Code No: RT21011 **R13** SET - 1

II B. Tech I Semester Regular Examinations, Dec - 2015
BASIC ELECTRICAL AND ELECTRONICS ENGINEERING
(Com. to CE, ME, CHEM, AME, MM, PE, PCE)

Time: 3 hours Max. Marks: 70

Note: 1. Question Paper consists of two parts (**Part-A** and **Part-B)**
2. Answer **ALL** the question in **Part-A**
3. Answer any **THREE** Questions from **Part-B**

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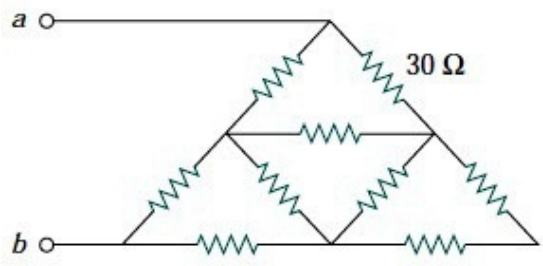
PART –A

1. a) List the differences between active and passive elements? (3M)
   b) What are the difference between d.c a motor and a generator? (4M)
   c) Define voltage regulation of a transformer and also explain the effect of power factor on the voltage regulation? (4M)
   d) Define slip? What is the relationship between slip and speed of the induction motor? (4M)
   e) Explain the properties of an OP – AMP. (3M)
   f) What is meant by 'thermal runaway' in a transistor? (4M)

PART –B

2. a) State and explain Kirchoffs' laws with an example? (8M)
   b) Find the equivalent resistance R_{ab} for the circuit shown below. All the resistor values are 30 Ω. (8M)



3. a) Explain in brief about classification of DC Generator? (8M)
   b) A 6-pole generator has a lap-wound armature with 40 slots with 20 conductors per slot. The flux per pole is 25 mWb. Calculate the speed at which the machine must be driven to generate an e.m.f. of 300 V. (8M)

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4. a) Derive EMF equation of a single phase transformer? (8M)
   b) A single phase 15 KVA transformer has iron losses of 200W and full-load copper losses 300W. Determine the efficiency of a transformer at i) full-load, UPF ii) $\frac{3}{4}$ full load, UPF iii) half – load, 0.8 PF. (8M)

5. a) Explain the concept of rotating magnetic field and hence explain the operation of three phase induction motor? (8M)
   b) The frequency of the supply to the stator of a 6-pole induction motor is 50 Hz and the rotor frequency is 2 Hz. Determine (i) the slip, and (ii) the rotor speed in rev/min. (8M)

6. a) Explain the following applications of OP-AMPs (8M)
   (i) Inverting (ii) non inverting (iii) integrator and (iv) differentiator
   b) Draw the circuit diagram of half wave rectifier and explain its operation. (8M)

7. a) Explain how the transistor acts as an amplifier. (8M)
   b) Explain the operation of PNP transistor and draw its characteristics. (8M)

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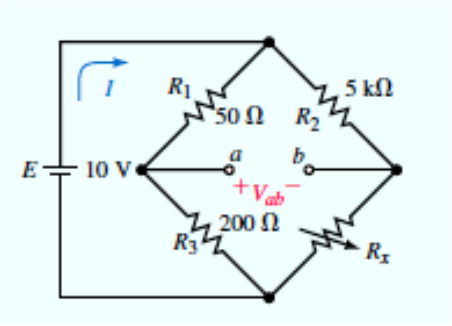
PART –A

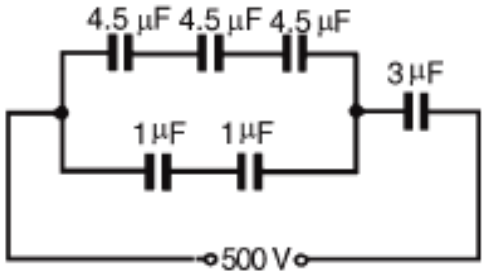
1. a) State and explain Kirchoff's Voltage Law. (3M)
   b) What is the function of holding coil in a 3-point starter? (4M)
   c) Why rating of the transformer is given in KVA? Explain? (4M)
   d) List the differences between squirrel-cage and wound-rotor types of induction motor? (4M)
   e) With reference to an OP-AMP explain the parameters input bias current, input offset current and input offset voltage (3M)
   f) What are the characteristics of feedback amplifier. (4M)

PART –B

2. a) For the circuit shown below calculate the current I and voltage V_{ab} when (8M)
   (i) R_x =0 Ω (ii) R_x =15 KΩ



   b) For the arrangement shown in Figure find (i) the equivalent circuit capacitance and (ii) the voltage across a 4.5 μF capacitor. (8M)



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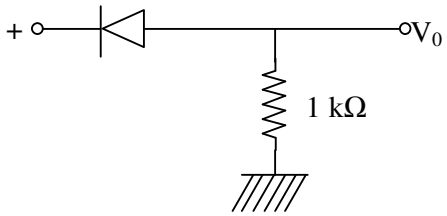
3. a) Explain various methods of speed control of DC Motor? (8M)
   b) The armature of a DC machine has a resistance of 0.5 Ω and is connected to a 200 V supply. Calculate the e.m.f. generated when it is running (i) as a motor taking 50 A and (ii) as a generator giving 70 A (8M)

4. a) Explain construction and working of a Single phase transformer? (8M)
   b) A 4500 V/225 V, 50 Hz single-phase transformer is to have an approximate e.m.f. per turn of 15 V and operate with a maximum flux of 1.4 T. Calculate (i) the number of primary and secondary turns and (ii) the cross-sectional area of the core. (8M)

5. a) Explain the working principle of three phase induction motor. (8M)
   b) A 3-phase, 60 Hz induction motor has 2 poles. If the slip is 2% at a certain load, determine (i) the synchronous speed, (ii) the speed of the rotor and (iii) the frequency of the induced e.m.f.'s in the rotor. (8M)

6. a) Draw the circuit diagram of full wave rectifier having two diodes and explain its operation. (8M)
   b) The half wave rectifier shown in the figure is fed with a sinusoidal voltage V=20 sin100t. (8M)
      i) Sketch the output waveform.
      ii) Determine the DC output voltage assuming ideal diode behaviour.



7. a) For a transistor connected in common-emitter configuration, sketch the output characteristics relating collector current and the collector emitter voltage, for various values of base current. Explain the shape of the characteristics. (8M)
   b) Write short notes about thermal runaway problems. (8M)

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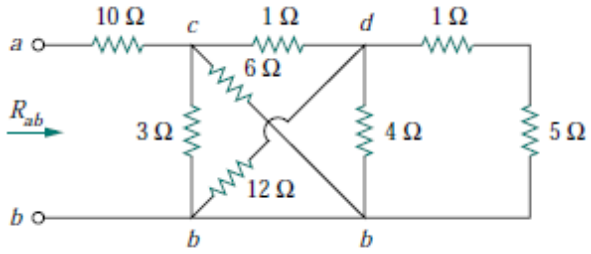
PART –A

1. a) Distinguish between ideal and practical voltage source? Give examples? (3M)
   b) List the applications of DC generators? (4M)
   c) Explain about different losses in a transformer? (4M)
   d) What are the limitations of Synchronous impedance method? (4M)
   e) Explain what is meant by minority and majority carriers in an n-type material and state whether the numbers of each of these carriers are affected by temperature. (4M)
   f) Define the term 'current gain' for a bipolar junction transistor operating in common emitter mode. (3M)

PART –B

2. a) Explain Star-delta transformation? (8M)
   b) Calculate the equivalent resistance R_{ab} for the circuit shown below? (8M)



3. a) Derive the torque equation of the DC motor? (8M)
   b) An 8-pole, wave-connected armature has 600 conductors and is driven at 625 rev/min. If the flux per pole is 20 mWb, determine the generated e.m.f. (8M)

4. a) Explain the working principle of single phase transformer? (8M)
   b) A 40 KVA,3300/240 –V,50 Hz,1- phase transformer has 660 turns on the primary. Determine (i) the number of turns on the secondary (ii) the maximum value of flux in the core (iii) the approximate value of primary and secondary full load currents. (8M)

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5. a) Draw and explain torque slip characteristics of 3 - Phase induction motor. (8M)
   b) 100KVA, 3KV, 50Hz, 3-phase star connected alternator has effective armature resistance of 0.2 Ω. The field current of 20Amps produces SC current of 120 Amps and an OC volts of 1060V (line value). Calculate the full load voltage regulation at 0.5 p.f. lag. (8M)

6. a) Draw the equivalent circuit of practical OP - Amp and state its characteristics (8M)
   b) Explain the op-amp integrator and differentiator circuits and derive the expressions for output voltage? (8M)

7. a) Draw the circuit and explain the characteristics of CE configuration (8M)
   b) Draw the frequency response of CE amplifier and explain. (8M)

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2. Answer **ALL** the question in **Part-A**
3. Answer any **THREE** Questions from **Part-B**

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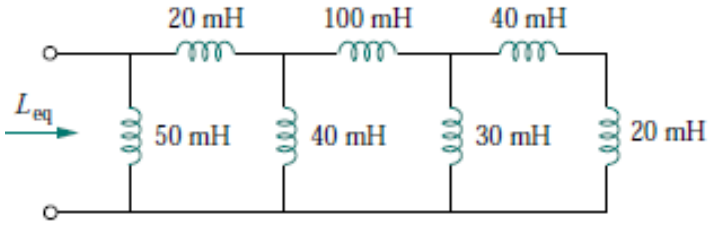
PART –A

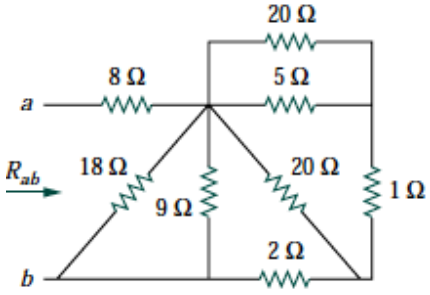
1. a) Distinguish between ideal and practical current source? Give examples? (3M)
   b) Explain the necessity of a starter in case of DC motor? (4M)
   c) Define regulation and efficiency of a transformer. (4M)
   d) Give the comparison between alternator and induction motor. (4M)
   e) Explain what you understand by the term intrinsic semiconductor and how an intrinsic semiconductor is turned into either a p-type or an n-type material. (4M)
   f) Draw the circuit diagram symbols for p-n-p and n-p-n transistors (3M)

PART –B

2. a) Calculate the equivalent inductance for the inductive ladder network shown below? (8M)



   b) Find R_{ab} for the circuit shown below? (8M)



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3. a) Explain the working of three point starter with the help of a neat sketch? (8M)
   b) Briefly explain the procedure to conduct Swinburne's test on a DC machine? (8M)

4. a) Derive the EMF equation of a single phase transformer? (8M)
   b) A 200 KVA rated transformer has a full-load copper loss of 1.5 kW and an iron loss of 1 kW. Determine the transformer efficiency at full load & half load for 0.85 power factor. (8M)

5. a) Explain the procedure to find the regulation of three phase alternator by using synchronous impedance method? (8M)
   b) Draw and explain slip-torque characteristics of an induction motor. (8M)

6. Explain briefly the action of a p-n junction diode: (a) on open-circuit, (b) when provided with a forward bias and (c) when provided with a reverse bias. Sketch the characteristic curves for both forward and reverse bias conditions. (16M)

7. a) Explain, with the aid of sketches, the operation of an n-p-n transistor and also explain why the collector current is very nearly equal to the emitter current. (8M)
   b) For a transistor connected in common emitter configuration, sketch the typical output characteristics relating collector current and the collector-emitter voltage, for various values of base current. Explain the shape of the characteristics. (8M)