



MACHAKOS UNIVERSITY

DIPLOMA II TVET

2601/204C, ELECTRICAL CIRCUIT ANALYSIS TIME 3HRS

Answer all questions

Time 2 Hrs

Question One

1. a) Explain the function of the following parts of a D.C. machine

I) Pole shoes

II) Armature core

(4marks)

ii) A D.C. shunt motor is supplied with 230V with a current of 5A at 1000 rpm. The armature resistance and shunt are 0.2Ω and 230Ω respectively. The armature current is varied to 30A using rheostatic method. Calculate new speed. (5marks)

b) i) Explain the dynamic braking in d.c. machines

(4marks)

ii) List the requirements of a good braking system

(4marks)

c) Highlight any three areas of application of shunt wound D.C. motor.

(3marks)

Question Two

2. a) i) For figure 1 below determine the current through the $6 + j8\Omega$ resistor using the Thevenins theorem.

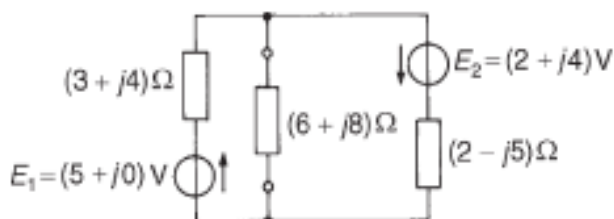


Figure 1

ii) State the Nortons theorem

(3marks)

b) For circuit in figure 2 below, using Delta-Star, transformation, determine the supply current.

(7marks)

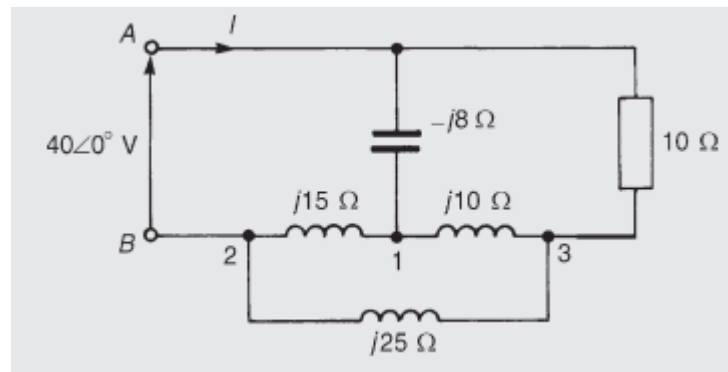


Figure2

c) For the circuit shown in figure 3 below the load impedance Z is a pure resistance. Determine the value of R for maximum power to be transferred from the source to the load.

(4marks)

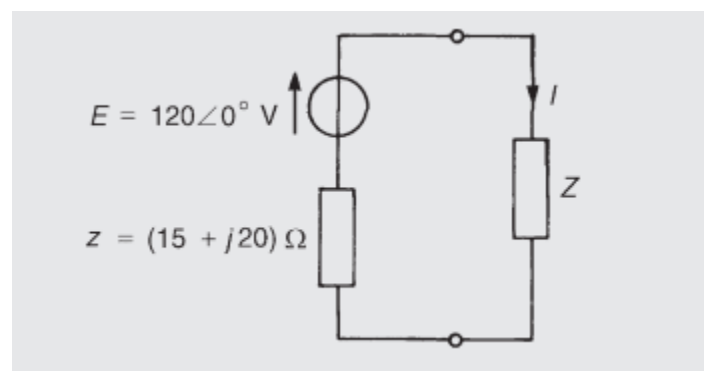


Figure 3

Question 3

1.a) i) Explain the terms D.C transients and Time constant as applied in transients. (4marks)

ii) Draw graphs of R.L growth circuit in transients

(5marks)

b) The windings of a transformer have an inductance of 5H and a resistance of 2Ω connected to a 200V d.c. supply calculate.

- i) Steady state current flowing
- ii) Induced voltage after 0.15
- iii) Time for current to raise to 95% of its final value. (11marks)

Question 4

- a) i) Explain the terms harmonics and periodic time as applied to complex waves. (4marks)
- ii) State any five sources of harmonies (5marks)

b) A supply voltage V is given by

$$V = (300\sin 314t + 100\sin 942 t + 50\sin 1570t)V$$

It is applied to a circuit with resistance of 15Ω , in series to a coil of 10mH

Determine

- i) Expression for instantenous current
- ii) rms current
- iii) rms voltage
- v) Power dissipated (11marks)

Question 5

- a) Define the following terms power factor and reactive power in A.C. circuit (4marks)
- b) A circuit has a resistor of 30Ω in series with an inductance of 0.2H. A 250V, 50Hz supply is connected. Determine

- i) Impedance
- ii) Current and phase angle
- iii) p.d. across the 30Ω resistor
- iv) p.d across the coil (8marks)

c) An A.C. network consists of a coil of inductance 80mH and resistance 20Ω in parallel with a capacitor of $50\mu F$. If the supply voltage is $300V\angle 0^\circ$ at 50Hz supply. Determine

- i) Total circuit impedance
- ii) Supply current
- iii) Circuit phase angle
- iv) Current in capacitor (8 marks)