TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division
2078 Chaitra

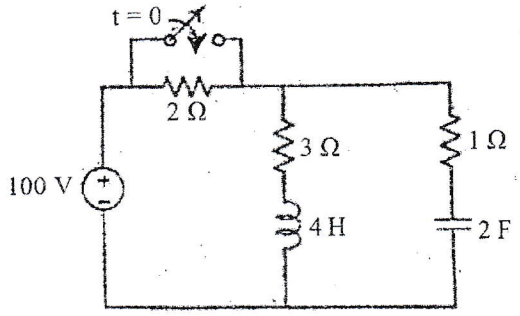
Exam.	Regular		
Level	BE	Full Marks	80
Programme	BEI	Pass Marks	32
Year / Part	I / II	Time	3 hrs.

Subject: - Electric Circuits and Machine *(EE 460)*

- ✓ 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.*

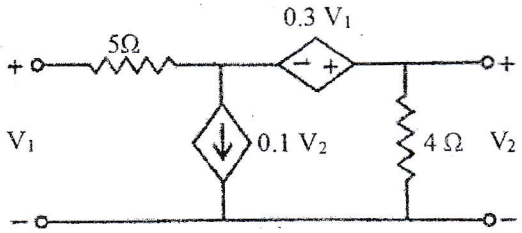
1. What do you mean by resonance in electric circuit? Derive the condition for series resonance. Also determine the expression of bandwidth. [2+2+4]

2. For the circuit shown below, find currents and voltages across each elements at t = 0+. Also find the value of charge at t = 0+. [8]



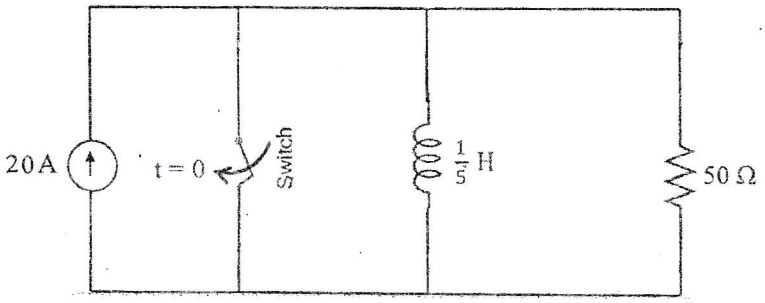
3. An exponential source $V(t) = 20e^{-3t}$ is suddenly applied at time t = 0 to a series RLC circuit comprising R = 4 ohms, L = 1 H and C = 1/3 F. Obtain the expression for the current i(t) in the circuit using Laplace Transform method. [8]

4. For the two port network shown below, find h-parameter and T' parameter. Also check for reciprocity of network. [8]



5. a) Derive the equivalent Y-parameters of two number of two port network when connected in parallel. [4]

   b) Find the expression of inductor current for t > 0 using classical method. [4]



6. An iron ring has mean length of 2m and cross-sectional area of $0.01m^2$. It has a radial air gap of 4 mm. The ring is wound with 250 turns. What dc current would be needed in coil to produce a flux density of 0.5 Tesla in the core? ($\mu_r = 4000$) [8]

7. Following results were obtained from test on a transformer of rating 8 kVA, 400/120V, 50 Hz.

   Open circuit Test (LV side): 120 V, 4A, 75 W
   Short circuit Test (HV side): 9.5 V, 20A, 110 W
   Calculate equivalent circuit parameters referred to LV and HV side and draw equivalent circuit of same. [8]

8. Explain how rotating magnetic field is produced in central space of three phase induction motor. Show that magnitude of rotating magnetic field is 1.5 times maximum flux density. [8]

9. A shunt generator delivers 50KW at 250V and 400 rpm. The armature resistance is 0.02Ω and field resistance is 50Ω. Calculate the induced emf by armature and electrical efficiency. [8]

10. Derive the expression of torque developed in armature of Dc motor. How the direction of shunt motors can be reversed? [4+4]

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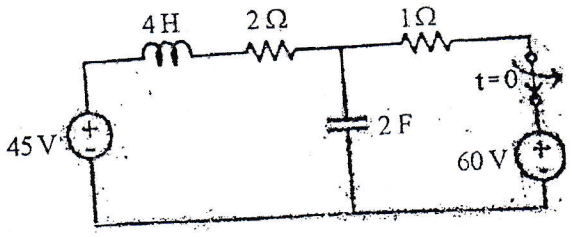
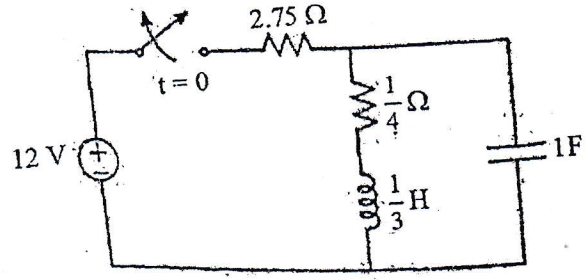
- ✓ *Attempt <u>All</u> questions.*
- ✓ *<u>All</u> questions carry equal marks.*
- ✓ *Assume suitable data if necessary.*

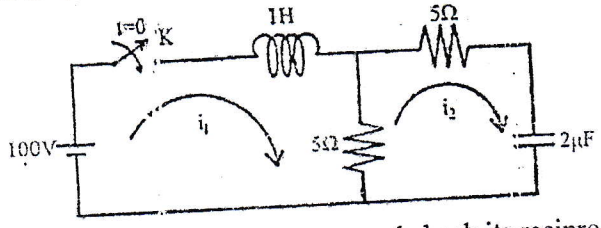
1. Explain the phenomena of resonance in parallel circuit and also derive the expression for resonance frequency and the impedance at resonance.
2. Find currents and voltages across each elements at t = 0+. Also find dV_c/dt and dI_1/dt for t = 0+.



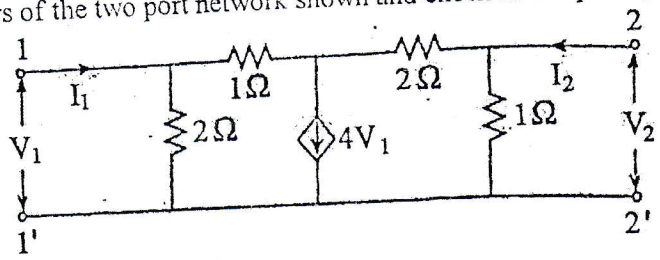
3. Find the expression of current and voltage across inductor for t > 0 using direct solution method.



4. In the network shown, the switch is closed at t = 0, with the network previously unenergised. For the element value given on diagram, find the expression for mesh currents $i_1(t)$ and $i_2(t)$, by Laplace Transformation method.



5. Find Z parameters of the two port network shown and check its reciprocity.



6. A wrought iron bar 40cm long and 3cm in diameter is bent into a circular shape as in following figure. It is then wound with 800 turns of wire. Calculate the current required to produce a flux of 0.35m Wb in the magnetic circuit in the following cases.
   a) No air gap
   b) With an air gap of 1mm; assume the following data for the magnetization iron

H in AT/m	2500	3000	3500	4000
B in T	1.55	1.59	1.6	1.615

7. A 10 KVA, 200/400 V, 50 Hz single phase transformer gave the following test results:

OC test (hv winding open)	: 220V,	1.3A	120W
SC test (lv winding short-circuited)	: 22V,	30A	200W

   Find parameters of equivalent circuit as referred to lv winding.

8. Derive the emf equation and torque equation of dc machine, defining corresponding terms involved.
9. Describe the torque speed characteristic of three phase induction motor showing starting torque, maximum torque and operating region. Also show the effect of rotor resistance in the T-S characteristics with a conclusion.
10. What are initial conditions? Explain the procedure to evaluate the initial condition.

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