POLITEKNIK
Jabatan Pengajian Politeknik

EXAMINATION AND EVALUATION DIVISION
DEPARTMENT OF POLYTECHNIC EDUCATION
(MINISTRY OF HIGHER EDUCATION)

MECHANICAL ENGINEERING DEPARTMENT

FINAL EXAMINATION

JUNE 2012 SESSION

E2063 – ELECTRICAL TECHNOLOGY 2

DATE: 19 NOVEMBER 2012(MONDAY)
DURATION: 2 HOURS (8:30AM-10:30AM)

This paper consists of **FIVE**(5) pages including the front page.
Essay (6 questions – **answer 4 questions**)

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INSTRUCTION

This section consists of **SIX(6)** essay questions. Answer **FOUR (4)** questions only.

QUESTION 1

a) State the definition of the magnetomotive force(mmf).

(3 marks)

b) State four (4) differences between magnetic and electrical circuit.

(8 marks)

c) A iron ring of mean diameter 20 cm is uniformly wound with 4000 turns of wire. When a current of 0.35A is passed through the coil a flux density of 0.4T is set up in the iron. Calculate;

i. magnetic field strength
ii. relative permeability of the iron
iii. cross-sectional area if the flux is 60 μWb

(9 marks)

d) A conductor carries a current of 70A a right angles to a magnetic field having a flux density of 1.5T. If the length of the conductor in the field is 200mm, calculate;

i. force acting on the conductor
ii. emf induced if the velocity is 5 m/s

(5 marks)

QUESTION 2

a) State any four parts of a DC generator.

(4 marks)

b) State three types of self-excited generators.

(3 marks)

c) An 8 pole generator wave connected armature has 750 conductor and is driven 535 rev/min. If the flux per pole is 30 mWb, determine the generated e.m.f.

(5 marks)

d) A long shunt compound generator has full-load output of 100kW at 250V.The armature,series and shunt windings have resistance of 0.05Ω,0.03Ω and 55Ω respectively.Find:

i. the armature current
ii. generated e.m.f

(13 marks)

QUESTION 3

a) Explain the function of dc motor.

(2 marks)

b) State one (1) of characteristic and one (1) application of series motors and shunt motors.

(8 marks)

c) A 10 pole, 500V dc compound long shunt motor is wave connected and takes 150A. The shunt field resistance, armature resistance and series field resistance are 20Ω, 0.05Ω and 0.6Ω respectively. If the motor is driven at 3000rpm and flux per pole is 35mWb, calculate;

i. the shunt current and armature current

ii. the back emf

iii. the power developed in armature

iv. the torque developed

(15 marks)

QUESTION 4

a) Explain the definition of the slip.

(2 marks)

b) State the formula for the frequency of rotor current.

(3 marks)

c) A 4 pole, 3 phase, star connected alternator has 24 slots with 12 conductors per slot and the flux per pole is 0.1 Wb. Calculate the line emf generated when the alternator is driven at 1500 rpm.

(10marks)

d) A 3 phase induction motor is supplied from a 50 Hz system. Calculate;

i. the synchronous speed

ii. the speed of the rotor when the slip is 4 %

iii. the rotor frequency when speed of the rotor is 600 rpm.

(10 marks)

QUESTION 5

a) Gives the definition and formula of :-

i. Synchronous Speed

iii. Percent Slip

(6 marks)

b) Starter often use in AC control system, state :-

i. Four reason why starter be used

ii. Two types of starter

(6 marks)

c) A 4-pole, 3 phase,240V , 50 H_z induction motor runs at 1440 rev/min at full load. Calculate:-

i. Synchronous speed

(4 marks)

ii. Percent slip

(3 marks)

iii. Rotor frequency

(3 marks)

iv. Stator frequency

(3 marks)

QUESTION 6

a) Draw the circuit diagram symbol for a transformer and state THREE(3) functions of transformer.

(6 marks)

b) State two types of single-phase double-wound transformer construction that are broadly used.

(2 marks)

c) The number of windings for three transformers are

i. Np = 100, Ns = 2000

ii. Np = 3000, Ns = 2000

iii. Np = 100, Ns =100

Calculate the value of K for each transformer then determine the type of transformer and draw the symbol of transformer to differentiate the number of windings.

(12 marks)

d) A transformer output voltage is supplied at 60 V from 240 V A.C supply. Calculate

i. the turns of ratio

ii. the number of primary turns, if the secondary wound are 500 turns.

(5 marks)