

Dr. Harsh Johal₁

JAYPEE UNIVERSITY OF INFORMATION TECHNOLOGY, WAKNAGHAT
TEST-3 EXAMINATION – May 2019
B.Tech., IInd Semester, BT-BI

COURSE CODE: 18B11EC212

MAX. MARKS: 35

COURSE NAME: BASIC ELECTRICAL SCIENCE

COURSE CREDITS: 4

MAX. TIME: 2:00 Hr.

Note: All questions are compulsory. Carrying of mobile phone during examinations will be treated as case of unfair means. Missing data, if any, can be appropriately assumed.

Q1. [CO1]

- (a) Differentiate between the following dc sources by giving *circuit diagram* and *characteristics curve* (i) ideal voltage source and practical voltage sources (ii) ideal current source and practical current source. (2)
- (b) At $t=0$, suddenly a dc supply of 100 V is applied to a series RL circuit having $R=11 \Omega$ and $L=20$ H. Determine (a) the time constant of the circuit (b) initial rate of change of current (1.5+1.5)

Q2. [CO2]

- (a) An alternating current of frequency 110 Hz has a maximum value of 24 A. (a) Write down the equation for its instantaneous value. (b) Find the value of current after $1/180$ seconds (c) Find the time taken to reach 19.6A for the first time. (3)
- (b) What reactance will be offered by (i) an inductor of 0.2H, (ii) by a capacitance of $10\mu\text{F}$, to an a.c. voltage of 10V, 100Hz? What of the frequency changed to 140 Hz? (2)

Q3. [CO5]

- (a) Action potential and resting potential at cellular level leads to generation of bioelectric potentials. Explain in detail with the help of suitable labelled diagrams. (3)
- (b) Give the definition, frequency range and voltage range of the following bioelectric signals: (6)
- (i) EEG (ii) ENG (iii) ECG (iv) EMG

Q4. [CO4]

- (a) What are the necessary conditions for a transformer to be called as an ideal transformer? Give the circuit diagram, phasor diagram and derive the expression for turn ratio. (4)
- (b) A single phase, 50 Hz transformer has 11 primary turns and 101 secondary turns. Net cross sectional area of the core is 250cm^2 . The primary winding is connected to 230V, 50 Hz supply, calculate (i) Voltage induced in secondary winding (ii) primary current is the secondary current is 49 A. (Ignore non idealities.) (2)

Q5. [CO3]

- (a) Two impedances $Z_1=(14+j16)\Omega$ and $Z_2=(8-j8)\Omega$ are connected in parallel. If the total potential difference across the combination is $(230+j0)\text{V}$, calculate (i) the current supplied to *each branch* and *total current* (ii) power consumed by *each branch* and *total power* (iii) power factor for *each branch* (lead/lag) and *overall* power factor of the circuit. (3)

P.T.O.

- (b) When A two element parallel circuit is connected across an a.c. source of frequency 110Hz, it offers an impedance $Z = (25 - j25) \Omega$. Determine the values of two elements. (2)
- (c) Refer to the circuit shown in Fig. 1 below. (i) Find the current $i(t)$. (ii) Find voltage across the capacitor by applying thevenin's theorem. (iii) Determine the values of the two series connected elements of an electrical load that must be connected in place of the capacitor $(1/5)\mu\text{F}$, so as to consume maximum power from the remaining circuit. (1+2+2)

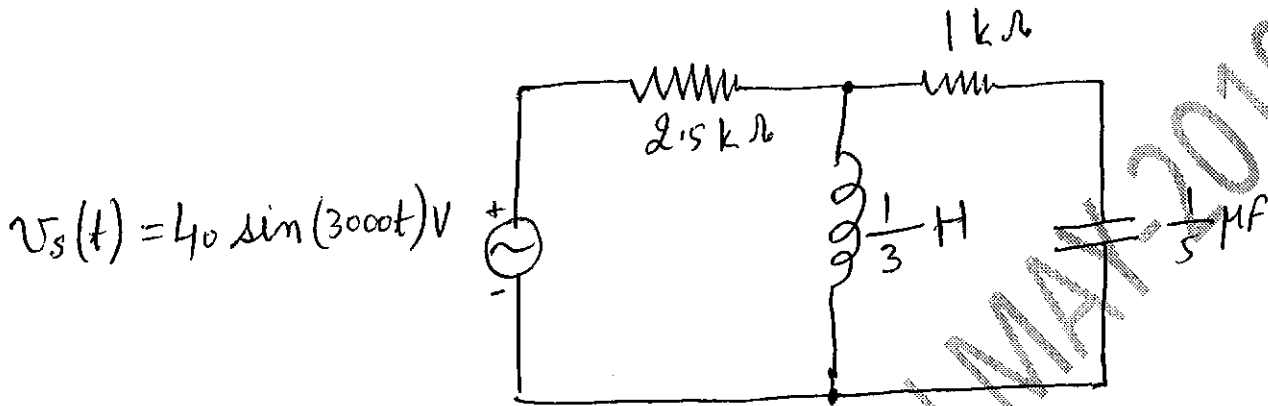


Fig. 1.