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P.E.S. College of Engineering, Mandya - 571 401

(An Autonomous Institution affiliated to VTU, Belgaum)

Fourth Semester, B.E. - Electrical and Electronics Engineering

Semester End Examination; June - 2016

Network Analysis - II

Time: 3 hrs *Max. Marks: 100*

Note*: Answer* ***FIVE*** *full questions, selecting* ***ONE*** *full question from each unit.*

UNIT - I

1\. a. The circuit shown in Fig-1 was in steady state with switch K closed for t < 0. At t = 0, K is opened. Determine the voltage across the switch v_k, dv_k / dt and d^2v_k / dt^2 at t = 0+. 10

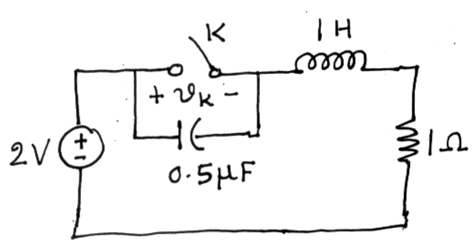

FIG-1

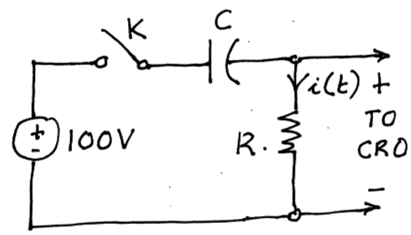

FIG-2

b. In the network shown in Fig-2 switch K is closed at t = 0. The current waveform is observed with a CRO. The initial value of current is measured to be 0.01 A. The time constant of circuit is 0.025 s. Find; 10

(i) The value of R (ii) The value of C (iii) The equation for i(t).

2 a. In the circuit shown in Fig-3 switch K is closed at t = 0. At t = 0- all capacitor voltages and inductor currents are zero. Three node-to-datum voltages are identified as v_1, v_2 and v_3. Find;

(i) v_1 *and* $^{dv_1}\!/_{dt}$ *at* $t = 0+$,

(ii) v_2 *and* $^{dv_2}\!/_{dt}$ *at* $t = 0+$ and

(iii) v_3 *and* $^{dv_3}\!/_{dt}$ *at* $t = 0+$ 10

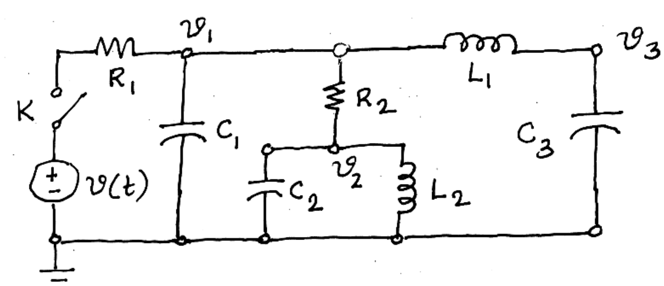

FIG-3

b. (i) What is the meaning of initial conditions in electrical circuits? Why do we need to compute them? 4

(ii) Describe the behaviour of R, L and C at t = 0+ and as t→∞ when the excitation is D.C. 6

UNIT - II

3 a. Show that $L\left\{f(t-a)u(t-a)\right\} = \in^{-as} F(s)$ where $F(s) = L\left\{f(t)\right\}$ and using this result obtain the Laplace transform of a periodic function. 10

b. For the waveform shown in Fig-4, which is made up straight line segments, obtain the Laplace transform. 10

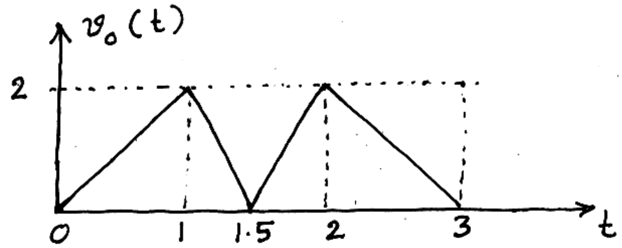

FIG-4

4 a. Express the recurring waveform shown in Fig-5 as a linear combination of appropriate basic signals and then obtain its Laplace transform. 10

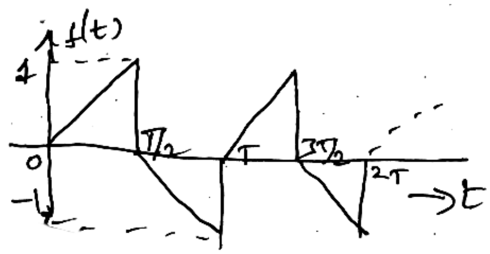

FIG-5

b. State and Prove convolution theorem of Laplace transforms. 10

UNIT - III

5 a. Find $v_L(t)$ *for* $t \geq 0$ in the circuit shown in Fig-6 by drawing Laplace transformed network. Take: $i_L(0-) = 0$. 10

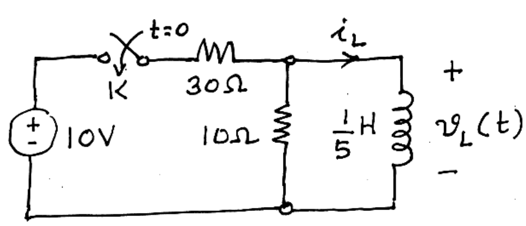

FIG-6

b. Determine the impulse response of the circuit shown in Fig-7 which is initially relaxed. Take $v_L(t)$ as output solve by drawing transformed network. 10

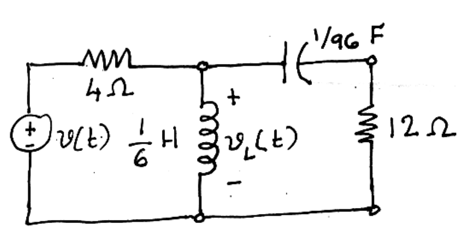

FIG-7

6 a. Show that the response of an initially relaxed linear circuit can be determined in terms of the step response using Duhammel's Super position Integral. 10

b. It is given that $F(S)=\dfrac{aS^2+bS+c}{S^3+2S^3+S+1}$ Find a, b and c such that $f(0)=f'(0)=f''(0)=1.$ 10

UNIT - IV

7 a. An inductor L is in series with a resistance R. This is in Parallel with a capacitor C. The driving point impedance of this circuit has a dual pole at $(-1.5\pm j5.268)$. If $Z(j0)=1$ find the values of R, L and C. 10

b. A two-part network is characterized by the equations,

$$12v_1+3i_1-6i_2+4v_2=0$$
$$6v_1-5i_1-2i_2+0.1v_2=0$$

Find y-parameters of the network. 10

8 a. Determine the z-parameters of the two part network shown in Fig-8. 10

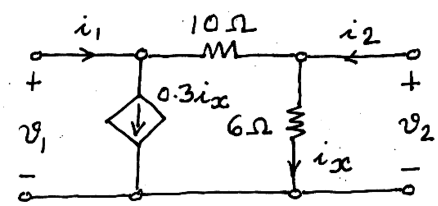

FIG-8

b. Obtain the condition for reciprocity and symmetry of a two-port network in terms of its ABCD parameters. 10

UNIT - V

9 a. What are Hurwitz polynomials? Mention their properties? How are polynomials tested for Hurwitz property? 8

b. Check whether the following functions are PR or not by giving reasons: 12

i) $\dfrac{2s^3+2s^2+3s+2}{s^2+1}$ *ii)* $\dfrac{(s+2)(s+4)}{(s+1)(s+5)}$

10 a. Realize the following RC driving point impedance function in first Foster form and first Cauer form: 10

$$Z(s)=\frac{(s+2)(s+5)}{(s+1)(s+3)}$$

b. Realize the driving point impedance function given below in two Cauer forms: 10

$$Z(s)=\frac{(s^2+1)(s^2+9)}{s(s^2+4)}.$$

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