Code No: R19ES1206 **R19** SET - 1

I B. Tech II Semester Regular Examinations, December - 2020
BASIC ELECTRICAL AND ELECTRONICS ENGINEERING
(Com. to ME, Auto E, Min E)

Time: 3 hours Max. Marks: 75

Answer any five Questions one Question from Each Unit
All Questions Carry Equal Marks

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1. a) Derive an expression for the equivalent capacitance of a group of capacitors when they are connected (i) in parallel (ii) in series. (7M)

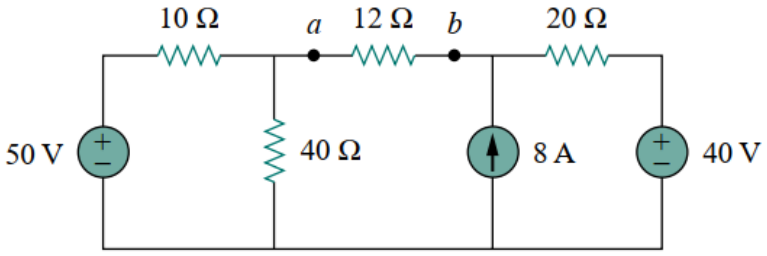
   b) A bridge network *ABCD* is arranged as follows: Resistances between terminals are (8M)
   A-B =10 Ω, *B-C = 20* Ω,
   C-D =15 Ω, *D-A = 05* Ω and *B-D = 40* Ω

   A 20 V battery of negligible internal resistance is connected between terminals *A* and *C*. Determine the current in each resistor.

Or

2. a) How do you use Kirchhoff's Current and Voltage Laws to determine branch currents and loop voltages? (7M)

   b) Determine the voltage across the terminals 'a' and 'b' in the following circuit. (8M)



3. a) Explain the principle of operation of dc generator and derive emf equation of a dc generator. (8M)

   b) Explain the speed-current, torque-current and speed-torque characteristics of dc shunt motor. (7M)

Or

4. a) Describe with relevant diagrams the different methods of excitation in d.c. generators. (7M)

   b) A 10 h.p., 230 V shunt motor takes an armature current of 6 A from 230 V line at no load and runs at 1200 r.p.m. The armature resistance is 0.25 Ω. Determine the speed and torque when the armature takes 36 A with the same rated flux and 50% reduced flux. (8M)

5. a) Explain briefly the action of a transformer and show that the voltage ratio of the primary and secondary windings is same as their turn's ratio. (8M)

   b) Describe with the help of neat sketches, constructional details of phase wound 3-phase alternator. (7M)

Or

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6. a) What do you mean by synchronous reactance? How do you determine synchronous impedance of the alternator? (8M)

   b) When a 100 kVA, single phase transformer was tested, the following results were obtained: on Open circuit the power consumed was 1300 W and on Short circuit at full-load current the power consumed was 1200 W. Calculate the efficiency on full-load and 1/3rd full load when working at 0.8 power factor lagging. (7M)

7. a) Explain the operation of a full wave bridge rectifier with relevant waveforms. (8M)

   b) Explain the operation of OP-AMP as integrator and differentiator with their circuit diagrams. (7M)

Or

8. a) Derive expressions for ripple factor and efficiency of rectification for a full wave rectifier. (8M)

   b) Draw the circuit configuration and explain the operation of OP-AMP as inverting amplifier. (7M)

9. a) Draw the input and output characteristics of n-p-n transistor in common base configuration and explain how they are obtained. (8M)

   b) Explain in detail about the frequency response of CE Amplifier. (7M)

Or

10. a) Explain the working of a single-stage common emitter practical amplifier. Describe the importance of dynamic characteristics. (8M)

    b) What are the two types of feedback? What are the advantages and disadvantages of feedback? (7M)

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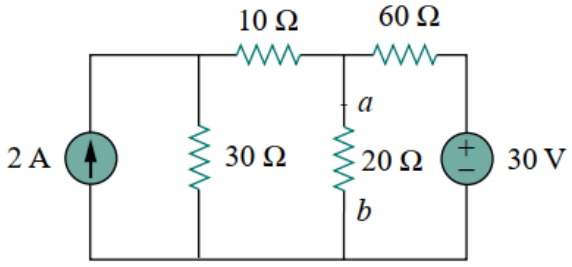
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1. a) What is meant by ideal and practical voltage sources give the differences between them. (7M)

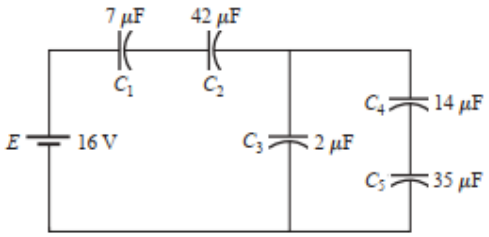
   b) A bridge circuit has nodes A, B, C and D. The circuit is arranged as follows: (8M)
   between A and B: a resistance of 10 Ω
   between B and C: a resistance of 80 Ω
   between C and D: a resistance of 750Ω
   between D and A: a resistance of 100 Ω
   between B and D: a resistance of 200 Ω
   between A and C: a voltage source of 20 V having an internal resistance of 4 Ω.
   The positive terminal of the voltage source is connected to the node A. Calculate the current through the 750 Ω resistor.

Or

2. a) Determine the voltage across the terminals 'a' and 'b' in the following circuit? (8M)



   b) For circuit shown in the following figure, determine the voltage across each capacitor and the charge on each capacitor. (7M)



3. a) Explain how a commutator works in a dc machine to generate dc voltage with the help of neat sketches. (7M)

   b) Why the starting current is very high in a d.c. motor? How does the starter reduce the starting current to a safe value? (8M)

Or

4. a) How do you conduct Swinburne's test, how this test is used to find the efficiency of d.c. generator? (8M)

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b) A 250 V shut motor takes a current of 41 A and runs at 800 r.p.m. on full-load. Armature and field resistances are 0.2 Ω and 250 Ω respectively. If a resistance of 2 Ω is added in series with the armature, determine (i) the speed at full load torque (ii) the speed at double full-load torque, assume flux remains constant throughout. (7M)

5. a) Derive an expression for the e.m.f. induced in a transformer winding. Show that the e.m.f. induced per turn in primary is equal to the e.m.f. per turn in secondary. (8M)

b) What is meant by distribution factor and how does it effect the generated emf of an alternator? (7M)

Or

6. a) Explain with neat sketches the principle of operation of a 3-phase synchronous motor. Also explain why it never runs at a speed other than synchronous speed? (8M)

b) The following test results were obtained for a 250/500V, single-phase transformer: – Short circuit test with low voltage winding short circuited; 20 V, 12 A, 100 W; Open circuit test on low voltage side; 250 V,1 A, 30 W. Determine the efficiency of the transformer when the output is 10 A, 500 V at 0·8 p.f. lagging. (7M)

7. a) With a neat diagram, explain the working of a PN junction diode in forward bias and reverse bias. (8M)

b) Draw the circuits of a full wave rectifier using 2-diodes and 4-diodes. Describe their advantages and disadvantages. (7M)

Or

8. a) Derive expressions for ripple factor and efficiency of rectification for a half wave rectifier. (8M)

b) Draw the circuit configuration and explain the operation of OP-AMP as non inverting amplifier. (7M)

9. a) Draw the input and output characteristics of n-p-n transistor in common collector configuration and explain how they are obtained. (8M)

b) Draw and explain the common-emitter transistor characteristics (7M)

Or

10. a) Show how a transistor can be used as a static switch, explain in detail. (8M)

b) The feedback factor of an amplifier is β=0.5. The open-loop gain A, which is frequency dependent can be expressed as (7M)

$$A(j\omega) = \frac{2 \times 10^5}{1 + jf/10}$$

Determine (i) the closed loop low frequency gain, (ii) the closed loop bandwidth and (iii) gain-band width product.

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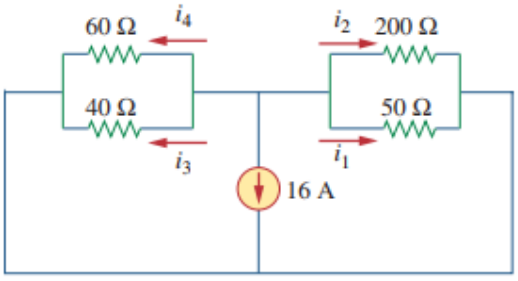
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1. a) What is meant by independent and dependent sources give the differences between them. (7M)

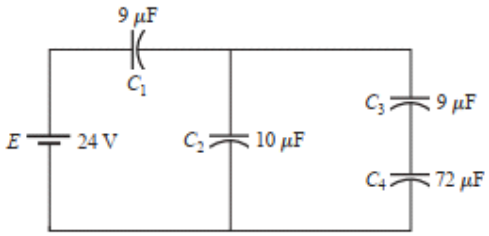
   b) Three resistors having resistances of 100 Ω, 200 Ω and 1 Ω are connected in delta. Determine the resistances of the equivalent star connected resistors. (8M)

Or

2. a) Find the currents i_1 to i_4 in the following circuit. (8M)



   b) For circuit shown in the following figure, determine the voltage across each capacitor and the charge on each capacitor. (7M)



3. a) Distinguish between self-excited and separately excited d.c. generators. How self-excited d.c. generators are classified. Give their circuit diagrams. (8M)

   b) A DC shunt motor operating from a constant voltage supply is running steadily on no-load. Explain how the motor will adjust itself on application of load. (7M)

Or

4. a) How do you conduct brake test on d.c shunt motor? How it is used to find out efficiency? (8M)

   b) A d.c. generator has a generated e.m.f. of 210V when running at 700 r.p.m. and the flux per pole is 120 mWb. Determine the generated e.m.f. (i) at 1050 r.p.m., assuming the flux remains constant, (ii) if the flux is reduced by one-sixth at constant speed, and (iii) at a speed of 1155 r.p.m. and a flux of 132 mWb. (7M)

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5. a) What information can be obtained from the open and short circuit tests of a transformer? How can you get these information? (8M)

   b) Explain with the help of suitable diagram, how rotating magnetic field is developed in a 3-phase induction motor when 3-phase ac supply is given to it? (7M)

Or

6. a) Describe with the help of neat sketches, the principle of operation of a 3-phase synchronous motor. Also describe why it never runs at a speed other than synchronous speed. (8M)

   b) The primary and secondary turns of a single-phase transformer are 400 and 1100, respectively. The net cross sectional area of the core is 60 cm^2. When its primary is connected 500V, 50 Hz supply, calculate the value of maximum flux density in the core and the e.m.f. induced in secondary winding. Draw the vector diagram representing the condition. (7M)

7. a) Compare half wave rectifier, full wave rectifier and bridge rectifier in different aspects. (8M)

   b) How do you use OP-AMP as integrator and differentiator, explain with relevant waveforms. (7M)

Or

8. a) Draw the circuit diagram and explain the working of half-wave rectifier and derive the expression for a ripple factor, efficiency, peak inverse voltage and form factor. (8M)

   b) How do you use OP-AMP as non-inverting amplifier, explain with their circuit configuration. (7M)

9. a) Draw the input and output characteristics of n-p-n transistor in common emitter configuration and explain how they are obtained. (8M)

   b) How do you find the modified gain ‘A’ of a feedback amplifier? (7M)

Or

10. a) What are the advantages and disadvantages of negative feedback in amplifiers? (8M)

    b) In a fixed bias circuit using n-p-n transistor, find the operating point if V_{CC} = 24V, R_B = 220kΩ, R_C = 4.7kΩ. (7M)

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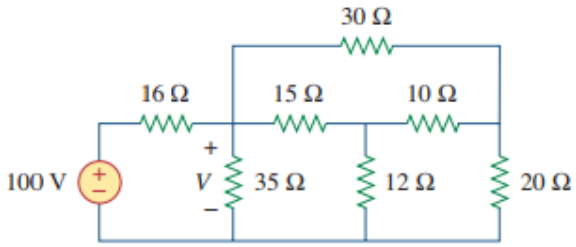
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1. a) What is meant by (i) active and passive elements (ii) unilateral and bilateral elements? (8M)

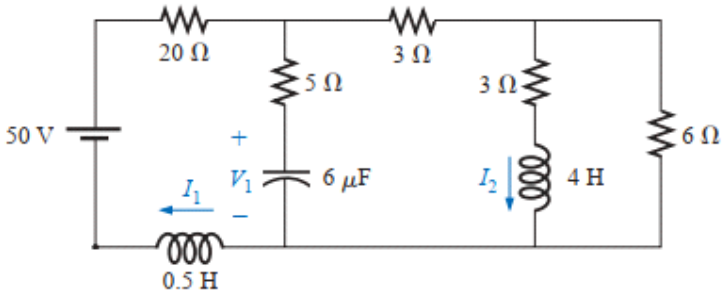
   b) Three 20 Ω resistors are connected in star and a voltage of 480 V is applied across two of them. If three other resistors (identical to each other) are connected in delta and the same supply is connected across one of them, determine (i) the value of the delta connected resistors and (ii) the current in each of the delta connected resistors. The supply current is the same as before. (7M)

Or

2. a) Find the voltage V in the circuit of following circuit. (8M)



   b) Find the voltage V_1 and the current through each inductor in the circuit of following figure. (7M)



3. a) Explain how commutator works in a d.c. machine to generate d.c. voltage. Describe briefly important parts in d.c. generator. (7M)

   b) What is back emf? Is the back emf greater or lesser than the applied voltage? By what amount do the two voltages differ. Write voltage equation of a motor. (8M)

Or

4. a) Explain the working principle of a 3 point starter of a d.c. shunt motor. Describe briefly its important parts. (8M)

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b) A separately excited generator develops a no load e.m.f. of 180V at an armature speed of 15 rev/s and a flux per pole of 0.20 Wb. Calculate the generated e.m.f. when: (i) the speed increases to 20 rev/s and the flux per pole remains unchanged (ii) the speed remains at 15 rev/s and the pole flux is decreased to 0.125 Wb (iii) the speed increases to 25 rev/s and the pole flux is decreased to 0.18 Wb. (7M)

5. a) Draw and explain the phasor diagram of single-phase transformer connected to a lagging p.f. load. (8M)

   b) Explain the difference between salient pole and cylindrical pole type of rotor used in alternators. Mention their applications. (7M)

Or

6. a) Explain with neat sketches, the principle of operation of a 3-phase induction motor. Explain clearly how torque develops. (8M)

   b) A 230/440 V, single-phase transformer has primary and secondary winding resistance of 0.25 Ω and 0.8Ω, respectively and corresponding reactance of 0.6Ω and 2.8 Ω. Find the approximate secondary terminal voltage when supplying (i) 10 A at 0.707 p.f. lagging (ii) 10A at 0.707 p.f. leading. (7M)

7. a) What do you understand by depletion region at p-n junction? What is the effect of forward and reverse biasing of p-n junction on the depletion region? Explain with necessary diagrams. (8M)

   b) A transistor is connected in common emitter configuration in which collector supply is 8V and the voltage drop across resistance R_c connected in the collector circuit is 0.5V. The value of $R_c = 800\Omega$. If $\alpha = 0.96$, determine: (7M)
   (i) Collector – emitter voltage (ii) Base Current

Or

8. a) Draw the circuit diagram and explain the working of full-wave rectifier and derive the expression for a ripple factor, efficiency, peak inverse voltage and form factor. (8M)

   b) How do you use OP-AMP as integrator, explain with relevant waveforms. Derive the expression for gain. (7M)

9. a) Draw the input and output characteristics of p-n-p transistor in common emitter configuration and explain how they are obtained. (8M)

   b) How do you take into account the β dependency of modified gain 'A' in feedback amplifier? (7M)

Or

10. a) What is the difference between open-loop gain and closed-loop gain of a feedback amplifier? (8M)

    b) Explain how a transistor can be used as an amplifier. (7M)

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