



RN-6161

B. E. II (Sem. III) (CO) Examination

May / June - 2010

Electrical Circuit Theory

Time : 3 Hours]

[Total Marks : 100

Instruction :

(1)

नीचे दशावलि निशानीवाणी विगतो उत्तरवडी पर अवश्य लभवी.  
 Fillup strictly the details of signs on your answer book.

Name of the Examination :  
 B. E. 2 (Sem. 3) (CO.)

Name of the Subject :  
 Electrical Circuit Theory

Subject Code No. : 6 1 6 1 Section No. (1, 2,.....): 1&2

Seat No. :

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Student's Signature

- (2) Attempt all questions.
- (3) Answers to both sections must be written in **separate** answer books.
- (4) Assume suitable data if required.
- (5) Give sketches wherever **necessary**.
- (6) Figures to the **right** indicate full marks.
- (7) Students must use FX-100w casio or any equ. scientific calculator.

SECTION - I

1 Do as directed :

10

(1)

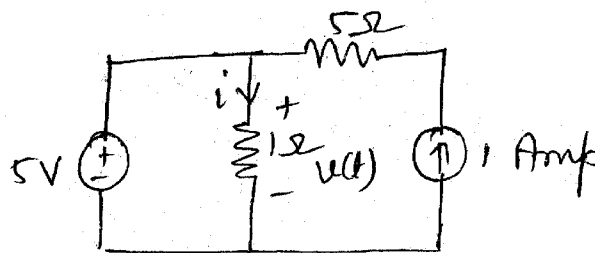


Fig. 1

The ckt shown in the above fig. is linear and time invariant. The sources are ideal. The voltage across the 1Ω resistor and the current through it will be \_\_\_\_\_.

- (2) The time constant for an RL-P series circuit with R=2Ω and L=4H is \_\_\_\_\_.
- (3) What is node ?
- (4) Define mutual inductance.

- (5) Dual of capacitance is \_\_\_\_\_. 1  
 (6) Dual of Thevenin's ckt is \_\_\_\_\_. 1  
 (7) The Thevenin equivalent impedance of the ckt in fig. is \_\_\_\_\_. 2

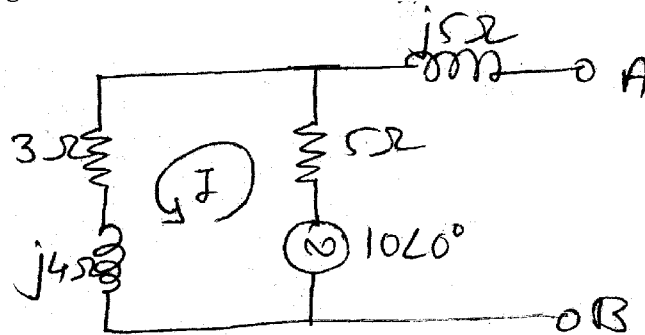


Fig. 2

- (b) State whether following statements are true or false. 4  
 (i) Super position theorem is valid only for linear circuits.  
 (ii) Superposition theorem is not applicable to networks containing transformers.  
 (iii) The maximum value of the co-efficient of coupling is 100%.  
 (iv) The value of the co-efficient of coupling K is more for air cored coupled ckt compared to the iron core coupled ckt.
- (c) State and explain KVL and KCL. 4  
 (d) State maximum power x'fer theorem and condition for max. power x'fer. 2
- 2 (a) With switch at A network attains equilibrium. At time  $t=0$ , the switch is moved to B. Find  $V_{R_2}(t)$ . 8

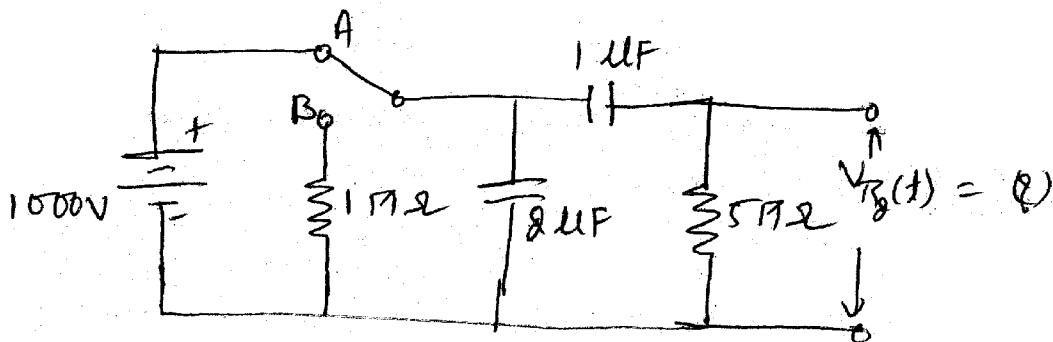


Fig. 3

- (b) Find  $I_2$  using mesh analysis. 7

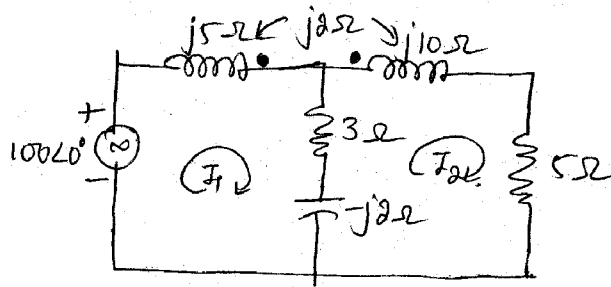


Fig. 4

OR

- 2 (a) In the below fig. the switch is closed at position 1 at  $t=0$ . At  $t=0.5$  msec. the switch is moved to position 2. Find the expression for the current in both the conditions and sketch the transient. 8

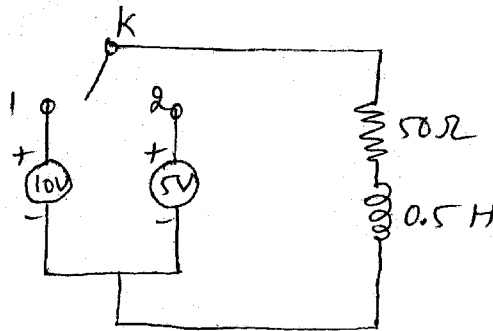


Fig. 5

- (b) Obtain the dotted equivalent ckt for the coupled ckt shown in fig. find the voltage across the  $-10\Omega$  reactance using the equivalent ckt. 7

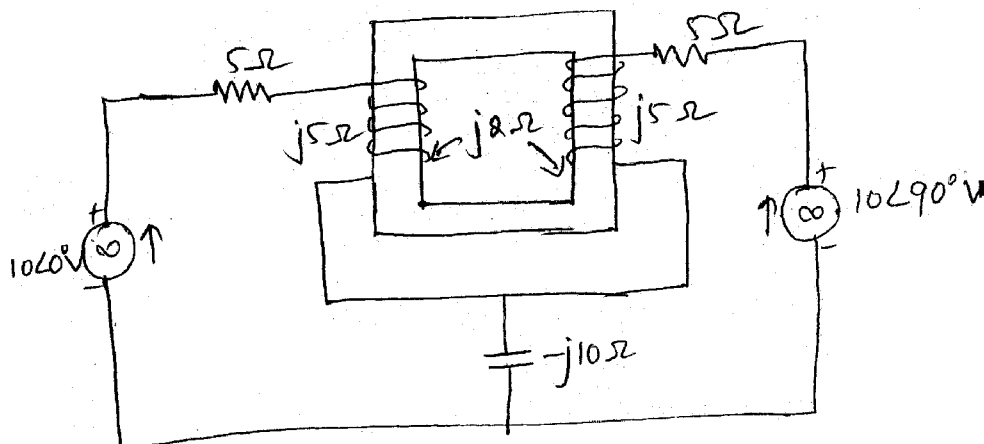


Fig. 6

- 3 Attempt any three : 15  
 (1) Use node voltage technique to obtain the current in the n/w shown in the below fig.

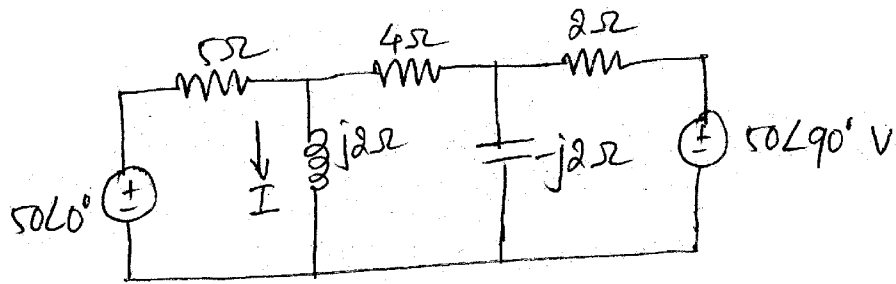


Fig. 7

(2) Draw the dual of the n/w.

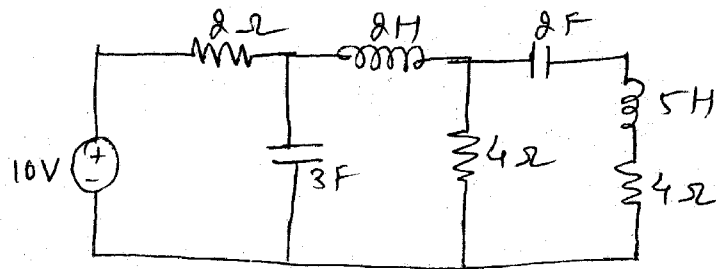


Fig. 8

(3) Determine the load current  $I_2$  using Norton's theorem.

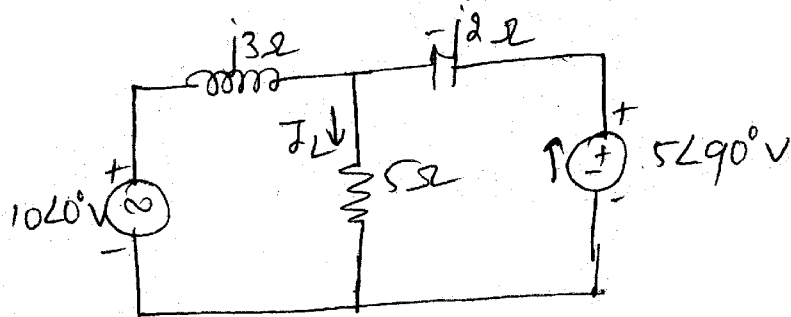


Fig. 9

(4) Use mesh analysis to find  $I_x$  in the ckt.

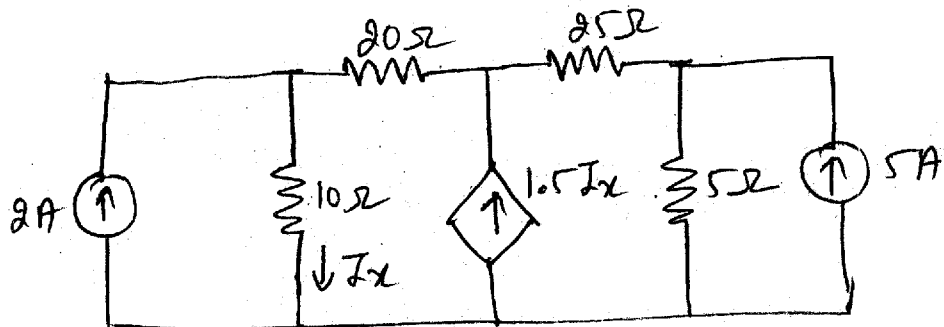


Fig. 10

(5)

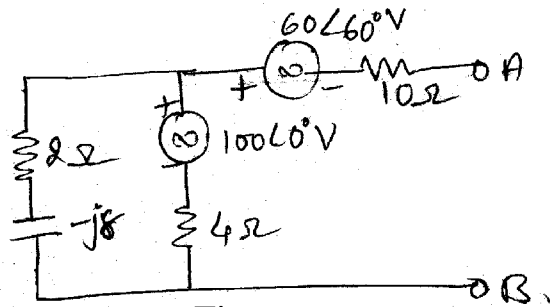


Fig. 11

Find the Thevenin equivalent ckt at terminal AB of the ckt as shown above.

## SECTION - II

1 (a) Do as directed : 10

(1) Match the following : 4

**Function**

**Laplace**

(i)  $t$

(a)  $\frac{1}{s^2} + a$

(ii)  $e^{-at}$

(b)  $\frac{(s^2 - a^2)}{(s^2 + a^2)^2}$

(iii)  $t \sin \omega t$

(c)  $\frac{2as}{(s^2 + a^2)^2}$

(iv)  $t \cos \omega t$

(d)  $\frac{1}{s^2}$

(2) Find  $i(0^-)$  using initial value theorem for 2

$$I(s) = \frac{2s+3}{(s+1)(s+3)}$$

(3) Laplace transform of  $\int_0^t f(t) dt = \underline{\hspace{2cm}}$ . 1

(4) State Dirichlet condition for the fourier series. 3

(b) Obtain the laplace transform of the following waveform. 6

(i) Non-recurring waveform

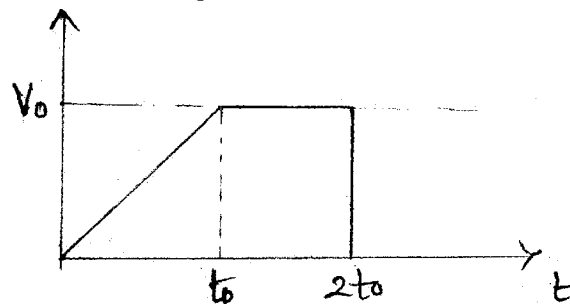


Fig. 12

(ii) Recurring waveform

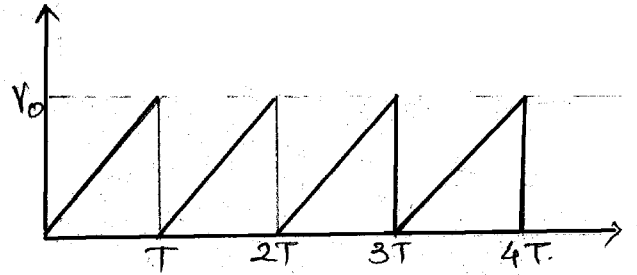


Fig. 13

(c) State and Prove the initial value theorem. 4

5 For the waveform shown in fig. obtain the trigonometrical Fourier series. 4

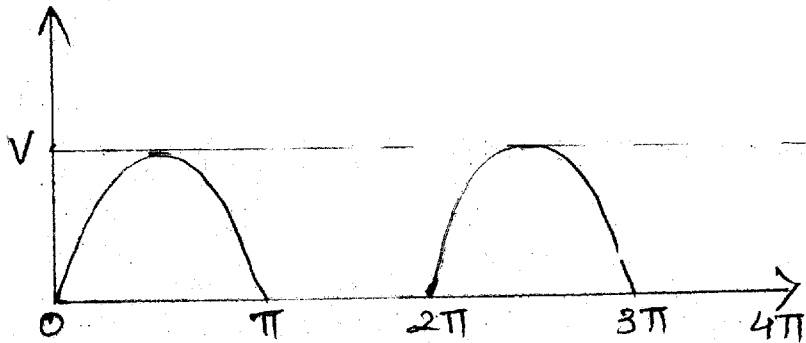


Fig. 14

(i) Find the co-efficient  $a_0$ . 3

(ii) Find the co-efficient  $a_n$ . 3

(iii) Find the co-efficient  $b_n$  and function  $f(t)$ . 7

(iv) Sketch the line spectrum. 2

OR

5 (a) Obtain fourier co-efficients for trigonometric form of Fourier series. 7

(b) Explain odd and half-wave symmetry for the trigonometrical form of fourier series and derive the co-efficient. 8

6 Attempt any **three** : 15

(1) Define ABCD parameters and obtain their values in terms of Z-parameters.

(2) Find y-parameters for the Network shown below :

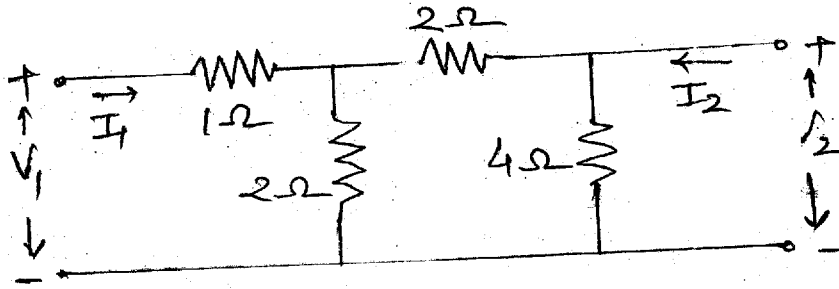


Fig. 15

(3) Obtain inverse laplace using convolution theorem :

(i) 
$$F(s) = \frac{2}{s^2(s+2)}$$

(ii) 
$$F_1(s) = \frac{1}{s(s+1)}$$

$$F_2(s) = \frac{1}{s+1}$$

(4) Prove for periodic function f(t) with displaced time period

T, 
$$F(s) = \frac{F_1(s)}{1 - e^{-TS}}$$
, where  $F_1(s)$  is laplace of the first cycle.