ROLL NO. _____

Code: AE59/AE110 **Subject: CIRCUIT THEORY & DESIGN**

AMIETE – ET (Current & New Scheme)

Time: 3 Hours **June 2019** **Max. Marks: 100**

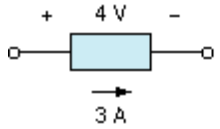
PLEASE WRITE YOUR ROLL NO. AT THE SPACE PROVIDED ON EACH PAGE IMMEDIATELY AFTER RECEIVING THE QUESTION PAPER.

NOTE: There are 9 Questions in all.

- **Question 1 is compulsory and carries 20 marks. Answer to Q.1 must be written in the space provided for it in the answer book supplied and nowhere else.**
- **The answer sheet for the Q.1 will be collected by the invigilator after 45 minutes of the commencement of the examination.**
- **Out of the remaining EIGHT Questions answer any FIVE Questions. Each question carries 16 marks.**
- **Any required data not explicitly given, may be suitably assumed and stated.**

Q.1 Choose the correct or the best alternative in the following: **(2×10)**

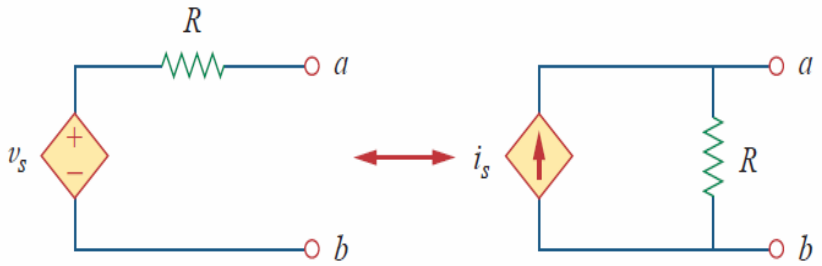
a. Power absorbed in the circuit shown in the Figure below



(A) 1.5 W **(B)** 6 W
(C) 12W **(D)** 60W

b. What is the charge stored on a 2 micro farad capacitor with 10 V across it?
(A) 20 microampere **(B)** 20 microcoulomb
(C) 2 Coulomb **(D)** 2 ampere

c. In the circuit below, value of i_s will be,



(A) v_s*R **(B)** v_s / R
(C) v_s **(D)** R

d. For the RC circuit, voltage response is given as $v(t) = Ae^{-t/RC}$, initial voltage will be equal to,
(A) Ae **(B)** A
(C) $Ae^{-1/RC}$ **(D)** $Ae^{-2/RC}$

e. Laplace transform for e^{-at} sinωt will be,
(A) $\omega/[(s+a)^2+\omega^2]$ **(B)** $a/[(s+a)^2+\omega^2]$
(C) $\omega/[(s+a)+\omega^2]$ **(D)** $\omega/[(s+a)^2+\omega]$

f. Theorem which is not able to measure power,
(A) Thevenin's theorem **(B)** Norton's Theorem
(C) Superposition theorem **(D)** Tellegan's theorem

g. Transfer impedance function for a two port network is,
(A) $V_2(s)/I_1(s)$ **(B)** $V_2(s)/I_2(s)$
(C) $V_1(s)/I_1(s)$ **(D)** $V_1(s)/I_2(s)$

h. Condition for reciprocal network in terms of two transmission parameters,
(A) AC-BD = 0 **(B)** AD-BC=0
(C) AD-BC=1 **(D)** A=D

i. Removal of pole at infinity corresponds to,
(A) Addition of inductor from network
(B) Removal of capacitor from network
(C) Removal of inductor from network
(D) Removal of Source from a network

j. Phase constant for a low pass filter in stop band is,
(A) 0 **(B)** π
(C) $2\sin^{-1}(f/f_c)$ **(D)** $2\sin^{-1}(f_c/f)$

Answer any FIVE Questions out of EIGHT Questions.
Each question carries 16 marks.

Q.2 Design T–section and Π-section low pass filter having cut off frequency 2 kHz and nominal characteristic impedance of 600 ohms. **(8+8)**

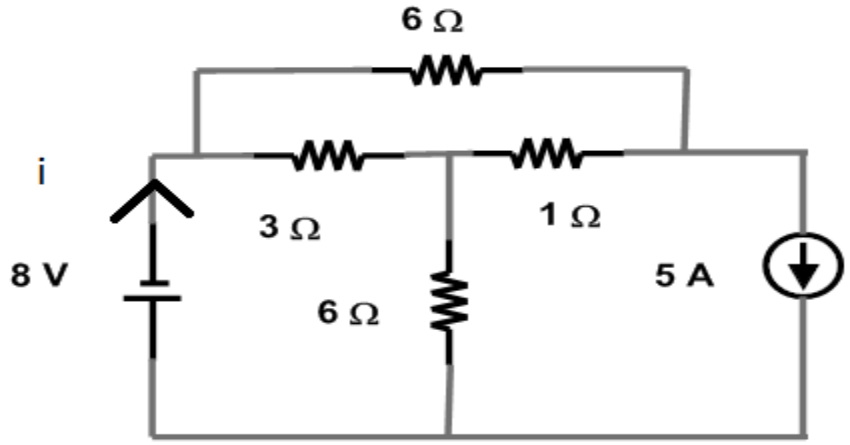
Q.3 Check whether the following functions represent the L-C admittance functions.
(i) $K(s^2+1)(s^2+3)/[s(s^2+4)]$
(ii) $s^5+3s^3+4s/[2s^4+6s^2]$ **(8+8)**

Q.4 a. Check whether the polynomial $P(s) = s^4+3s^3+4s^2+3s+1$ is Hurwitz? **(8)**

b. Explain the basic syntheses procedure for RLC network. **(8)**

Q.5 The h-parameters of a certain two port network is given as matrix: $\begin{bmatrix} 1 & 2 \\ -2 & 1 \end{bmatrix}$
Find z-parameters, y-parameters and ABCD parameters. Find whether the network is reciprocal and symmetrical. **(6+6+4)**

Q.6 a. Find '**i**' using superposition theorem in the following Figure **(8)**



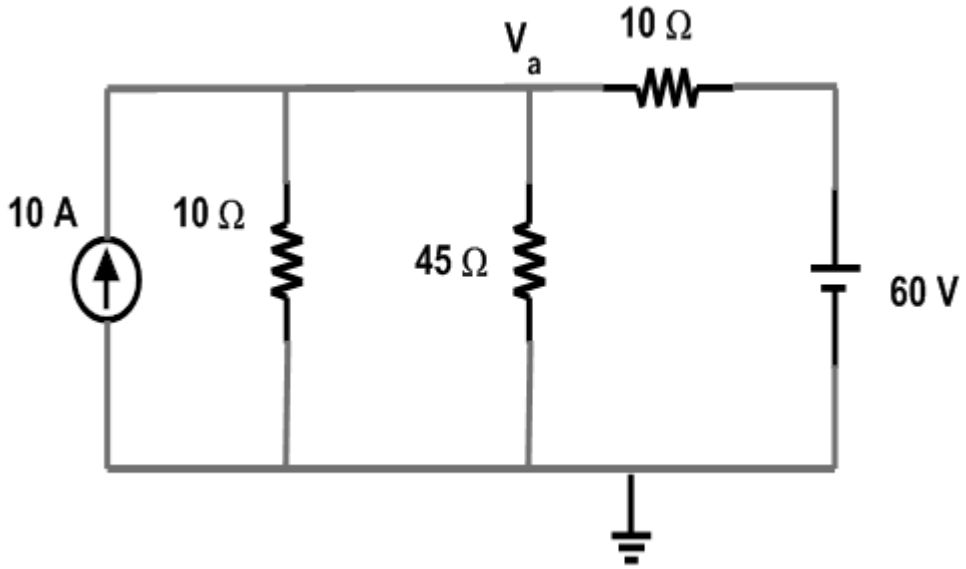
b. Explain Thevenin theorem with proper example. **(8)**

Q.7 Find the Laplace transform of a square wave of magnitude that varies from +1 to -1 and the time period of one cycle is '2a' seconds. **(16)**

Q.8 a. Two identical coupled coils in series has an equivalent inductance values of 0.084 H and 0.0354 H. Find the values of L_1, L_2, M and K. **(8)**

b. For a series RL circuit with the driving force voltage $v(t) = Ve^{-\alpha t}$ for $t \geq o$, where V and α are constant, calculate the current flowing in the circuit. **(8)**

Q.9 a. Find $\mathbf{V_a}$ using nodal analysis for the following circuit.



b. Explain the method of source transformation with suitable example. **(8)**