Roll No.									

National Institute of Technology Goa

Programme Name: B.Tech., I Sem

END Semester Examinations, April 2021

Course Name: Basic Electrical Science | Course Code: EE151

Date: 07th April 2021 | Time: 9:30 AM – 12:30 PM

Duration: 3 Hours | Max. Marks: 100 Marks

ANSWER ALL THE QUESTIONS TO THE POINT

1. Find below the current waveform in Fig. 1.

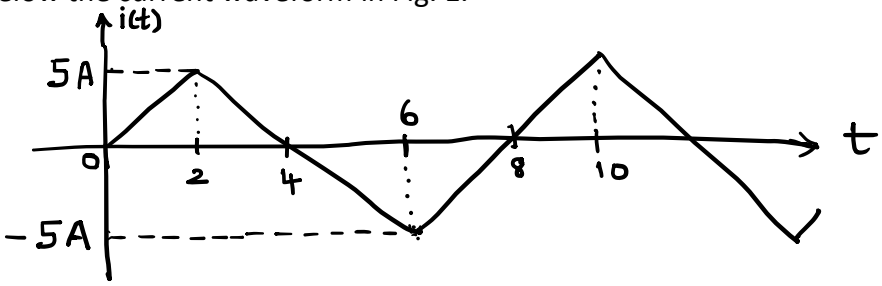


Fig. 1.

   a. Write the equation of voltage that produces this current through an inductor of 2 H [3 M]
   b. Represent graphically the Voltage expression obtained in 1(a) [2 M]
   c. Find the equation of Charge driving this current [3 M]
   d. Represent graphically the Charge expression obtained in 1(c) [2 M]

2. For the coupled network shown in the Fig. 2, write the three loop equations using Kirchhoff's Voltage law for the ***given current directions***. [3+2+3=8 M]

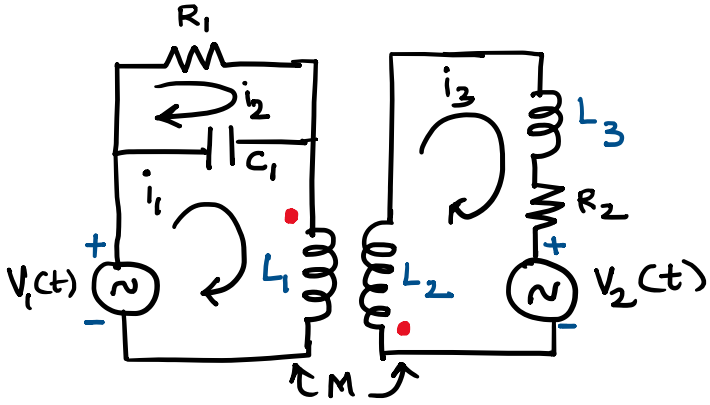


Fig. 2.

3. For the magnetically coupled network given in Fig.3. formulate the loop equations for the ***given current directions***. [3+3 = 6 M]

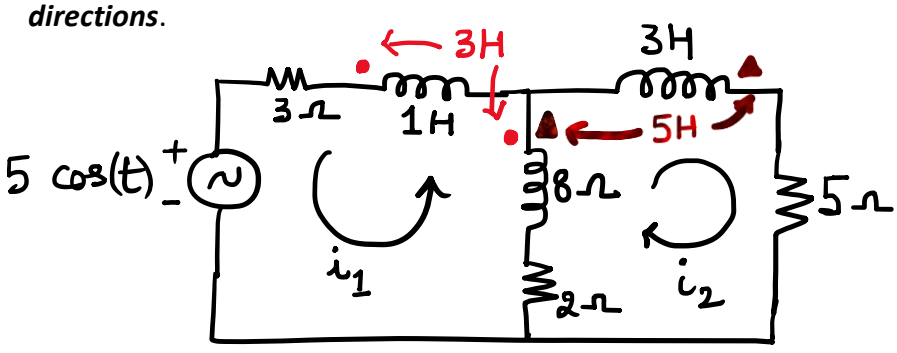


Fig. 3.

4. In the network given in Fig. 4., all the sources are time invariant. Determine the value of i_2. [12 M]

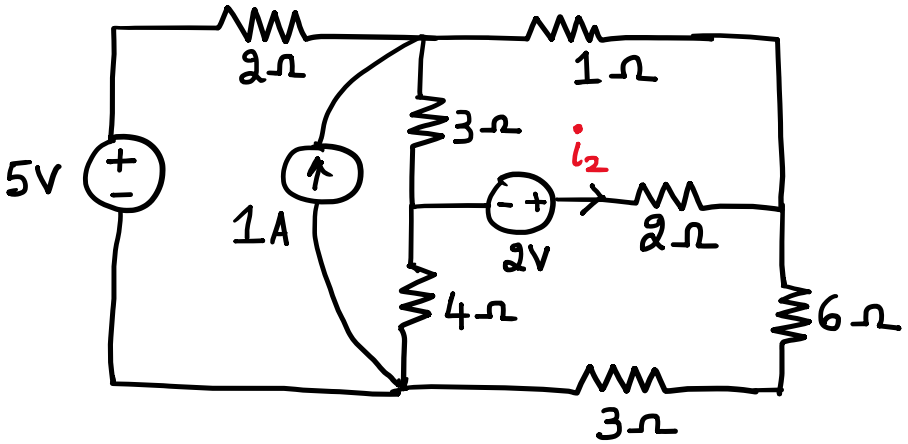
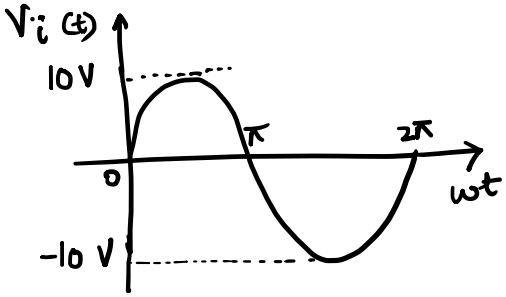


Fig. 4.

5. For the expression: $V(t) = 12\cos(\omega t - \pi/6)$ Volts
   a. Represent graphically V(t) wrt ωt (rad) [3 M]
   b. Represent graphically V(t) wrt t (sec) [2 M]
   c. Represent V(t) in Polar form [1 M]
   d. If V(t) is applied across an ideal Capacitor of C = 3 mF, compute i(t) through the capacitor. [2 M]
   e. Do the Phasor representation of V(t) and i(t) [2 M]

6. Consider the circuits given in Fig. 5 and Fig. 6, write the output Voltages $V_o(t)$. Consider the forward bias drop across the diode 'D' to be 1.1 V for each of the cases. [5 + 5 = 10 M]



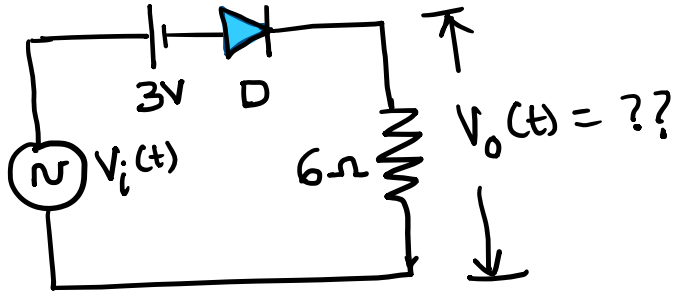
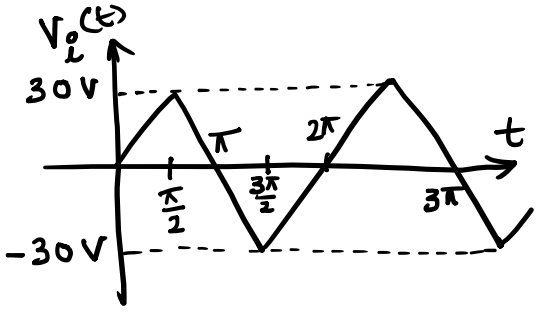


Fig. 5



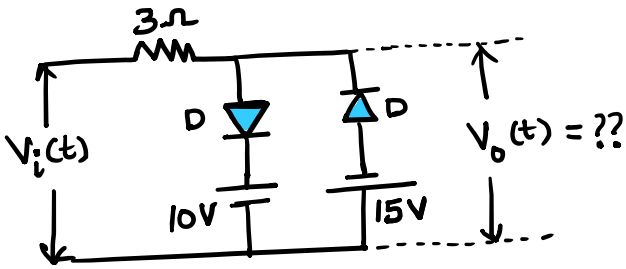
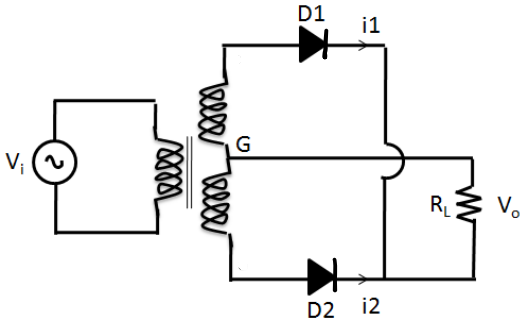


Fig. 6

7. A fullwave P-N junction diode rectifier is connected across a load resistor of 1500 Ω. Assuming ideal diode characteristics with a forward diode resistance 0Ω and an AC voltage of $V_i(t)$ = ***40 Sin*** (ωt) Volts, 50 Hz applied across the primary side of the center-tapped transformer, Calculate the below:

[2+1.5+1.5+2+2+2 = 11M]

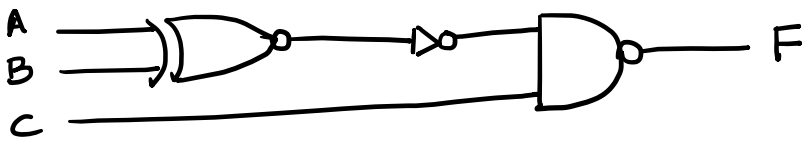


   a. Draw the output Voltage and Current waveforms across the Load
   b. Average value of load current
   c. RMS value of load current
   d. Rectifier efficiency
   e. Ripple factor
   f. Draw the Peak Inverse Voltages across D1 and D2.

8. Using 1s complement, compute $(52)_{10} - (98)_{10}$ [3M]

9. Using 2s complement, compute $(74)_{10} - (09)_{10}$ [3M]

10. For the below Gate interconnection, write the Boolean expression for 'F' and its truth table. [2+3 M]



11. Consider $F = A\overline{B} + \overline{A}BC$. Prove that $\boldsymbol{F.\overline{F} = 0}$ and $\boldsymbol{F + \overline{F} = 1}$ for the given function 'F'. [5 M]

12. Reduce $F = \overline{A}B\left(\overline{D} + \overline{C}D\right) + B(A + \overline{A}CD)$ to minimum number of literals. [4M]

13. Consider $F = AB\left(\overline{C}D + C\overline{D}\right) + \overline{A}.\overline{B}\left(\overline{C} + D\right).(\overline{D} + C)$

   a. Find the complement of 'F' [4 M]
   b. Realize 'F' using logic gates [4 M]

14. You plan to procure a very high processing speed Laptop with a good storage space. Discuss on the RAM, SRAM, DRAM and Hard disk capabilities you must look for, with proper justification and example. [5 M]

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