(University of Choice)

MASINDE MULIRO UNIVERSITY OF SCIENCE AND TECHNOLOGY (MMUST)

MAIN CAMPUS

UNIVERSITY EXAMINATIONS 2021/2022 ACADEMIC YEAR

SECOND YEAR SECOND SEMESTER EXAMINATIONS

FOR THE DIPLOMA IN ELECTRICAL AND ELECTRONICS ENGINEERING

COURSE CODE: DEE 072

COURSE TITLE: ELECTRICAL ENGINEERING PRINCIPLES III

DATE: Thursday 28th April, 2022 **TIME:** 12.00p.m – 2.00 p.m

INSTRUCTIONS TO CANDIDATES

ANSWER QUESTION ONE AND ANY OTHER TWO QUESTIONS.
QUESTION ONE CARRIES 30 MARKS AND ALL OTHERS 20 MARKS EACH.

TIME: 2 Hours

MMUST observes ZERO tolerance to examination cheating

Question One

a) State THREE advantages of three phase systems over single phase systems (3 marks)

b) Prove that the current flowing between the neutral points for a star-star connection with a balanced load is equal to zero (8 marks)

c) A series RLC circuit containing a resistance of 15 Ω an inductance of 200 mH and capacitance of 33 μF are connected in series across 100 V 50 Hz supply. Calculate the total circuit impedance, circuit's current, voltage across the components, power factor and draw the voltage phasor diagram (15 marks)

d) Differentiate between low pass filter and high pass filter (4 marks)

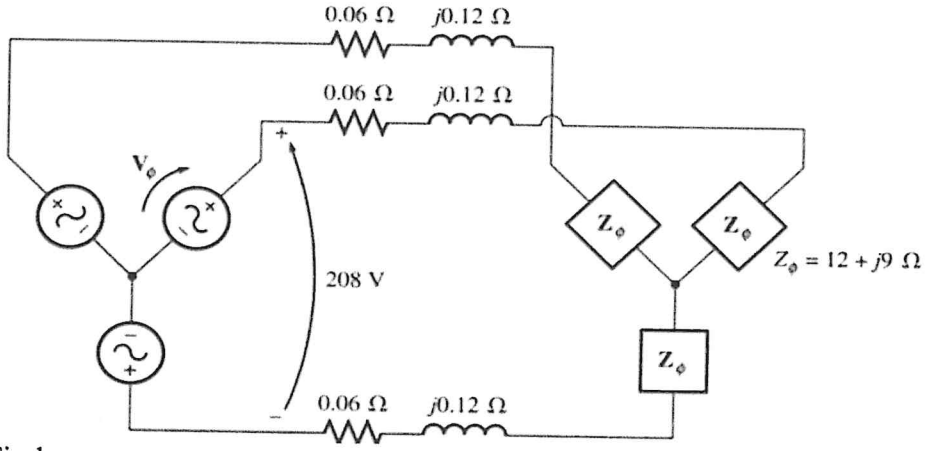
Question Two

a) With the aid of sketches, give a brief description of the following connections as applied in three phase circuits

i) Star (Y) connection (3 marks)

ii) Delta (Δ) connection (3 marks)

b) For a 208-V three-phase ideally balanced system shown below,



Find:

i) The magnitude of the line current I_L (4 marks)

ii) The magnitude of the load's line and phase voltages V_{LL} and $V_{\Phi L}$; (3 marks)

iii) The real, reactive, and the apparent powers consumed by the load; (3 marks)

iv) The power factor of the load. (2 marks)

c) Determine the line current of a balanced delta connected load if current through one of the phases is 10A (2 marks)

Question Three

a) Differentiate between Band stop and Band pass filters (2 marks)

b) Design a low pass filter (both T and π sections) having a cut off frequency of 2 KHz to operate with a terminated load resistance of 400Ω. (sketch the circuits)

(6 marks)

c) Design an m-derived LPF (T-section) having a cut-off frequency of 6 kHz and a design impedance of 500 V. The frequency of infinite attenuation should be 1.75 times the cut-off frequency

(10 marks)

d) State TWO types of attenuators

(2 marks)

Question Four

a) Differentiate between one port network and two port network

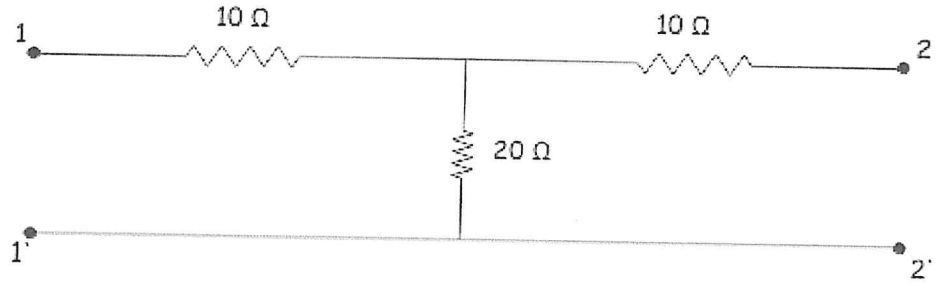
(4 marks)

b) State the FOUR Z-parameters of a two port network

(4 marks)

c) For the circuit given below, find the Z-parameters

(5 marks)

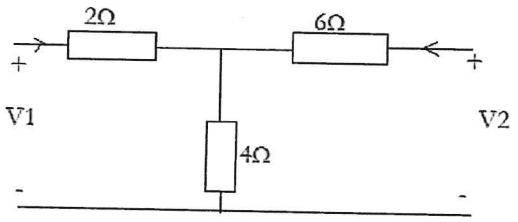


d) Distinguish between Y and Z parameters

(2 marks)

e) Find Y parameters for the circuit shown below

(5 marks)



Question Five

a) Sketch a frequency response curve for RLC series resonant circuit with clear indication of bandwidth

(3 marks)

b) State TWO similarities between series resonant and parallel resonant circuits

(2 marks)

c) A series resonance network consisting of a resistor of 30Ω, a capacitor of 2uF and an inductor of 20mH is connected across a sinusoidal supply voltage which has a constant output of 9 volts at all frequencies. Calculate, the resonant frequency, the current at

resonance, the voltage across the inductor and capacitor at resonance, the quality factor and the bandwidth of the circuit.

(7 marks)

d) Sketch phasor diagram of parallel RLC circuit and derive equation for source current

(4 marks)

e) A 1kΩ resistor, a 142mH coil and a 160uF capacitor are all connected in parallel across a 240V, 60Hz supply. Calculate the impedance of the parallel RLC circuit and the current drawn from the supply

(4 marks)