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

II B. Tech I Semester Regular/Supplementary Examinations, Oct/Nov - 2016
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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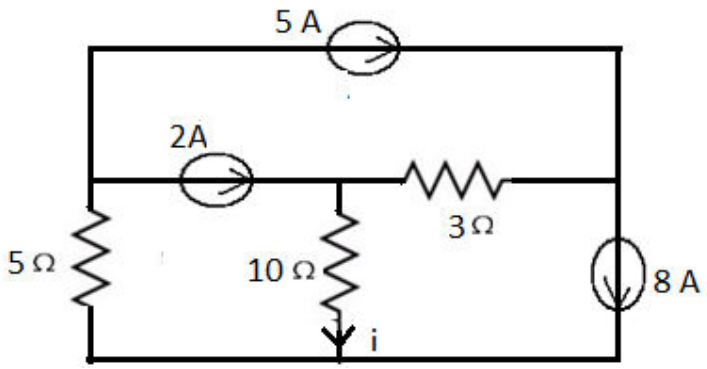
PART –A

1. a) Define network with an example (3M)
   b) What are the applications of the DC series motor? (4M)
   c) Define mutual flux? Explain its significance (4M)
   d) What is the principle of alternator? (4M)
   e) Draw the diagram of operational amplifier and indicate different parts (4M)
   f) What are the terminals of transistor? Explain (3M)

PART –B

2. a) State and explain the Kirchhoff's laws as applied to electrical circuits. (8M)
   b) Find the current 'i' in the circuit shown in the figure below (8M)



3. a) What is the importance of NVL and OLC in starter (8M)
   b) Determine developed torque and shaft torque of 220V, 4-pole DC series motor with 800 conductors wave connected supplying a load of 10 kW by taking 50A from the mains. The flux per pole is 20 mWb and its armature circuit resistance is 0.8 Ω (8M)
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4. a) What is the working principle of a single phase transformer? Explain with the help of neat sketch (8M)
   b) A single phase, ideal transformer of voltage rating 100 V/300 V, 50 Hz produces a flux density of 1.8 T when its LV side is energized from a 100 V, 50 Hz source. Find the flux density produced in the core, if the LV side is energized from a 25 V, 20 Hz supply (8M)

5. a) Explain the construction of an alternator with the help of a neat sketch (8M)
   b) Describe the Torque- Slip characteristics of 3-phase induction motor (8M)

6. a) Explain in detail about the Characteristics of operational amplifiers (8M)
   b) A resistive load of 50 Ω is supplied from a sinusoidal supply of 100V, 50 Hz through a single phase half wave diode rectifier. Given the voltage drop across the diode as 0.7 V when it conducts. Find the angles at which diode starts conducting and at which stops conducting? (8M)

7. a) Explain in detail about the applications of transistors (8M)
   b) Draw and explain the frequency response of CE amplifier (8M)

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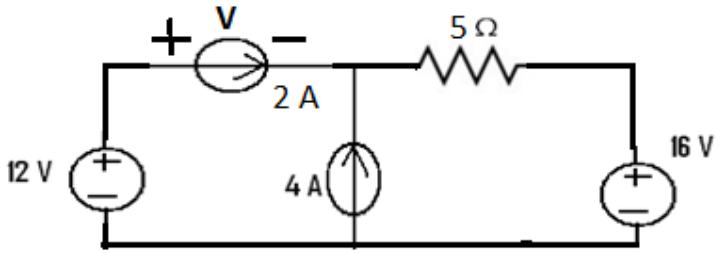
PART –A

1. a) Define Ohm's law with an example (4M)
   b) Define Faraday's law of electromagnetic magnetic induction (3M)
   c) What is meant by Hysterisis loss? How to limit it? (4M)
   d) What is the principle of three phase induction motors (4M)
   e) What is a rectifier? List its applications? (4M)
   f) Define feedback. What its purpose (3M)

PART –B

2. a) What is resistance and what are the factors affecting it. (6M)
   b) Find the voltage 'V' in the circuit shown in the figure below (10M)



3. a) With the help of circuit diagram, explain the Swinburn's Test (8M)
   b) Calculate the generated emf of a 4-pole, wave-wound armature having 38 slots with 18 conductors per slot when drive at 1000rpm. The flux per pole is 0.018wb. (8M)
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4. a) Describe the different losses in a single phase transformer. (8M)
   b) A 10 KVA, 1000/100V, single phase transformer has full load copper loss of 90W. The maximum possible voltage drop in the transformer secondary is 5V. Calculate the voltage regulation of the transformer for rated KVA output at 0.8 lagging power factor (8M)

5. Describe how you can determine the regulation of alternator using synchronous impedance method. (16M)

6. a) Explain in detail about the applications of operational amplifiers (8M)
   b) A resistive load of 60 Ω is supplied from a sinusoidal supply of 120V, 50 Hz through a single phase half wave diode rectifier. Given the voltage drop across the diode as 0.7 V when it conducts. Find the average value of load voltage and the peak inverse voltage of diode (8M)

7. a) Explain how transistor works as an amplifier (8M)
   b) Describe the concept of feedback amplifiers with necessary diagram (8M)

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2. Answer **ALL** the question in **Part-A**
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PART –A

1. a) Define Kirchoff's current law (KCL) with an example (4M)
   b) Draw the circuit diagram of a DC shunt motor and identify all parts (3M)
   c) What is meant by eddy current loss? How to limit it? (4M)
   d) Define synchronous speed and what it is significance (3M)
   e) Draw the inverting configuration of an Operational amplifier and explain (4M)
   f) What is the function of an amplifier? Explain (4M)

PART –B

2. a) Two resistors 4 Ω and 6 Ω are connected in parallel. If the current supplied by source is 30 A. Find the equivalent resistance and current through each branch. (8M)
   b) A 35 V d.c supply is connected across a resistance of 600 Ω in series with an unknown resistance R. A voltmeter having a resistance 1200 Ω is connected across 600 Ω and shows a reading of 5V. Calculate the value of resistance R. (8M)

3. a) What is the operating principle of a DC motor? Explain in detail (8M)
   b) A long shunt compound generator delivers a load current of 30A at 400V and has armature, series field and shunt field resistances of 0.04Ω, 0.02Ω and 180Ω respectively. Calculate the generated voltage and the armature current. Allow 1V per brush for contact drop (8M)
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4. a) What are the causes for power losses in single phase transformer? Explain (8M)
   b) A 4 KVA, 200/100 V single phase transformer has 1% equivalent resistance and 4% equivalent reactance. Determine the resistance and reactance referred to both LV and HV sides (8M)

5. a) What are the different ways to calculate the voltage regulation of alternators? Explain any one method. (8M)
   b) Draw the slip-torque characteristics of three phase induction motor? Explain different modes of operation (8M)

6. a) Draw the circuit diagram of an integrator with the help of operational amplifiers and explain the operation (8M)
   b) A bridge rectifier uses four identical diodes of forward resistance of 0.5Ω each. It is supplied from transformer with output of 12V (rms) and secondary winding resistance of 2Ω. Calculate the output DC voltage at a DC load current of 40 mA and 50 mA respectively (8M)

7. a) Draw the physical structure of a NPN transistor and explain the operation (8M)
   b) Explain the amplifier mode of operation of a transistor in detail (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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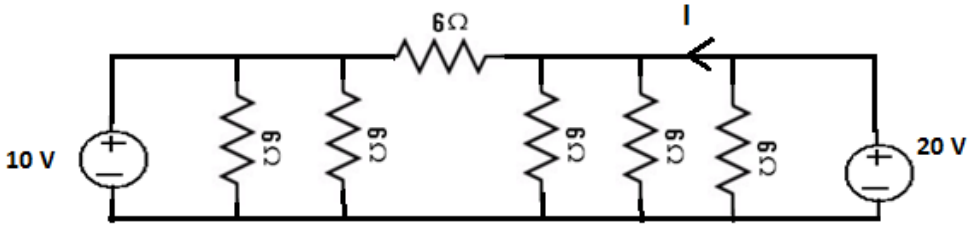
PART –A

1. a) Define Kirchoff's voltage law (KVL) with an example (4M)
   b) What is meant by back EMF? (3M)
   c) Explain how the specifications of transformer are rated? (4M)
   d) Define slip and write its expression (4M)
   e) Define cut in voltage. What is its significance? (4M)
   f) Describe a transistor. (3M)

PART –B

2. a) Three resistors of 8 Ω, 6 Ω, and 4 Ω are connected in a series across 100 V supply. Determine what equivalent resistance current and voltage across each element (8M)
   b) Determine current 'I' as shown in the figure below (8M)



3. a) Draw and explain a circuit diagram to perform a test for determining constant loss of DC machine (8M)
   b) A 4-pole, 220V shunt motor has 540 lap wound conductor. It takes 32A from the supply mains and develops output power of 6 kW. The field winding takes 1A. The armature resistance is 0.08Ω and the flux per pole is 25 mWb. Calculate the speed and torque developed. (8M)

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4. a) What is meant by voltage regulation? Derive the expression in a single phase transformer (8M)
   b) A 5 KVA, 300V/100V, 50 Hz single phase transformer has the full load copper loss of 90W and core loss 40 W. At what KVA and load power factor the transformer should be operated for maximum efficiency? (8M)

5. a) With the help of neat sketch, explain the principle of operation of alternators (8M)
   b) Derive the expression for the efficiency of three phase induction motor (8M)

6. a) Draw the circuit diagram of a differentiator with the help of operational amplifiers and explain the operation (8M)
   b) A half wave rectifier uses one diode of forward resistance of 0.8Ω. It is supplied from transformer with output of 20V (rms) and secondary winding resistance of 3Ω. Calculate output DC voltage at a DC load current of 40 mA and also calculate the peak inverse voltage (PIV) of diode (8M)

7. a) Draw the physical structure of a PNP transistor and explain the operation (8M)
   b) Draw the circuit diagram of a single stage CE amplifier and explain the operation (8M)

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II B. Tech I Semester Regular Examinations, Dec - 2015
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2. Answer **ALL** the question in **Part-A**
3. Answer any **THREE** Questions from **Part-B**

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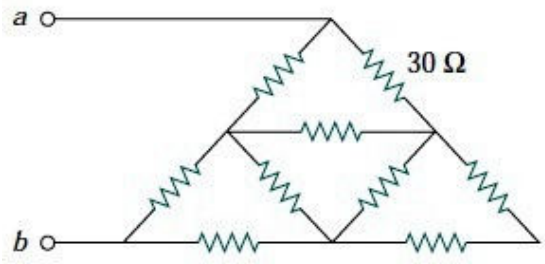
PART –A

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

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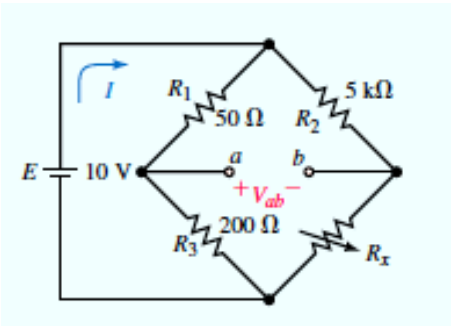
PART –A

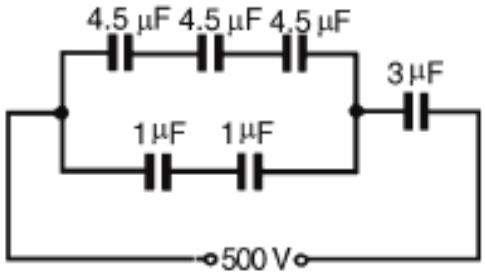
1. a) State and explain Kirchoff's Voltage Law. (3M)
   b) What is the function of holding coil in a 3-point starter? (4M)
   c) Why rating of the transformer is given in KVA? Explain? (4M)
   d) List the differences between squirrel-cage and wound-rotor types of induction motor? (4M)
   e) With reference 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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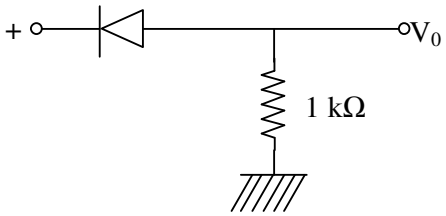
3. a) Explain various methods of speed control of DC Motor? (8M)
   b) The armature of a DC machine has a resistance of 0.5 Ω and is connected to a 200 V supply. Calculate the e.m.f. generated when it is running (i) as a motor taking 50 A and (ii) as a generator giving 70 A (8M)

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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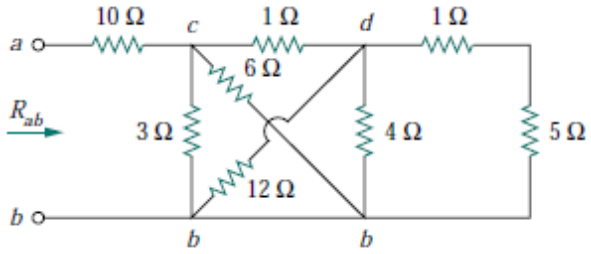
PART –A

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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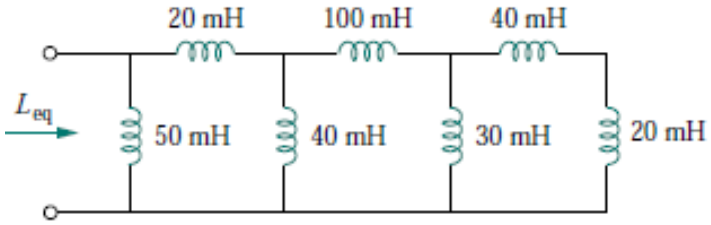
PART –A

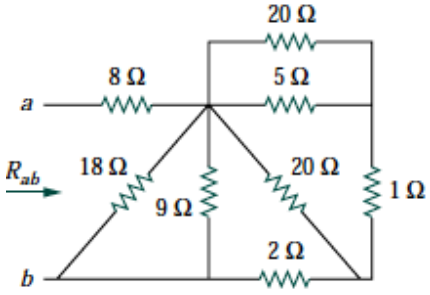
1. a) Distinguish between ideal and practical current source? Give examples? (3M)
   b) Explain the necessity of a starter in case of DC motor? (4M)
   c) Define regulation and efficiency of a transformer. (4M)
   d) Give the comparison between alternator and induction motor. (4M)
   e) Explain what 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)