Semester: *III* **Course name & Code:** *Network Analysis (PYS 101)*

Total marks: *60* **Date:** *28/11/2022* **Duration:** *2 Hours* **Total No of pages: 02**

Instructions:

1) *All questions are compulsory, however internal choice is available.*
2) *Figures to the right indicate maximum marks to the question.*
3) *Symbols have their usual meanings unless otherwise stated.*
4) *Draw neat diagram wherever necessary.*
5) *Use of non-programmable calculator is permitted.*

Q.1. Answer any **Five** of the following questions. **(2 x 5 = 10)**

a) Explain the working of constant current source.
b) State the principal of non-inductive resistance coil.
c) State Kirchhoff's voltage law.
d) Sketch the graph to show the resonance in a series LCR resonance circuit.
e) State the application of Wheatstone A.C. Bridge.
f) What is meant by a two-port network?
g) List different kinds of losses in a transformers.

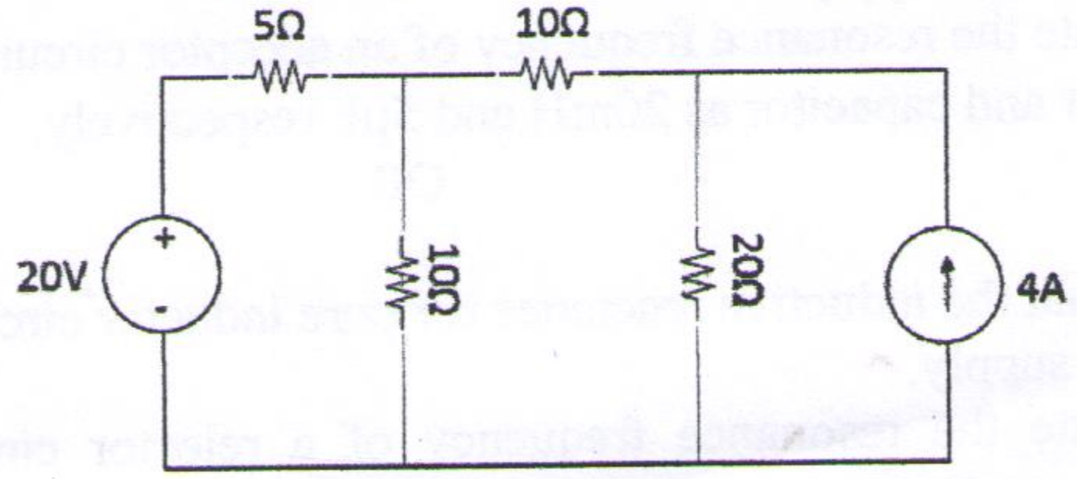
Q.2. Answer any **Five** of the following questions. **(2 x 5 = 10)**

a) What is meant by an ideal power source?
b) Calculate the total inductance of the coils 1mH, 2mH and 3mH connected in parallel.
c) State the principal based on which a transformer works.
d) Capacitive reactance in D.C. circuit is infinite. Explain.
e) Why there is no power factor or power factor is zero for a pure inductor or capacitor?
f) Draw DeSauty's Capacitance Bridge and also write the balancing condition.
g) State the significance of the time constant in a LR circuits.

Q.3.(A)

(p) State the limitations of the Superposition theorem. **(2)**

(q) Find the current flowing through 20Ω using the superposition theorem. **(3)**



OR

Q.3.(A)

(x) State Thevenin's Theorem. **(2)**

(y) Draw neat diagram of two coils of self-inductance L1 and L2 are connected in parallel and Derive the expression for the total inductance. **(3)**

Q.3.(B)

State Norton's Theorem and draw a Norton equivalent circuit to demonstrate the same. **(5)**

Q.4.(A)

(p) Show that in case of A.C. the potential drop across an inductor lags the current by 90°. **(2)**

(q) A charged 30μF capacitor is connected to a 27 mH inductor. What is the frequency of free oscillations of the circuit? **(3)**

OR

Q.4.(A)

(x) Draw the frequency response curve for LCR parallel resonance. Give one application of a resonant circuit. **(2)**

(y) Draw a two port network and mention all the relevant z-parameters. **(3)**

Q.4.(B)

A D.C. source of e.m.f V volts is connected in series with a key, a capacitor of C Farads and a resistor of R Ω. Find the maximum charge on the capacitor and the time taken for the charge to reach half its maximum value. **(5)**

Q.5.(A)

(p) How can the transformers be categorised as a step-up or step-down transformers? **(2)**

(q) A D.C. electromagnet is wound with 960 turns and has resistance of 50Ω when the exciting voltage is 230V, the magnetic flux linking the coil is 0.005Wb. Calculate the self – inductance of the coil and the energy stored in the magnetic field. **(3)**

OR

Q.5.(A)

(x) What is meant by an ideal transformer? Explain. **(2)**

(y) What is the self-inductance of a solenoid of length 40cm, area of cross section 20cm2 and total number of turns = 800? **(3)**

Q.5.(B)

Derive expression for average power supplied to resistance over a complete cycle in an A.C. circuit. **(5)**

Q.6.(A)

(p) Show that the capacitive reactance for pure capacitor circuit is infinite in case of D.C. supply. **(2)**

(q) Calculate the resonance frequency of an acceptor circuit with value of inductor and capacitor as 20mH and 5μF respectively. **(3)**

OR

Q.6.(A)

(x) Show that the inductive reactance for pure inductor circuit is zero in case of D.C. supply. **(2)**

(y) Calculate the resonance frequency of a rejector circuit with value of inductor and capacitor as 60mH and 25μF respectively. **(3)**

Q.6.(B)

Name the basic interconnection that can be done with two-port networks. Demonstrate at least two of them with neat circuit diagram. **(5)**