*Total number of printed pages:4* **UG/3rd/DIE301**

**2021**

# ELECTRICAL CIRCUITS AND NETWORKS

*Full Marks: 100*

Time: Three hours

***The figures in the margin indicate full marks for the questions.***

*Answer **any five** questions.*

1. a) Determine the equivalent resistance between terminals A and B in figure 1. 6

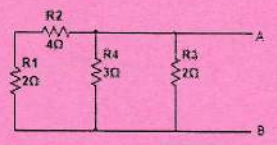


Figure 1

b) State Kirchhoff's Voltage Law (KVL) and find the current in figure 2 using KVL. 7

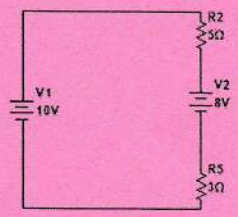


Figure 2



c) State Kirchhoff's Current Law and explain using a suitable circuit diagram. 7

2. a) Find the voltage across resistor R1 in figure 3 using voltage divide rule. 5

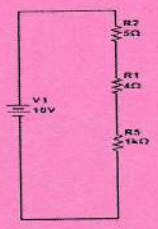


Figure 3

b) What is current divide rule? Explain with a circuit diagram. 7

c) State Norton's Theorem. Show the application of Norton's Theorem in a circuit. 8

3. a) Find the currents $I_1$, $I_2$ and $I_3$ in figure 4 using mesh analysis. 10

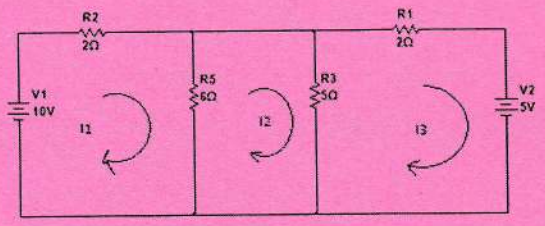


Figure 4

b) Find currents $I_1$ and $I_2$ in figure 5 using nodal analysis. 10

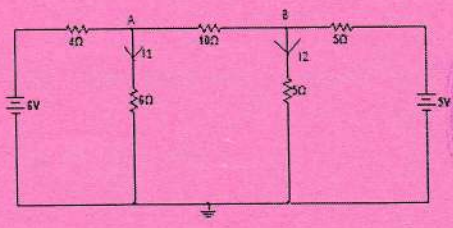

Figure 5

4. a) Determine the current I in figure 6 using Thevenin's Theorem 10

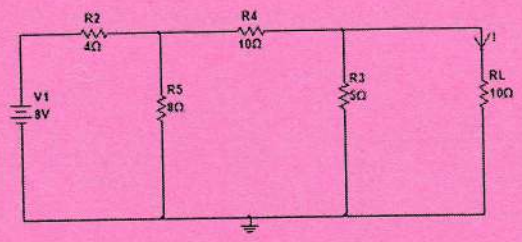


Figure 6

b) Determine current I through 2Ω resistor in figure 7 using Superposition Theorem. 10

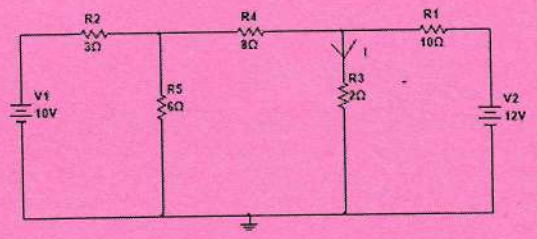


Figure 7



5. a) Draw the phasor diagram for the following cases: 10

i. A.C. Through pure ohmic resistance alone.
ii. A.C. Through pure inductance alone.
iii. A.C. Through pure capacitor alone.
iv. A.C. through series resistor and inductor circuit.
v. A.C. through series resistor and capacitor circuit.

b) A 50 Hz sinusoidal waveform of voltage $v(t)=100\sin 314t$ is applied to a series R-L circuit. The values of resistance and inductance are 5Ω and 0.4mH respectively. Determine the following 7

i. RMS Value of the voltage waveform
ii. Inductive reactance $X_L$.
iii. Impedance $Z_L$
iv. RMS Value of current.
v. Phase angle
vi. Power factor.

c) What is maximum power transfer theorem? 3

6 a) The instantaneous value of a waveform is given as v(t)=10Sin314t.What is the maximum value, frequency and time period of the waveform? 4

b) What is the function of resistor, capacitor and inductor in a circuit? 6

c) Define the following 10

i. R.M.S value of an alternating waveform.
ii. Average value of an alternating waveform.
iii. Phase difference between two alternating waveforms.
iv. Impedance.
v. Reactance.

7 Write short notes on the following: 20

i. Star/Delta Transformation.
ii. Source conversion.
iii. R.M.S value and Average value of an alternating waveform
iv. Independent and dependent sources.
v. Active, passive and apparent power.