Code No: R161209 **R16** SET - 1

I B. Tech II Semester Regular/Supplementary Examinations, April/May - 2018
BASIC ELECTRICAL AND ELECTRONICS ENGINEERING
(Com. to ME, AE, AME, Min.E, MET)

Time: 3 hours Max. Marks: 70

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

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PART –A

1. a) When three capacitors 1F each are connected in series, what is the equivalent capacitance. (2M)

   b) What is the necessity of three point starter in a dc motor? (2M)

   c) Define magnetizing and no-load components of a single phase transformer. (2M)

   d) Explain the relation between motor speed and supply frequency in a synchronous motor. (2M)

   e) Define slip of an Induction motor. (2M)

   f) Define the ideal characteristics of OP-AMP. (2M)

   g) What is the operating point of transistor amplifier? (2M)

PART –B

2. a) Calculate V_o and I_o in the circuit shown in figure 2(a). (7M)

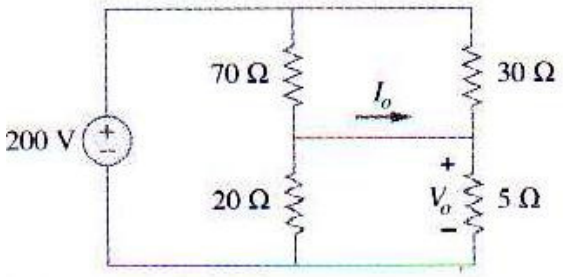

Figure 2(a)

   b) Find the equivalent resistance between terminals x-y in the resistance network shown in figure 2(b) by using Y- Δ transformation. (7M)

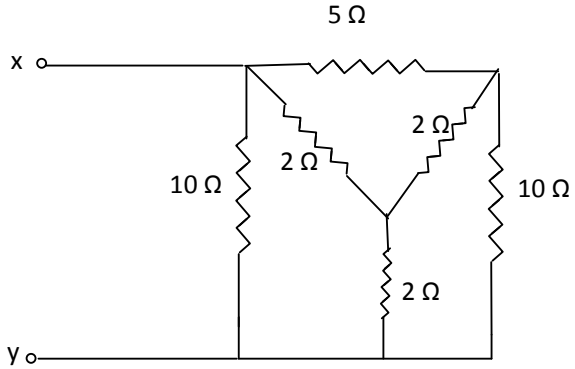

Figure 2(b)
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3. a) Explain the principle of operation of a dc generator and derive its emf equation. (9M)

   b) A 220-V, shunt motor, running at 700 rpm, has an armature resistance of 0.45 Ω and takes an armature current of 22 A. What resistance should be placed in series with the armature to reduce the speed to 450 rpm? (5M)

4. a) Describe how open-circuit and short circuit tests are performed on a single phase transformer. (8M)

   b) A single- phase, 230-V/110-V, transformer has iron loss of 100 W at 60 Hz. Determine the hysteresis and eddy-current losses at 50 Hz. (6M)

5. a) Draw and explain the torque-slip characteristic of an induction motor. (7M)

   b) With neat sketches, explain the classification of alternators. (7M)

6. a) Derive the efficiency and ripple factor of half wave rectifier. (7M)

   b) Explain how an op-amp can be used as an integrator. (7M)

7. a) Draw and explain the input-output characteristics of CE amplifier. (7M)

   b) Explain voltage series current shunt feedback amplifier with near sketch. (7M)

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PART –A

1. a) State and explain ohms law. (2M)
   b) What is meant by Back Emf? (2M)
   c) State the conditions for transformer to be ideal. (2M)
   d) Give the relation between torque and slip of an Induction motor. (2M)
   e) Why is an alternator known as synchronous generator? (2M)
   f) What is P-N junction diode? How its terminals are identified? (2M)
   g) What are the different configurations of transistor? (2M)

PART –B

2. a) Classify different types of network elements. (6M)
   b) Find the equivalent resistance across the terminals A & B of the network shown in figure 2(b) using Y-Δ transformation. (8M)

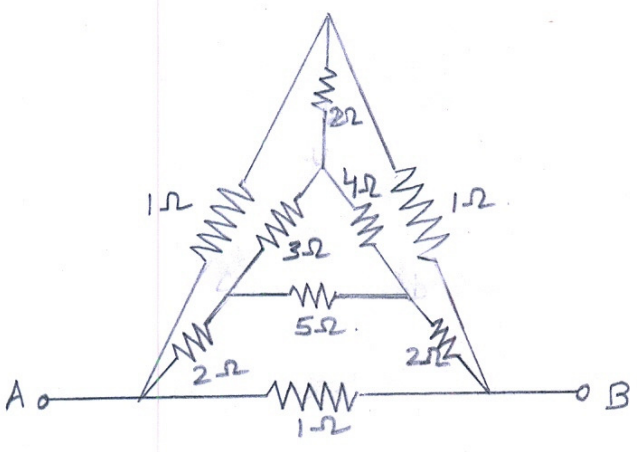

Figure 2(b)

3. a) Explain the Swinburne's test to find the efficiency of a dc generator and a dc motor. (7M)
   b) Explain armature voltage control method of speed control of dc motor. (7M)
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4. a) Define transformer efficiency and derive the condition under which it will have maximum efficiency. (8M)

   b) The primary of a 50Hz, step-down transformer has 480 turns and is fed from 6400V supply. Find (i) the peak value of the flux produced in the core, and (ii) the voltage across the secondary winding if it has 20 turns. (6M)

5. a) Explain the principle of operation of a three-phase induction motor. (8M)

   b) A three phase 6-pole induction motor runs at 60rpm on the full load. It is supplied from a 4-pole alternator running at 1500 rpm. Calculate (i) the full-load slip of the motor, (ii) speed of stator held with respect to rotor, (iii) frequency of IM rotor current at full load slip. (6M)

6. a) Draw the circuit diagram of a full wave bridge rectifier and explain its operation with the help of input and output wave forms. (8M)

   b) Compare the characteristics of ideal and practical OP-AMPs. (6M)

7. a) Describe the similarities and dissimilarities in the operation of PNP and NPN transistors. (6M)

   b) Explain the advantages and drawbacks of negative feedback amplifiers. (8M)

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PART –A

1. a) Differentiate between active and passive elements. (2M)
   b) Explain kirchoff's laws with examples. (2M)
   c) Why Swinburne's test is called as no load test? (2M)
   d) Define regulation of a transformer. (2M)
   e) What are the applications of Induction motor? (2M)
   f) What are the disadvantages of centre-tapped full wave rectifier? (2M)
   g) Define α and β of a transistor and give relation between them. (2M)

PART –B

2. a) Two batteries E_1 and E_2 having e.m.fs of 6V and 2V respectively and internal resistances of 2 and 3 ohms are connected in parallel across a 5 ohm resistor. Calculate i) the current through each battery (ii) terminal voltage and (iii) energy dissipated in 5 ohm resistor in 10 minutes. (8M)
   b) In the circuit shown in figure 2(b), find the current through 8 Ω branch. (6M)

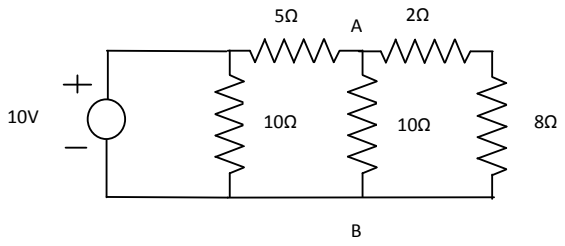

Figure 2(b)

3. a) Obtain the expression for the torque developed by a dc motor. (7M)
   b) A shunt – wound DC generator delivers 46 A at 440 V to a load. The resistance of the shunt field coil is 110 Ω and that of the armature winding is 0.02 Ω. Calculate the emf induced in the armature. (7M)

4. a) Explain the construction and working principle of a single-phase transformer. (8M)
   b) Derive the expression for voltage regulation of a single-phase transformer. (6M)

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5. a) Explain the constructional details of a synchronous machine. (7M)

   b) A 6-pole, 3-phase, 50Hz induction motor is running at full load with a slip of 4%. The rotor is star-connected and its resistance and reactance are 0.25Ω and 1.5Ω per phase. The e.m.f. between slip rings is 100V. Find the rotor current per phase and p.f., assuming the slip rings are short-circuited. (7M)

6. a) Explain the V-I Characteristics of a junction diode when it is forward and reverse biased. (8M)

   b) Explain how an op-amp can be configured as a differentiator. (6M)

7. a) Explain with the help of circuit, the working of a transistor as an amplifier in CE configuration. (7M)

   b) Explain the operation of NPN transistor with neat circuit diagram. (7M)

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PART –A

1. a) When numbers of resistors are connected in series, show that their effective value increases. (2M)

   b) Classify DC generators. (2M)

   c) Enumerate the various losses that occur in a dc machine. (2M)

   d) Differentiate core and shell type transformers. (2M)

   e) What do you mean by rotor frequency in an induction motor? (2M)

   f) Define Threshold voltage in a P-N junction diode. (2M)

   g) Draw the symbols of PNP and NPN transistors. (2M)

PART –B

2. a) Find the equivalent resistance between the terminals 1 and 2 of the network shown in figure 2(a). (7M)

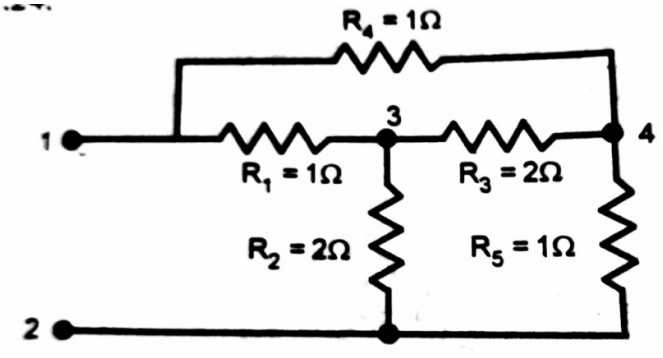

Figure 2(a)

   b) Use star-delta conversion of resistors to determine the current delivered by the battery in the network shown in figure 2(b). (7M)

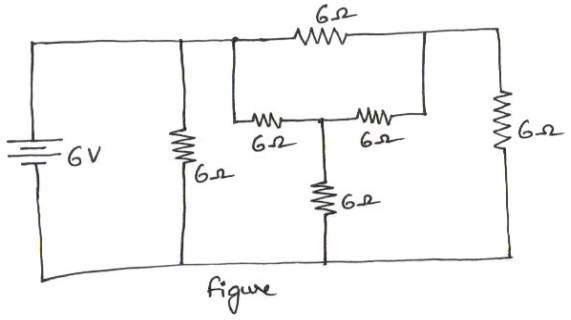

Figure 2(b)
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3. a) Draw the diagram of a 3 – point starter and explain the function of each component. (8M)

   b) The induced emf in a dc machine while running at 500 rpm is 180 V. Assuming constant magnetic flux per pole. Calculate the induced emf when the machine runs at 600 rpm. (6M)

4. a) Derive the emf equation of a transformer. (6M)

   b) A single-phase, 50-Hz transformer has 30 primary turns and 350 secondary turns. The net cross-sectional area of the core is 250 cm^2. If the primary winding is connected to a 230-V, 50-Hz, supply, calculate (a) the peak value of flux density in the core, (b) the voltage induced in the secondary winding, and (c) the primary current when the secondary current is 100 A. (neglect losses). (8M)

5. a) Explain the principle of operation of a synchronous motor. (6M)

   b) A three-phase, 6-pole, 50-Hz induction motor has a slip of 1% at no load and 3% at full load. Find (a) the synchronous speed (b) the no-load speed (c) the full-load speed (d) the frequency of rotor-currents at standstill and (e) the frequency of rotor-currents at full load. (8M)

6. a) Explain the operation of full-wave rectifier with neat sketch and draw its wave forms. (7M)

   b) Explain how an op-amp can be used as a non-inverting amplifier. (7M)

7. a) Explain the operation of PNP transistor with neat circuit diagram. (7M)

   b) Explain the operation of CE amplifier with its frequency response. (7M)

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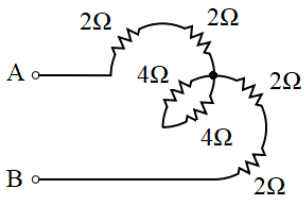
PART –A

1. a) What is the equivalent resistance between the terminals, AB in the following circuit? (2M)



b) What is the function of commutator in dc generator? (2M)

c) What is meant by primary and secondary windings of a transformer? (2M)

d) What are the functions of various winding in the alternator? (2M)

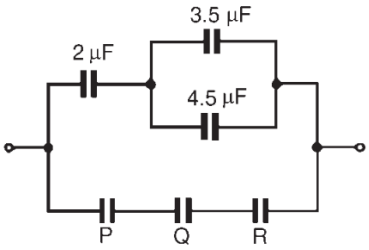
e) Sketch *v-i* characteristics of practical diode in forward biased condition. (2M)

f) Show the forward and reverse biasing in the formation of npn transistor. (2M)

g) What is the equivalent inductance of a circuit in which L_1 and L_2 connected in series together and the combination is connected in parallel with inductance L_3? (2M)

PART –B

2. a) In the following given circuit, capacitors P, Q and R are identical and the total equivalent capacitance of the circuit is 3 µF. Determine the values P, Q and R (7M)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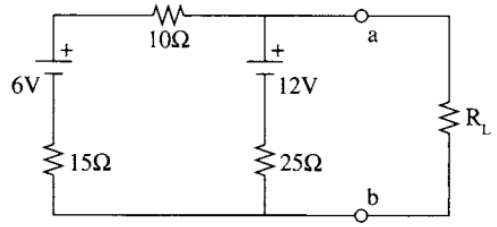
b) Determine the voltage across the terminals 'ab' in the following given circuit when $R_L = 0\ \Omega$ and $R_L = 10\ \Omega$? (7M)



3. a) Discuss with suitable diagrams different types of dc generators and their field of applications. (7M)

   b) A 240 V dc motor takes 5A when running on no load. The armature and field resistances are 0.5 and 175 Ω respectively. Determine its efficiency when it is assumed to be taking a full load current of 50A using Swinburne's test. (7M)

4. a) Explain the principle of working of transformer. Why the primary of transformer draws current from the mains when the secondary is open circuited? (7M)

   b) The maximum efficiency of a 10 kVA, 500/5000V single phase transformer is 98% which occurs at 80% of full load at 0.8 power factor lagging. If the equivalent leakage impedance of the transformer referred to primary is 4.55 Ω, find the voltage regulation at full primary load current of 30.1A. (7M)

5. a) Describe the different types of the construction of rotors used in alternators. (7M)

   b) Define slip of induction motor. Why induction motor cannot run at synchronous speed? (7M)

6. a) Describe the operation of full bridge rectifier. What is its output current when rms input voltage is 120V ac and $R_L = 150\ \Omega$? (7M)

   b) Draw the OP-AMP circuit which acts as differentiator and explain its operation. (7M)

7. a) Describe the pnp transistor in common base configuration. How the transistor is used as an amplifier? (7M)

   b) Describe the various frequency response characteristic equations of common emitter amplifier. (7M)

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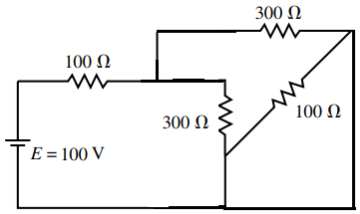
PART –A

1. a) Determine the current supplied by the source in the following circuit. (2M)



b) What is principle for varying speed above rated speed in dc motor? (2M)

c) What are the differences between shell type and core type transformers? (2M)

d) What is the relation between speed and frequency in the alternator? (2M)

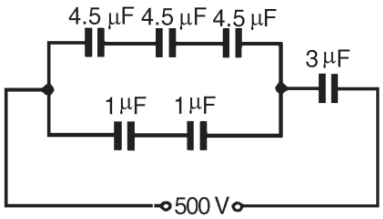
e) What are the characteristics of p-n junction diode in reverse biasing? (2M)

f) Show the forward and reverse biasing in the formation of pnp transistor. (2M)

g) What is the equivalent inductance of circuit in which L_1 and L_2 are connected in parallel together and the combination is connected in series with inductance L_3? (2M)

PART -B

2. a) For the arrangement shown in following figure, find (a) the equivalent circuit capacitance and (b) the voltage across a 4.5 μF capacitor. (7M)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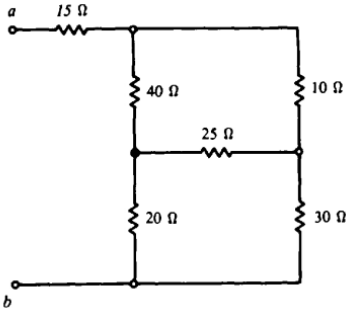
b) If 100V dc supply is given across the terminals 'ab' of the following circuit then what is voltage across the 15 Ω resistance? (7M)



3. a) Discuss the function of no-volt and over load release in the three point starter. In which circuit these devices are connected and why? (7M)

b) A 250V 50 kW, long shunt compound generator supplies a load at 220V, and the load consists of five heaters of 5 kW and two hundred lights of 100 W each. The armature and series field and shunt field resistances are 0.05 Ω, 0.04 Ω and 50 Ω respectively.Find the load current, armature current and emf generated. (7M)

4. a) Describe the tests on a single phase transformer that gives its ohmic losses and core losses. (8M)

b) A 100 kVA, 50Hz, 440/11000 V, single phase transformer has an efficiency of 96%, when supplying full load current at 0.8 power factor lagging and an efficiency of 98% when supplying half full load current at unity power factor. Find the core losses and copper losses corresponding to full load current. What is load current at which maximum efficiency occurs? (6M)

5. a) By means of a neat diagram, describe the main parts of a salient pole alternator. (7M)

b) Explain the operation of a synchronous motor. Why it will not run at speed other than synchronous speed? (7M)

6. a) Explain the operation of a half-wave rectifier with relevant waveforms. What is its output current when rms input voltage is 120V ac and R_L = 150 Ω? (7M)

b) Draw the OP-AMP circuit to obtain integration of triangular wave input signal and explain its operation. (7M)

7. a) What are the elements of amplifier and explain the amplification of a small signal into a large signal? (7M)

b) What are the advantages of feedback amplifier and explain various types of feedback amplifiers? (7M)

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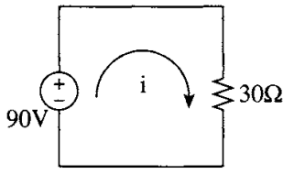
PART –A

1. a) How do you justify whether the given circuit is series circuit or parallel circuit? (2M)



b) What is the principle to vary speed below rated speed in a dc motor? (2M)

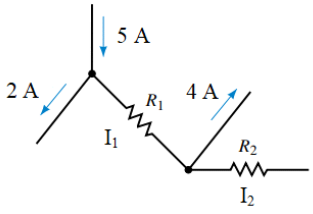
c) Why the open circuit test in a transformer is conducted on low voltage winding? (2M)

d) Why the synchronous motor speed is constant? (2M)

e) Why the p-n junction diode is not conducting in reverse biasing? (2M)

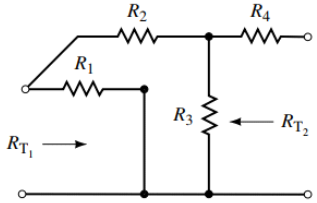
f) What are the majority and minority carriers in the regions of npn transistor? (2M)

g) Use Kirchhoff's current law to determine the magnitudes and directions of the currents indicated in the below figure. (2M)

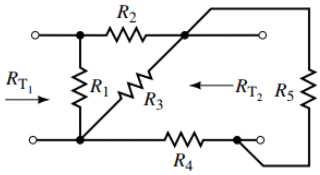


PART -B

2. a) What is the equivalent resistance when referred from the side R_{T1} and R_{T2} in the following given circuits? (7M)



(i)



(ii)
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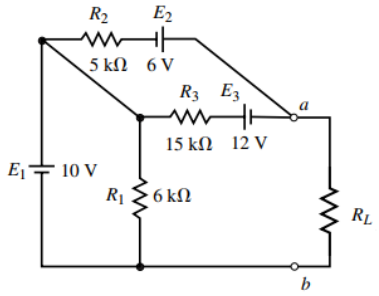
b) Determine the voltage across the terminals 'ab' in the following given circuit when R_L = 10 kΩ. (7M)



3. a) Derive the emf and torque equations of a dc motor. (7M)

b) A 4-pole, 250V dc long shunt compound generator supplies a load of 10kW at the rated voltage. The armature, series field and shunt field resistances are 0.1 Ω, 0.2 Ω and 220 Ω respectively. The armature is lap wound with 50 slots and each slot containing 6 conductors. If the flux per pole is 50 mWb, calculate the required speed of the generator. (7M)

4. a) Define the voltage regulation of a transformer. How it is determined? (7M)

b) A single phase transformer working at unity power factor has an efficiency of 95% at both half and full load of 5000W. Determine the efficiency at three fourth full load and maximum efficiency. (7M)

5. a) Explain the working of a synchronous motor and describe its constructional details. (7M)

b) Develop torque – slip characteristics of a 3-phase induction motor and explain. (7M)

6. a) What are the rectifier circuits for full wave rectification? Describe their advantages and disadvantages. (7M)

b) Explain the operation of OP-AMP as non-inverting amplifier. How it is used as voltage follower? (7M)

7. a) Describe ways of biasing a common-emitter amplifier and state which is the most stable. (7M)

b) Discuss the role of emitter, base and collector regions in the operation of BJT. (7M)

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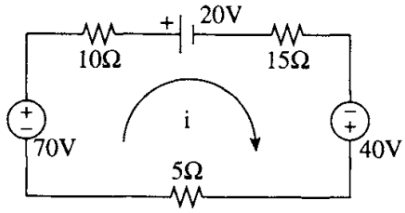
PART –A

1. a) What is the current flowing in the following given circuit? (2M)



b) What would happen if a dc motor is directly connected to the dc supply without any starter? (2M)

c) Why the short circuit test in a transformer is conducted on high voltage winding? (2M)

d) What is meant by slip in an induction motor? (2M)

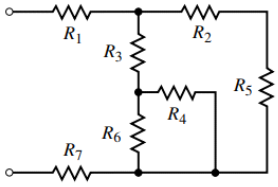
e) What is the difference between ideal and practical diode? (2M)

f) What are the majority and minority carriers in the regions of pnp transistor? (2M)

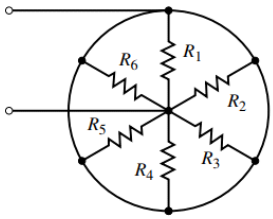
g) What is the difference between active and passive elements? (2M)

PART –B

2. a) For the following given circuits, indicate which resistances are connected in series and which resistances are connected in parallel. (7M)



(i)



(ii)

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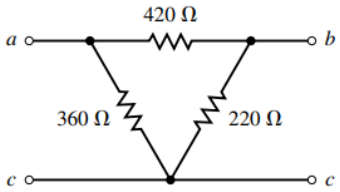
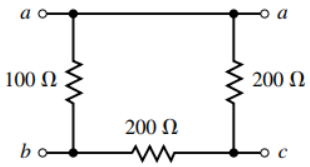
b) Convert each of the following Δ networks into its equivalent Y configuration. (7M)



(i)



(ii)

3. a) Describe different methods of excitations in dc motors with relevant diagrams. (7M)

b) A 10 h.p., 220V shunt motor takes an armature current of 6A from 220V supply at no-load and runs at 1200 rpm. The armature resistance is 0.4Ω. Calculate speed and torque when the motor takes armature current of 36A with same flux. (7M)

4. a) Develop the phasor diagram of a single-phase transformer under load condition at lagging power factor. (6M)

b) A 250/500 V, 3000 kVA, single phase transformer has the following results (8M)

Open – circuit test : 250V, 1A, 90W on l.v. side

Short – circuit test :30V, 12A, 200 W on h.v. side

Find the voltage regulation at half-full load 0.8 power factor lagging.

5. a) What are the advantages and disadvantages of salient and non-salient pole types of alternators? (7M)

b) Describe the different types of losses that occur in a three phase induction motor. (7M)

6. a) A half-wave rectifier diode, which has an internal resistance of 20 Ω while conducting, is to supply power to a 1 kΩ load from a 110 V ac (rms) source. Calculate (7M)
(i) The peak current.
(ii) The DC load current.
(iii) The rms load current.
(iv) The total input power.

b) Discuss about the ideal characteristics of OP-AMP. Draw the frequency response curves of OP-AMP. (7M)

7. a) Draw the output characteristics of an n-p-n transistor in CE Configuration and indicate the active, cut-off and saturation region. Explain them. (7M)

b) Discuss briefly about voltage series feedback and current series feedback amplifiers. (7M)

Code No: R161209 **R16** SET - 1

I B. Tech II Semester Supplementary Examinations, Nov/Dec - 2019
BASIC ELECTRICAL AND ELECTRONICS ENGINEERING
(Com. to ME, AE, AME, Min E, MET)

Time: 3 hours Max. Marks: 70

Note: 1. Question paper consists of two parts (**Part-A** and **Part-B**)
2. Answering the question in **Part-A** is Compulsory
3. Answer any **FOUR** Questions from **Part-B**

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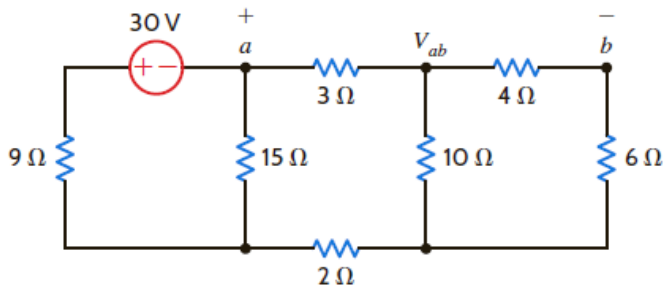
PART –A

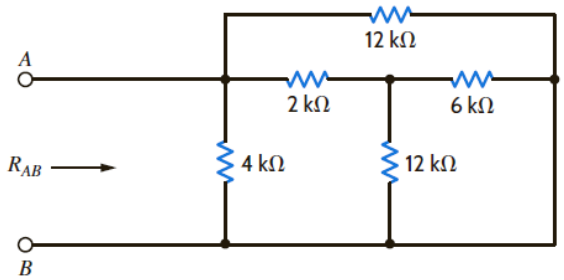
1. a) What is meant by unilateral and bilateral circuit? (2M)
   b) What is the main necessity of using starter in the motor circuit? (2M)
   c) What is the main purpose of conducting OC and SC tests in a transformer? (2M)
   d) Why the synchronous motor is called as constant speed motor? (2M)
   e) What are the losses in the induction motor? (2M)
   f) In the full bridge diode circuit, if one diode is open what is the dc output voltage? (2M)
   g) A transistor has a collector current of 2 mA. If the current gain is 120 what is the base current? (2M)

PART -B

2. a) Using the KCL and KVL equations, find the V_{ab} in the following circuit. (5M)



   b) Find R_{AB} in the following circuit using star-delta transformation. (5M)



   c) Two 6 μF capacitors are connected in series with one having a capacitance of 12 μF. Find the total equivalent circuit capacitance. What capacitance must be added in series to obtain a capacitance of 1.2 μF? (4M)

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3. a) Describe how the speed of the dc motor can be controlled above rated speed. (7M)

   b) A dc generator has an armature e.m.f of 100 V when the useful flux per pole is 20 mWb and the speed is 800 r.p.m. Calculate the generated e.m.f (i) with the same rated flux and a speed of 1000 r.p.m (ii) with a flux per pole of 25 mWb and a speed of 900 r.p.m. (7M)

4. a) Explain the various losses in a transformer. Describe how each loss varies with the load current, supply voltage and frequency. (7M)

   b) A single-phase transformer has 500 turns in the primary winding. When it is connected to a 1-ϕ, 120 V, 60 Hz power supply, the no-load current is 1.6A and the no-load power is 80 W. Neglect the winding resistance and leakage reactance of the winding. Calculate (7M)
   (i) The core loss current, I_c.
   (ii) The magnetizing current, I_m.
   (iii) The peak value of the core flux, $\Phi_{max.}$
   (iv) The magnetizing impedance Z_m,

5. a) Give the constructional details of synchronous machine and then describe the machine principle to operate as a generator and motor. (7M)

   b) Describe briefly torque-slip characteristics of induction motor. Based on these characteristics what are its applications? (7M)

6. a) Describe the operation of PN junction diode by including majority and minority carriers in your discussion. (7M)

   b) Explain the operation of OPAMP as a non-inverting and inverting amplifier. (7M)

7. a) Describe the NPN transistor operation in the common base configuration. What are its operating regions? (7M)

   b) An amplifier has mid-band voltage gain of 1000. If the cut-off frequencies are f_1=100 Hz and f_2=120 Hz, what does the frequency response look like? What is the voltage gain if the input frequency is 20 Hz and 300 kHz? (7M)