KATHMANDU UNIVERSITY
End Semester Examination
February / March 2018

Marks Scored:

Level : B. E.
Year : II

Course : EEEG 213
Semester : I

Exam Roll No. :

Time: 30 mins.

F. M. : 20

Registration No.:

Date : MAR 16 2018

SECTION "A"
[20 Q × 1 =20 marks]

Choose the most appropriate answer for the following questions.

1. Figure-1 shows the plot of the voltage across the resistor in a series RL circuit when a unit step voltage is applied. If the value of R is 1Ω the value of L for the circuit will be .....H.
(a) 1 (b) 2 (c) 1/2 (d) 10

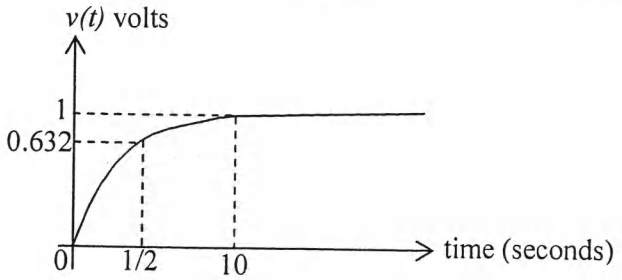

Figure-1

2. The switch S in the circuit of figure-2 is closed at t = 0. The di/dt (0+) for the circuit is .....A
(a) 0 (b) ∞ (c) $[R+R_s]/L$ (d) $[R_sI_s]/L$

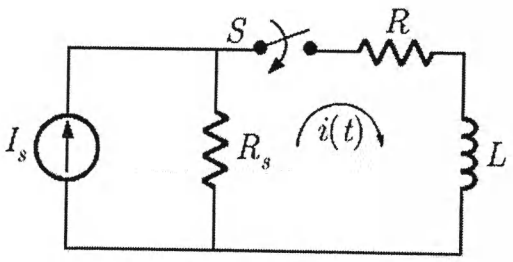

Figure-2

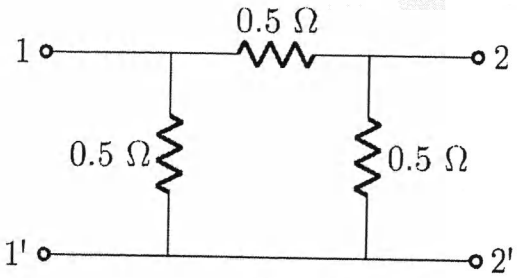

Figure-3

3. The Y parameters for the two port network in figure-3 are ..... simens.
(a) 4, -2, -2, 4 (b) 1, -0.5, -0.5, 1 (c) 1, 0.5, 0.5, 1 (d) 4, 2, 2, 4

4. The transient current in a *RLC* series circuit is oscillatory when .....
(a) $R = 0$ (b) $R > 2\sqrt{L/C}$ (c) $R < 2\sqrt{L/C}$ (d) $R = 2\sqrt{L/C}$

5. A 2mH inductor with some initial current can be represented as shown in figure-4. The value of initial current is .....A.

(a) 0 (b) 1 (c) 2 (d) 1/2

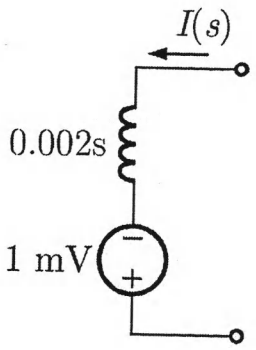

Figure-4

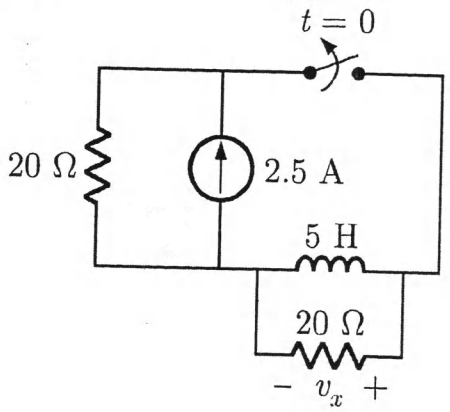

Figure-5

6. In figure-5, the switch was closed for a long time before opening at $t = 0$. The voltage v_x at $t = 0+$ is .....V.

(a) 25 (b) 50 (c) -50 (d) 0

7. The current ratio transfer function $\frac{I_0}{I_s}$ for the network in figure-6 is .....

(a) $\frac{s(s+4)}{s^2+3s+4}$ (b) $\frac{s(s+4)}{(s+1)(s+3)}$ (c) $\frac{s^2+3s+4}{s(s+4)}$ (d) $\frac{(s+1)(s+3)}{s(s+4)}$

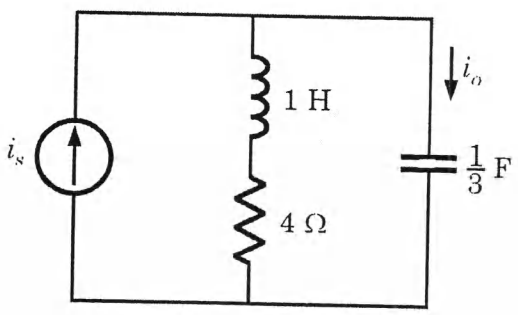

Figure-6

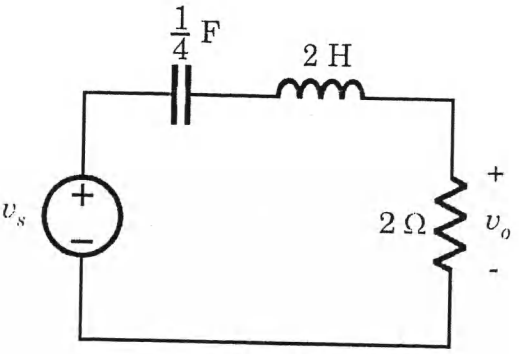

Figure-7

8. In the network of figure-7, all initial conditions are zero. The damping exhibited by the network is .....

(a) over damped (b) under damped (c) critically damped (d) un-damped

9. Which of the following is not an application of a filter circuit?

(a) AM demodulation (b) Band limiting
(c) Audio amplification (d) Channel equalization

10. The frequency of oscillation of a network is increased if the poles of its network function lies .....

(a) away from the origin on the imaginary axis
(b) near to the origin on the imaginary axis
(c) away from the origin on the real axis
(d) near to the origin on the real axis

11. In the Bode plot of a network, the value of phase of G(jω) at the gain cross over frequency is – 125° . The phase margin of the system is .....
(a) -125° (b) 125° (c) -55° (d) 55°

12. The equivalent circuit for a capacitor with a charge at t = ∞ can be replaced by .....
(a) a voltage source and an open circuit in series
(b) a voltage source and an open circuit in parallel
(c) a short circuit
(d) an open circuit

13. The y-parameters of a two port network are $[Y] = \begin{bmatrix} 5 & 3 \\ 1 & 2 \end{bmatrix}$ S. A resistor of 1Ω is connected across as shown in figure-8. The new y-parameter for the interconnectd network would be .....
(a) $\begin{bmatrix} 6 & 4 \\ 2 & 3 \end{bmatrix}$ (b) $\begin{bmatrix} 6 & 2 \\ 0 & 3 \end{bmatrix}$ (c) $\begin{bmatrix} 5 & 4 \\ 2 & 2 \end{bmatrix}$ (d) $\begin{bmatrix} 4 & 4 \\ 2 & 1 \end{bmatrix}$

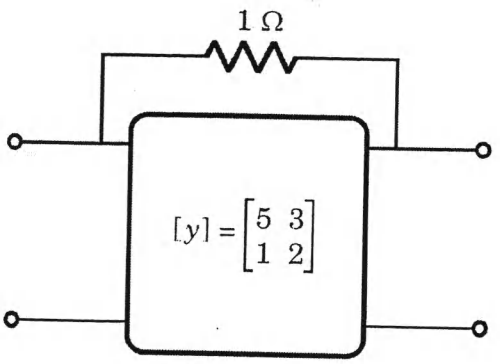

Figure-8

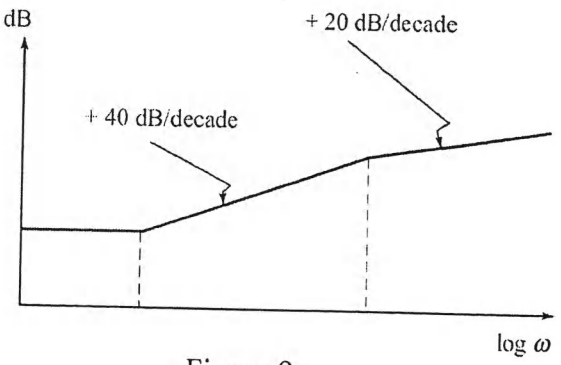

Figure-9

14. The Bode asymptotic plot for a transfer function is shown in figure-9. The transfer function has .....
(a) one pole one zero
(b) two poles one zero
(c) one pole two zeros
(d) three poles one zero

15. The Laplace transform of a impulse function is.....
(a) 1 (b) 1/S (c) S (d) 0

16. The lowest power of s in the denominator polynomial and numerator polynomial for a p.r.f. may differ at most by.....
(a) 0 (b) 1 (c) 2 (d) 3

17. If ξ > 1 the roots of the second order RLC network are.....
(a) real and distinct
(b) imaginary
(c) real and equal
(d) complex conjugate with positive real part

18. For a two port symmetrical passive network, if transmission parameters A = 3 and B = 1 , the value of parameter C is .....S.
(a) 3 (b) 8 (c) 6 (d) 9

19. The cut-off frequency of a first order low pass filter of figure-10 is……MHz.
(a) 0.707 (b) 3.00 (c) 1.59 (d) 62.83

20. The differential equation for the current *i(t)* in the circuit of the figure-11 is …..
(a) $2\frac{d^2i}{dt^2} + 2\frac{di}{dt} + i(t) = sint$ (b) $\frac{d^2i}{dt^2} + 2\frac{di}{dt} + 2i(t) = cost$
(c) $2\frac{d^2i}{dt^2} + 2\frac{di}{dt} + i(t) = cost$ (d) $\frac{d^2i}{dt^2} + 2\frac{di}{dt} + 2i(t) = sint$

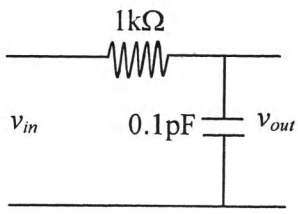

Figure-10

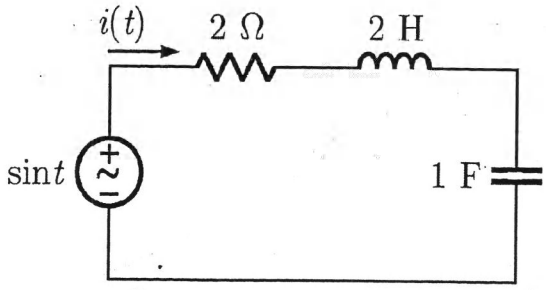

Figure-11

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SECTION "B"

Attempt *ANY FIVE* questions. Assume necessary information if required.

1. a. A bolt of lightning having a waveform which is approximated as $v(t) = te^{-t}$ V strikes a transmission line having resistance R = 0.1Ω and inductance L = 0.1H. The phenomenon can be modeled as shown in figure-1. Determine the current *i(t)* flowing through the transmission line due to lightning. [5]

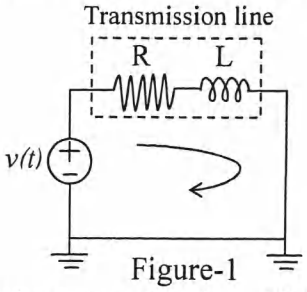

Figure-1

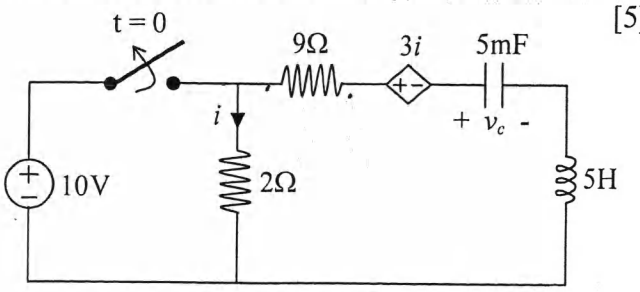

Figure-2

b. Find the expression for $v_c(t)$ in figure-2 for t > 0. [6]

2. a. In the network of figure-3, initially the steady state is reached when the switch K is open. At t = 0, switch K is closed. Find the voltage across the capacitor for t > 0, sketch this voltage and determine the time constant of the circuit. [6]

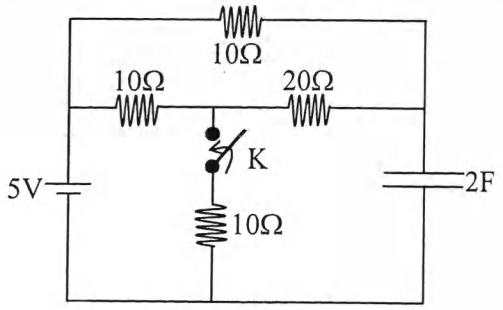

Figure-3

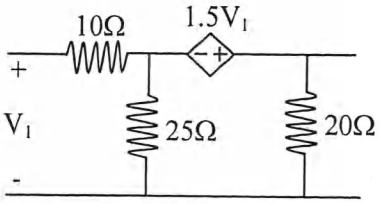

Figure-4

b. Find the transmission parameters for the network shown in figure-4. [5]

3. a. Plot the asymptotic magnitude response and phase response for the network function

$$G(s) = 1000\frac{(1+0.25s)(1+0.1s)}{(1+s)(1+0.025s)}$$

Use semi-log graph paper for the plots. [8]

b. Determine whether the following function is positive real function or not. [3]

$$T(s) = \frac{4s^3 + 8s^2 + 19s + 16}{16s^3 + 28s^2 + 32s + 12}$$

4. a. For the network of figure-5 determine the transfer function $V_2(s)/V_1(s)$. [6]

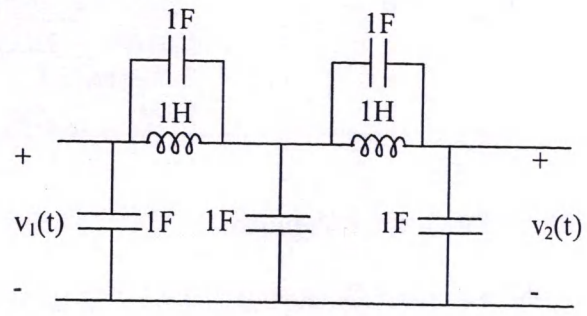

Figure-5

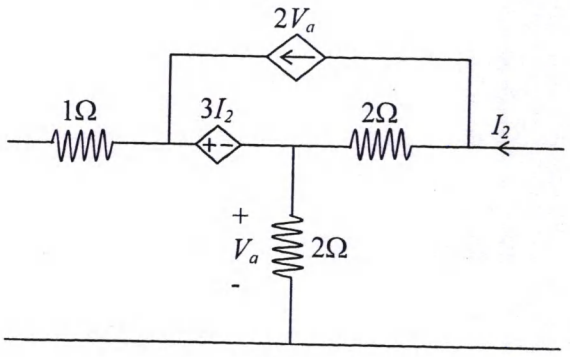

Figure-6

b. Find the y parameters for the network of figure-6. [5]

5. a. Find $i_L(0+)$, $V_C(0+)$, $\frac{di_L(0+)}{dt}$ and $\frac{dV_C(0+)}{dt}$ for the circuit shown in figure-7. [5]

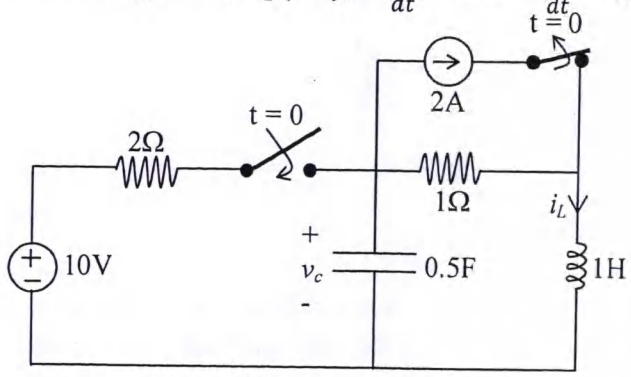

Figure-7

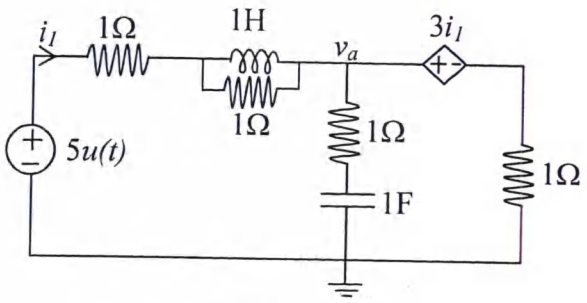

Figure-8

b. Determine $v_a(t)$ for the network given in figure-8 using Laplace transform method. [6]

6. a. A truncated ramp waveform as shown in figure-9 is applied to an R and L series network. If R = 2Ω and L = 5μH find the current $i(t)$ in the circuit using Laplace transform method. [5]

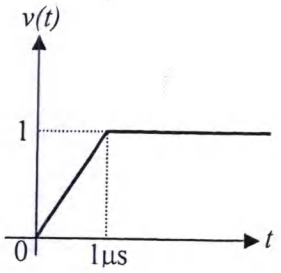

Figure-9

b. Find the current response $i(t)$ for a RLC series circuit with supply voltage 4sin20t. Assume R = 4.8Ω, L = 4H and C = 0.25F. [3]

c. A low pass filter is required to have a transfer function $T(s) = \frac{3s+1.5}{s+3}$. Obtain a first order active filter to realize the transfer function using op-amp in inverting mode. Use practical component values. [3]