

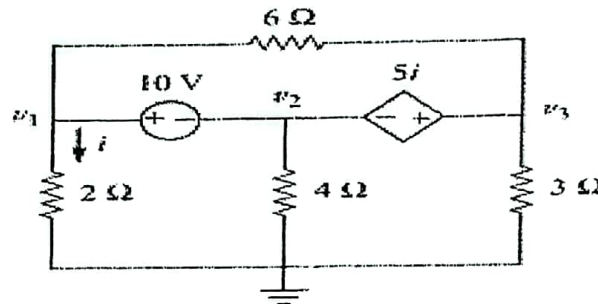
Exam.	Back (New Course)		
Level	BE	Full Marks	60
Programme	BEI, BCT	Pass Marks	24
Year / Part	I / II	Time	3 hrs.

Subject: - Electrical Circuit and Machines (ENEE 154)

- ✓ Candidates are required to give their answers in their own words as far as practicable.
- ✓ Attempt All questions.
- ✓ The figures in the margin indicate Full Marks.
- ✓ Assume suitable data if necessary.

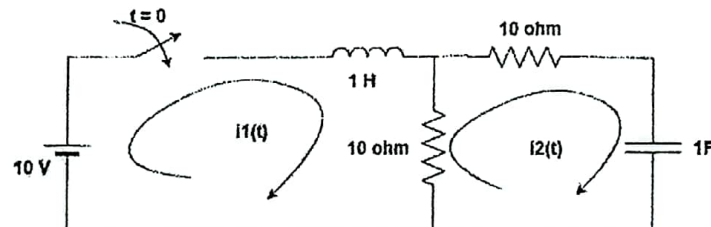
1. Find the current in 10V sources using nodal analysis.

[6]



2. Obtain the value of i_1 , i_2 , di_1/dt , di_2/dt at $t=0^+$, if the switch is closed at $t=0$ in the circuit shown.

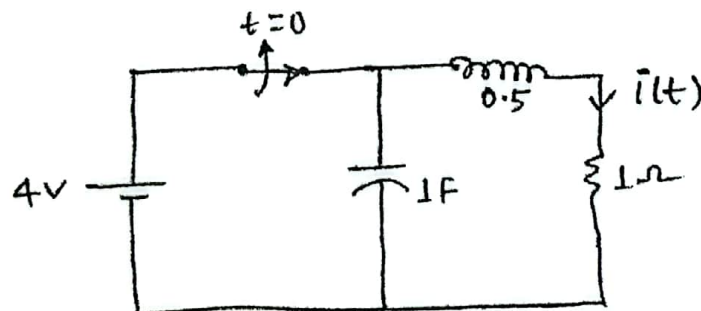
[5]



3. Derive the expression of current in series RC circuit excited by exponential voltage source by using classical method.
4. In the given circuit, switch is opened at $t=0$. Find the current and voltage across inductor using Laplace transform method.

[6]

[6]

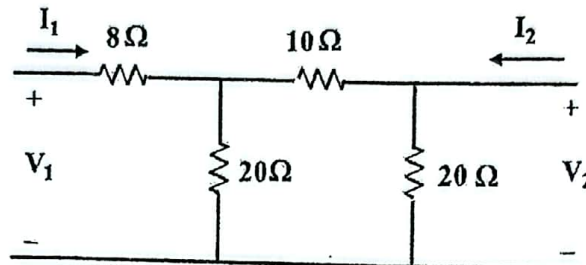


5. What is network function? Plot Asymptotic Bode graph of given transfer function.

[7]

$$H(s) = \frac{10(s^2 + 8s + 15)}{s^2(s+3)(0.05s+1)}$$

6. Find Z parameter for given two port network and state whether network is symmetrical or reciprocal. [6]



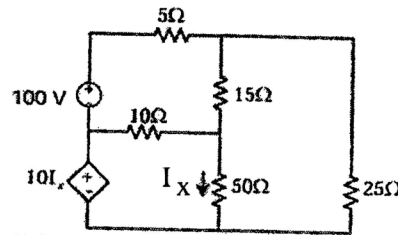
7. List out features of ideal transformer. Show that main magnetic flux in the transformer core is independent of load current. [5]
8. A shunt generator supplies 96 A at a terminal voltage of 200 V. The armature and shunt field resistance are 0.1 ohm and 50 ohm. The iron and frictional losses are 2500 W. Find a) emf generated, b) commercial efficiency. [5]
9. A three-phase induction motor is wound for 4 poles and supplied from 50 Hz supply system. Calculate; (a) the speed of motor when the slip is 5% (b) the rotor emf frequency when the motor runs at 600 rpm. [5]
10. Briefly explain (Any Three) [3×3]
- Series and parallel magnetic circuit
 - Universal motor
 - DC motor starter
 - Voltage regulation of transformer

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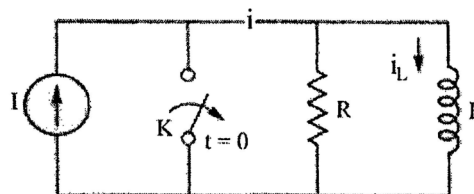
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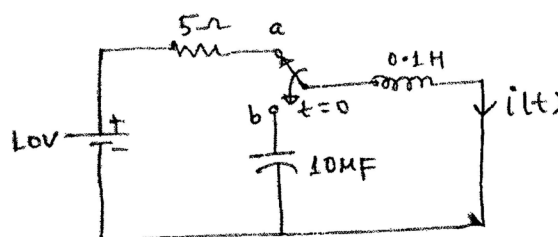
1. Find the current I_x and power delivered by the dependent voltage source in the circuit shown below using Mesh Analysis. [6]



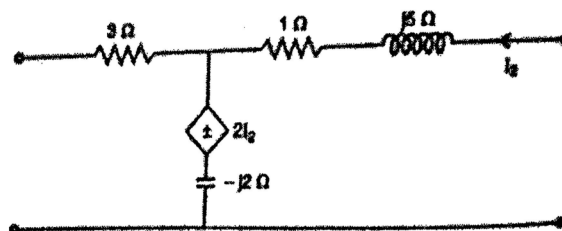
2. Explain the behavior of inductor when subjected to switching. In the network, the switch is opened at $t = 0$. Calculate v , dv/dt and d^2v/dt^2 at $t = 0+$ if $I = 2A$, $R = 200\Omega$ and $L = 1H$. Given that v is the voltage across inductor. [1+4]



3. Derive the differential equation of series RLC circuit when excited by step voltage and discuss the different cases of circuit responses. [6]
4. In the circuit shown switch is changed from position a to position b at $t = 0$. Determine the current $i(t)$ using Laplace transform method. [6]



5. Define two port network. For the given network, find Z parameters. [5]



6. Define poles and zeros of network function. Construct the asymptotic magnitude bode plot and phase plot for given transfer function. [1+7]

$$T(s) = \frac{100(s+5)}{s^2(s^2+21s+20)}$$

7. State the role of commutator and carbon brushes in DC machine. Explain the characteristics of DC generators. [5]
8. A circular ring of magnetic material has a mean length of 0.5 m, cross sectional area of 100 cm^2 , an air gap of 4 mm. Calculate the MMF required to produce flux of 2 mwb in the air gap, if ring is wound with a coil of 200 turns. Take relative permeability of 800. [5]
9. A 150 kVA single phase transformer has an iron loss of 700 W and a full load copper loss of 1800 W. Calculate the copper losses, iron losses, output power and efficiency of transformer at 0.8 power factor lagging when secondary is 25% overloaded. [5]
10. Justify and explain (Any Three) [3×3]
- a) Speed of three phase induction motor is always less than synchronous speed
 - b) Iron losses of transformer is independent of load
 - c) DC motor draws high starting current when switched on directly
 - d) Single phase induction motor has two stator winding

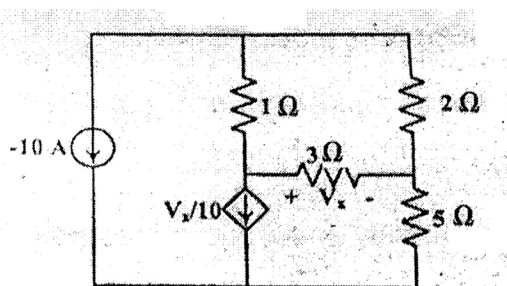
TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division
2082 Baishakh

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Programme	BEI, BCT	Pass Marks	24
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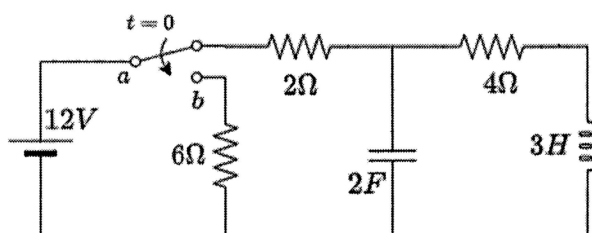
Subject: - Electrical Circuits and Machines (EE 154)

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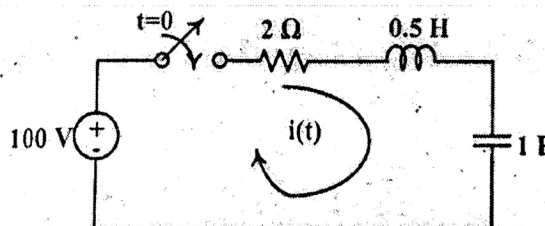
1. In the given circuit, determine V_x and power consumed by it using mesh analysis and solve by matrix method. [6]



2. In the network shown below, the switch has been in position a for long time. At $t = 0$, it is suddenly thrown off to position b. Find current through each element, $\frac{di_L}{dt}$ of coil and $\frac{dv_C}{dt}$ of capacitor at $t = 0^+$. [5]



3. A DC source of 100 V is suddenly applied at time $t = 0$ to a series RLC circuit comprising $R = 2\Omega$, $L = 0.5\text{ H}$ and $C = 1\text{ F}$. Obtain the expression for current in the circuit by using classical method. [6]



4. An exponential voltage $V(t) = 20e^{-4t}$ is suddenly applied at time $t = 0$ to series RLC circuit comprising $R = 2\Omega$, $L = 0.5\text{ H}$ and $C = 1\text{ F}$. Obtain the expression for the current $i(t)$ in the circuit using Laplace method. [6]

5. Sketch the asymptotic bode plot for the transfer function given by [8]

$$\frac{100s(s+5)}{(s+1)(s^2+10s+100)}$$

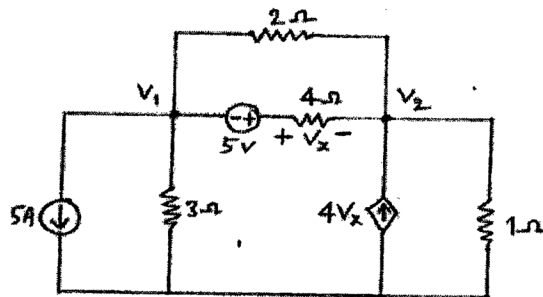
6. Find the expression of hybrid parameters in terms of Z parameters. Derive the equivalent T parameters of two cascade connected two port networks. [3+3]
7. The following test results were obtained on 20 kVA, 2200/220 V, 50 Hz, single phase transformer. [5]
O.C test: 220 V, 1.1 A, 125W (On LV side)
S.C test: 52.7 V, 8.4 A, 287W (On HV side)
Calculate the equivalent circuit parameters referred to secondary side.
8. Explain the production torque in DC motor with necessary mathematical explanation and derivation. What are the role of back emf in DC motor? [4+2]
9. How does three phase induction motor start? Why speed of this motor never reaches synchronous speed? [6]
10. Write notes on: (Any Two) [2×3]
a) Magnetization of magnetic material
b) Auto transformer and its application
c) Stepper motor

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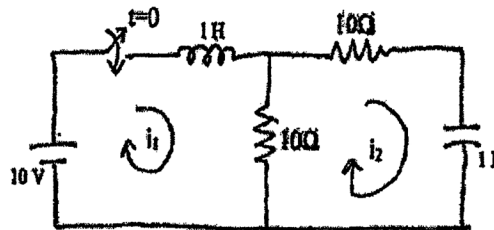
Subject: - Electrical Circuits and Machines (EE 154)

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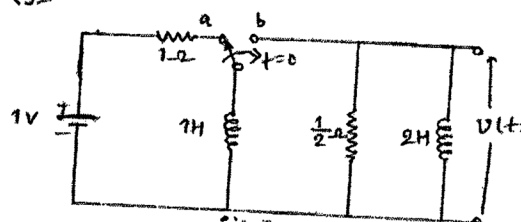
1. Using Nodal analysis and matrix solution method, find V_x and the current in 2 ohm resistance. [6]



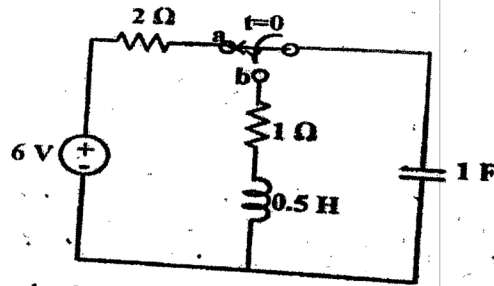
2. Obtain the value of i_1 , i_2 , di_1/dt , di_2/dt at $t = 0^+$, if the switch is closed at $t = 0$ in the circuit shown below. [5]



3. The circuit shown below is in steady state with switch is at position 'a'. The switch is moved to position 'b' at $t = 0$. Find the expression for $V(t)$ and current through 2H inductor $i_L(t)$ for $t > 0$ using classical method. [6]



4. The switch in the figure below has been in position 'a' for a long time. Then, it is moved to 'b' at $t = 0$. Obtain the expression for voltage across capacitor for $t > 0$ using Laplace transform method. [6]



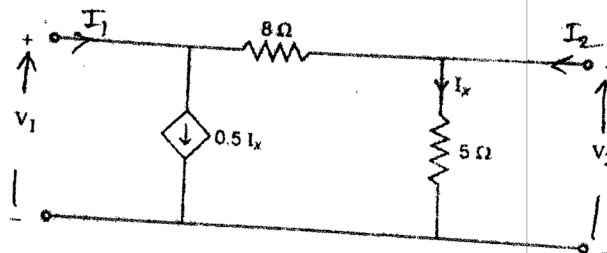
5. Plot asymptotic Bode graph of given transfer function.

$$G(s) = \frac{500(s+2)}{s(s^2+15s+121)}$$

[7]

6. Find the expression of Z parameters in terms of ABCD parameters. For given two port networks, find ABCD parameters.

[2+4]



7. Explain operation of transformer at loaded condition and prove that main flux in the core of transformer at any loading condition is constant. [6]
8. A 240 V dc shunt motor has armature winding resistance of 0.4Ω and field winding resistance of 120Ω . It draws a current of 30A at half load and the corresponding speed is 1400 rpm. If a resistance of 1.2Ω is connected in series with the armature winding and load torque is decreased by 20%. Calculate the new speed. [6]
9. Explain the Torque-speed characteristics of three phase induction motor with the help of proper mathematics and graph. [6]
10. Write short notes on (Any Two) [6]
- Role of commutator and carbon brush in dc machine
 - Hysteresis and eddy current power losses
 - Stepper motor

[2×3]
