic (terminal voltage vs load current) curve. [4]

(d) A shunt wound d.c. machine has an armature resistance of 0.12 Ω and a field resistance of 100 Ω. The machine's rated terminal voltage is 250 V. Find the ratio of speeds as a generator and motor if line current is 80 A in each case. [4]

Examination: 1-Semester B Tech (COM) Session: 2010-11 Semester: Monsoon(special)
Subject: *Electrical Technology* Max. Marks: 100 Time: 3Hours

Instructions: 1) Answers should be brief and to the point with legible handwriting.
2) Diagrams should have labeling.
3) All terms in an expression should be defined/ described.
4) Answers to all parts of a question should appear together.

GROUP - A (Attempt any two questions)

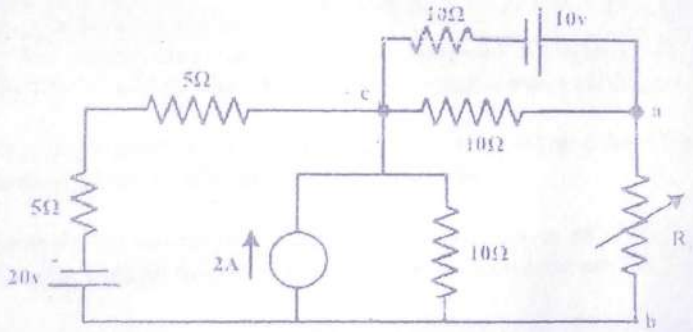
1. (a) Derive the emf equation for a dc generator. [5]
(b) Draw and explain torque-speed characteristics of a d.c shunt motor [5]
(c) A 220 V dc shunt motor has resistance of shunt field is 110 Ω and armature circuit resistance is 0.2 Ω. The motor takes 5A current at no load condition and runs at 1500 r.p.m. Determine the speed of the motor if it draws 52A current at rated voltage and rated load. [10]

2. a) Draw the exact equivalent circuit of a single-phase transformer referred to primary [5]
b) Draw Phasor diagram of a transformer under the condition of lagging load. [5]
b) The O.C and S.C test data are given below for a single phase, 20 kVA, 2500V/250V, 50Hz transformer.

O.C test from LV side: 250V 1.4A 105W
S.C test from HV side: 104V 8A 320W

Draw the equivalent circuit of the transformer referred to LV side inserting all the parameter values. [10]

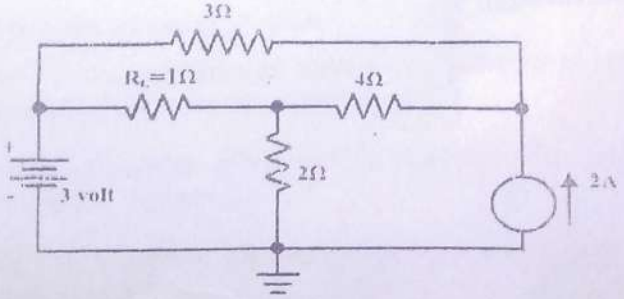
3. a) State and prove the maximum power transfer theorem applicable for electrical circuit. [8]
b) Find the value of the load resistance R_L connected across the terminals a-b of the following circuit that absorbs maximum power and determine the corresponding power under this condition.



[12]

GROUP – B (Attempt all questions)

4. Determine the current through 1Ω resistance of the following electrical circuit using Norton's theorem. [10]



5. (a) Deduce the relationship between the phase and line voltages in a 3-ph star connected circuit.
(b) Three equal impedance of $Z = (4+j3)\Omega$ are connected in each arm of a star connected circuit. For balanced line to line voltage of 208 Volts , determine line current, power factor, active power and reactive power of the circuit. [4+6]

6. Derive expression of electromagnetic torque of a 3-phase induction motor. Draw and explain torque-slip characteristics of a 3-phase induction motor. [10]

7. Prove that power consumed in a balanced 3-phase load can be measured using two wattmeter and derive expression of load power factor angle from reading of these two wattmeter. [10]

8. Define voltage regulation of a transformer? Determine expression of regulation of a transformer with leading load. [3+7]

9. (a) Draw phasor diagram of series RLC circuit in resonant condition. Determine expression of resonant frequency in terms of the constants of series RLC circuit.
(b) Derive an expression of the difference between two half power frequencies in terms of the constants of series RLC circuit. [4+6]

Examination: ***I Sem - B.Tech. (Common)***(A,B,C,D,E) Session: 2013-14 Semester: Monsoon
Subject: ***Electrical Technology*** (EEC11102) Max. Marks: 100 Time: 3 Hours

Instructions:

1) Answers should be brief and to the point with legible handwriting.
2) Diagrams should have proper labeling.
3) All the terms in an expression should be defined / described.
4) Answers to all parts of a question should appear together.
5) Symbols and terms are carrying their usual meaning.

GROUP-A (Attempt any two questions)

1. a) Derive the torque equation and condition for maximum torque of a three phase induction motor. [10]

   b) A 3 phase, 6 pole, 400 V, 50 Hz induction motor takes a power input of 35 KW at its full load speed of 890 r.p.m. The total stator losses are 1 KW and friction and windage losses are 1.5 kW. Calculate: (i) slip, (ii) rotor ohmic loss, (iii) shaft power , (iv) shaft torque and (v) efficiency. [10]

2. a) Derive the expression for power factor angle of a 3-phase load using two wattmeter method with necessary diagrams. [10]

   b) Three identical resistors of 20 Ω are connected in star to a 415 V, three-phase, 50 Hz supply. (i) calculate the total power taken by the load, (ii) calculate the power consumed in the resistors if they are connected in delta to the same supply and (iii) if one of the resistors is open circuited, in such case calculate the power consumed. [10]

3. a) Classify DC machines based upon the excitation. Write down the terminal voltage expression for all types of DC generators and motors. [10]

   b) A 500 V shunt motor takes a total current of 5 A when running unloaded. The resistance of armature circuit is 0.25 Ω and the field resistance is 125 Ω. Calculate the efficiency and output when the motor is loaded and taking a current of 100 A. [10]

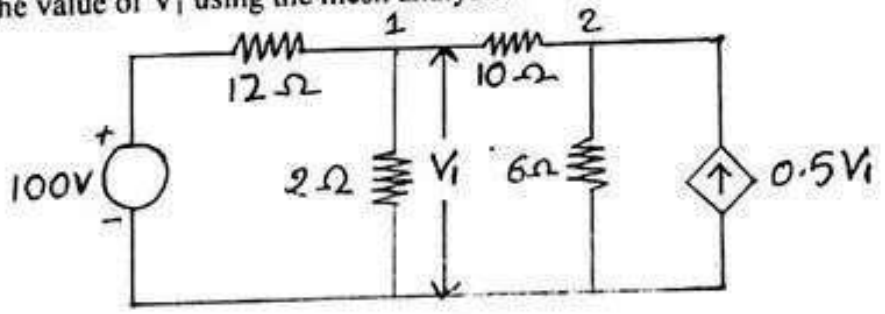
GROUP-B (Attempt all questions)

4. Derive the equivalent circuit of a single phase transformer referred to primary side. Also draw the phasor diagram of the transformer under loaded condition with lagging power factor. [10] [2×5]

5. Explain the following with necessary diagrams.
   i) Maximum power transfer theorem.
   ii) Auto transformer starting method. [5]

6. a) Explain the behavior of a series RLC with the help of phasor diagram when (i) $X_L > X_C$, (ii) $X_C > X_L$ and (iii) $X_L = X_C$ [5]

   b) Find the value of V_1 using the mesh analysis. [5]



7. a) Derive the EMF equation of a DC generator specifying all the notations used. [5]

   b) Two circuits with impedances of $Z_1 = 10 + j15\ \Omega$ and $Z_2 = 6 - j8\ \Omega$, respectively, are connected in parallel. If the supply current is 15 A, find each branch current and their phase angle with respect to the total current. What is the voltage across the combination and its phase angle? [5]

8. a) Derive the armature torque equation of a DC motor. [5]

   b) A 500 kVA transformer has 95% efficiency at full load and also at 60% of full load both at unity power factor. [5]
   (i) calculate the iron and copper loss at full load at unity power factor
   (ii) determine the transformer efficiency at 75% full load at unity power factor.

9. a) For a 3-phase star connected system, derive the relationship between: [5]
   (i) line voltage and phase voltage and (ii) line current and phase current

   b) (i) Find the efficiency of a DC generator running at no-load. [2+3]
   (ii) Find the r.m.s value of the voltage given as
   $v(t) = 10 + 200 \sin(\omega t - 30°) + 100 \cos(3\omega t) - 50 \sin(\omega t + 60°)$.

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Examination: *II Sem- B.Tech. (Common)* (E, F, G, H) Session: 2014-15 Semester: Winter
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GROUP-A (Attempt any two questions)

1. a) Draw and explain the open circuit characteristics of a d.c.generator. [5]
   b) Explain the significance of back e.m.f. in a d.c. motor. [5]
   c) A 250V shunt motor has an armature resistance of 0.5Ω and runs at 1200 rpm. when the armature current is 80A. If the torque remains unchanged. find the speed and armature current when the field is strengthened by 25%. [10]

2. a) State and explain Thevenin's theorem. [5]
   b) Find the Norton's equivalent to the left of terminal AB of the circuit shown in Fig. 1. [5]

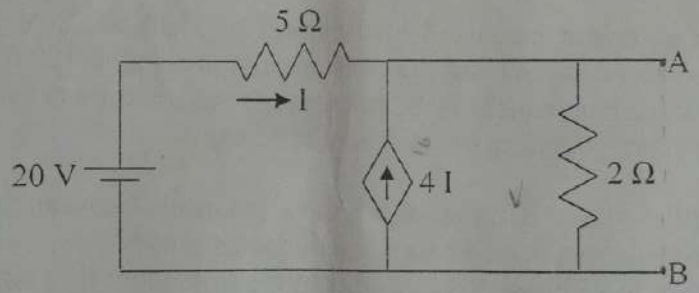

Fig. 1

c) Using Mesh Current Analysis, find the mesh currents in the circuit of Fig. 2. [10]

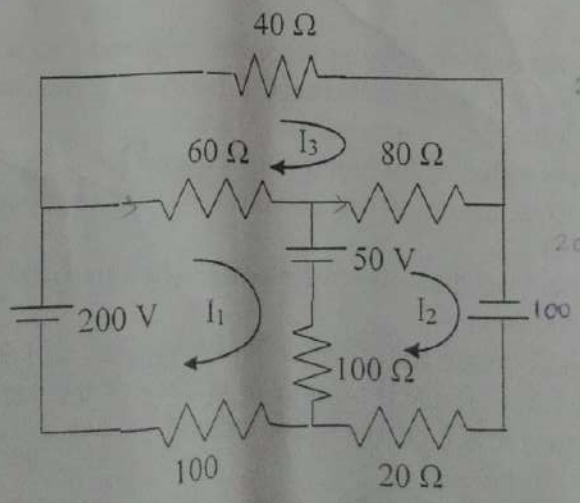

Fig.2

3. a) Show that the maximum torque occurs at a slip $s=R_2/X_2$ and further show that the maximum torque T_{max} is independent of 's'. [5]

b) Draw the torque-slip characteristic of a 3-phase induction motor with proper notations and supporting equation. Also, explain the effect of rotor resistance on the characteristics. [5]

c) A 3-phase, 50 Hz, 4-pole induction motor has a slip of 4%. Calculate (i) speed of the motor, (ii) frequency of the rotor e.m.f., (iii) if the rotor has the resistance of 1 Ω and standstill reactance of 4 Ω, calculate power factor at standstill and at a speed of 1400 r.p.m. [10]

GROUP-B (Answer all questions)

4. A 3-phase, 50 Hz, 440 V system supplies a delta-connected load having phase impedances Z_{RY} = 50 Ω, Z_{YB} = (43.3 + j25) Ω and Z_{BR} = (43.3 - j25) Ω. Two wattmeters are connected in the circuit to measure the load power. Determine the readings of both the wattmeters, if their current coils are in the lines R and Y respectively. The phase sequence is R-Y-B. [10]

5. a) State and derive the expression of maximum power transformer theorem for dc networks. [5]

b) A dc shunt generator has a full-load current of 196A at 220V. The shunt field winding resistance is 55Ω and the constant loss is equal to 720W. If the full load efficiency of the generator is 88%, calculate (i) the armature resistance and (ii) the load current corresponding to maximum efficiency. [5]

6. a) With the aid of Phasor diagram obtain the relationship between the line and phase values of voltage in a three-phase star-connected system. [5]

b) An industrial single phase load consists of the following: (i) a load of 200 kVA at 0.8 power factor lagging, (ii) a load of 50 kW at unity power factor and (iii) a load of 48 kW at 0.6 power factor leading. Calculate the total kW, total kVAr, total kVA and the overall power factor. [5]

7. a) Derive the expression for the resonant frequency of a parallel circuit with one branch having a coil of inductance L henry in series with resistance R ohm and other branch has only capacitor of C farad. [5]

b) Find the r.m.s value of the voltage given as [5]
$v(t) = 10 + 200 \sin(\omega t - 30^\circ) + 100 \cos(3\omega t) - 50 \sin(\omega t + 60^\circ)$.

8. a) Draw the no-load and on-load phasor diagrams of a 1-phase transformer with standard notations. [5]

b) A 100 kVA, 1-phase transformer has iron losses of 1.2 kW and full-load copper losses of 1.5 kW. Find (i) no load efficiency of the transformer and (ii) half-full-load efficiency at 0.8 power factor lagging. [5]

9. a) Explain with neat diagrams, the working principle of star-delta and auto-transformer starting method of a 3-phase induction motor. [10]

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