7/10/2017

Note: i) All the questions are compulsory.

ii) Figures to the right indicate full marks.

iii) Use of non programmable calculator is allowed.

Q.1) A) Attempt any one.   [8 Marks]

a) What is time constant of an L-R series circuit? Derive an expression for it by considering decay of current in an L-R circuit.

b) State Thevenin's theorem .Illustrate it with suitable example.

Q.1) B) Attempt any one.   [7 Marks]

a) State and explain Superposition Theorem.

b) Derive an expression for discharging of capacitor in C-R series circuit.

Q. 1) C) Attempt any one.   [5 Marks]

a) State Constant current source and explain in brief.

b) The time constant of a coil is 2ms .It is connected in series with resistance of 40 Ω. The time constant of series combination is 0.5ms. Calculate the self inductance and resistance of the coil.

Q.2) A) Attempt any one.   [8 Marks]

a) Draw a parallel L-C-R circuit .Derive an expression for its resonant frequency.

b) Explain de Sauty's capacitance bridge .Find the condition for balancing .Is the condition is independent of frequency of the applied voltage.

Q.2) B) Attempt any one.   [7 Marks]

a) Find the condition of the balance for Wein's bridge. How would you determine the frequency of the AC supply?

b) Derive an expression for current magnification and Q factor for Parallel L-C-R circuit.

                                                            [5 Marks]

Q.2) C) Attempt any one.

a) An Ac source specified as $V=200\cos 1000t$, is connected across 200 Ω resistance. Calculate the rms emf and frequency of the source. Also calculate the rms current thought the circuit.

(P.T.O.)

b) In a Maxwell's L/C bridge, the balance condition is obtained for $R_1 = 5$ KΩ, $R_2 = 10$ KΩ, $R_3 = 15$ KΩ and $C_1 = 0.22$ µF. Determine the inductance and resistance of given coil.

Q.3) A) Attempt any one.
[8 Marks]

a) Explain the input and output characteristics of CE configuration of transistor. What do you infer from these characteristics?

b) What is voltage regulation? Obtain the expression of voltage regulation for full wave rectifier.

Q.3) B) Attempt any one.
[7 marks]

a) Explain NAND and NOR gates with the help of their logic statements, logic symbol, truth table and logic diagram.

b) Find the relation between current amplification factor α and β.

Q.3) C) Attempt any one.
[5 marks]

a) What is EX-OR gate? What is the difference between inclusive OR gate and exclusive OR gate?

b) A 400 mW zener diode with breakdown voltage 5V as negligible resistance .Find the maximum current its can carry. What is the current limiting resistor for this zener to carry maximum current if the supply voltage is 15 V?

Q.4) Attempt any three.
[15 Marks]

a) State the following theorems

i) Norton's theorem

ii) Maximum Power Transfer Theorem

b) An inductance of 4 Henry and a resistance of 2 Ω are connected in series with a dc source of 5V emf. Calculate the current in the circuit 6 sec after it is switched on.

c) In a series LCR circuit, L=200 µH, R = 10Ω and C= 22µF .Find the resonant frequency for the circuit .Also, Find the Q –factor at resonance.

d) A Wein's bridge circuit has the following component value $R_1 = 1$ KΩ, $R_2 = 2$ KΩ, $C_1 = 0.1$ µF, $C_2 = 0.2$ µF, $R_4 = 1$ KΩ. Find the value of R_3 and frequency of the applied voltage required to balance the bridge.

(P.T.O.)

e) Prove that: $A + \bar{A}B + AB = A + B$

f) Calculate the emitter current in CE, transistor configuration for which $\beta = 100$ and $I_B = 50\mu A$. Hence calculate α.

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