**PVP 20**

Code: 20ES1302

**II B.Tech - I Semester –Regular / Supplementary Examinations**
**DECEMBER 2023**

# CIRCUIT THEORY
## (ELECTRICAL & ELECTRONICS ENGINEERING)

Duration: 3 hours Max. Marks: 70

Note: 1. This paper contains questions from 5 units of Syllabus. Each unit carries 14 marks and have an internal choice of Questions.
2. All parts of Question must be answered in one place.

BL – Blooms Level CO – Course Outcome

| | | | BL | CO | Max. Marks |
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| | | **UNIT-I** | | | |
| 1 | a) | An inductive coil takes 10A and dissipates 1000watts when connected to a supply of 250V, 25Hz. Calculate the (i) impedance (ii) effective resistance (iii) reactance (iv) inductance (v) power factor. | L3 | CO2 | 7 M |
| | b) | For a load, $V_{rms} = 110\angle 85^0$V, $I_{rms} = 0.4\angle 15^0$A. Determine i) Active power ii) Reactive power iii) Apparent power. | L3 | CO2 | 7 M |
| | | **OR** | | | |
| 2 | a) | A two element series circuit is connected across an AC source given by v=200√2sin(314t+20°). The current in the circuit is found to be i=10√2cos(314t-25°). Determine the parameters of the circuit. Also determine the power factor, real power and reactive power taken by the circuit | L3 | CO2 | 7 M |
| | b) | What is impedance diagram? Derive the expression for impedance of a RLC series circuit. | L3 | CO2 | 7 M |

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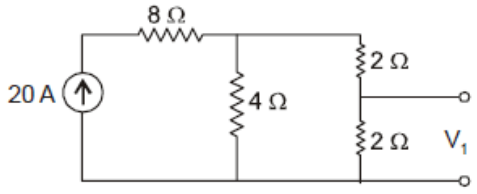
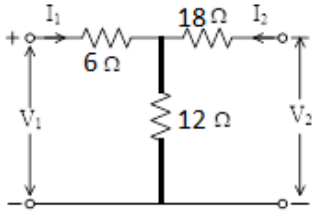
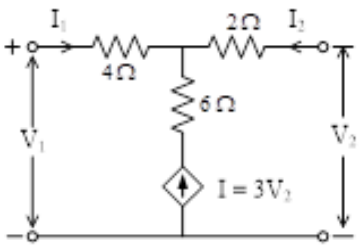
| **UNIT-II** | | | | | |
| 3 | a) | In a series resonant circuit prove that resonant frequency is the geometric mean of two half power frequencies. | L3 | CO3 | 7 M |
| | b) | A series RLC circuit with R= 100Ω, L=0.5H and C=40μF has an applied voltage of 50V with variable frequency. Calculate (i)Resonant frequency, (ii)Current at resonance, and (iii) Voltage across R, L and C | L3 | CO3 | 7 M |
| **OR** | | | | | |
| 4 | a) | Derive the relation between the resonance frequency and bandwidth of resonance circuit | L3 | CO3 | 7 M |
| | b) | Verify reciprocity theorem for the network shown in the figure.   | L3 | CO3 | 7 M |
| **UNIT-III** | | | | | |
| 5 | a) | If $Z_{11}$ = 3 Ω, $Z_{12}$ = 2 Ω, $Z_{21}$ =3 Ω and $Z_{22}$= 1 Ω, find the Y-parameters and ABCD parameters. | L3 | CO2 | 7 M |
| | b) | Obtain the Y-parameters of a Two Port network shown in figure.   | L4 | CO5 | 7 M |
| **OR** | | | | | |
| 6 | a) | Determine h-parameters and impedance parameters for the following network.   | L4 | CO5 | 7 M |

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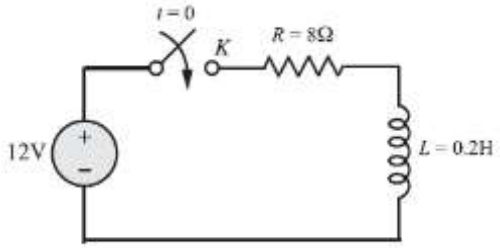
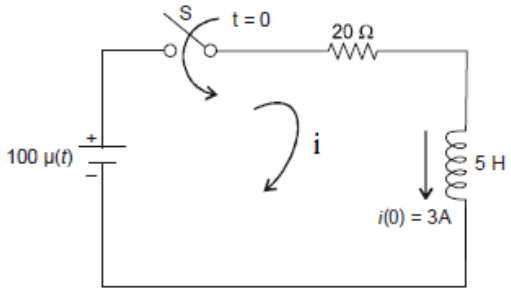
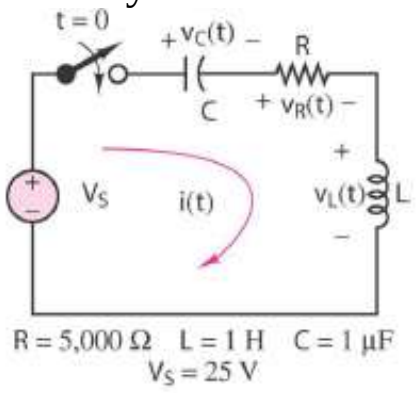
| | b) | Derive the expression for Coefficient of Coupling. | L2 | CO1 | 7 M |
| | | **UNIT-IV** | | | |
| 7 | a) | In the following network switch K is closed at t=0 with zero current in the inductor. Find the values of $i, \frac{di}{dt}$ and $\frac{d^2i}{dt^2}$ at $t=0^+$.   | L4 | CO4 | 7 M |
| | b) | In the circuit shown in the figure, find the transient voltage across $R$ and $L$ after the switch is closed at time t=0. Assume the initial current through the inductor before the switch is closed.   | L4 | CO4 | 7 M |
| | | **OR** | | | |
| 8 | a) | Derive the expression for i(t) in the given circuit for t>0. assume that there is no charge on the capacitor and no current passing through the inductor initially   | L4 | CO4 | 7 M |

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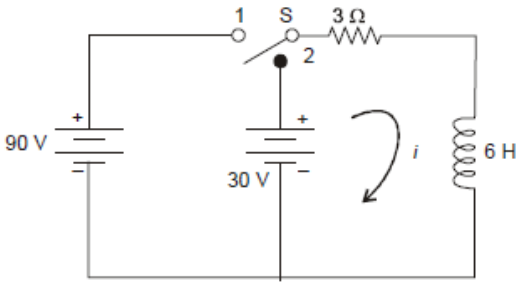
| | b) | In the circuit shown in the figure, switch 'S' is in position 1 for a long time and brought to position 2 at time $t = 0$. Find the transient current.<br>  <br> | L4 | CO4 | 7 M |
| **UNIT-V** | | | | | |
| 9 | a) | A 3-phase, 440V load has a power factor of 0.4. Two wattmeters are connected to measure the power. If the input power be 10 kW, find the reading of each instrument. | L4 | CO4 | 7 M |
| | b) | Develop Relation between line and phase voltages and currents in a delta connected 3-phase balanced system. | L4 | CO3 | 7 M |
| **OR** | | | | | |
| 10 | a) | A balanced delta connected load of (8 + j6) Ω per phase is connected to a 3-phase, 50 Hz, 230V supply. Calculate (i) Line current (ii) Reactive volt-ampere, (iii) power factor, and (iv) Total volt-ampere. | L4 | CO4 | 7 M |
| | b) | Two wattmeters are used to measure power input to a 1.5kV, 50 Hz, 3-phase motor running on full load at an efficiency of 85%. Their readings are 250kW and 80kW respectively. Calculate (i) input power<br>(ii) Power factor, and (iii) Line current | L4 | CO4 | 7 M |