

**POLITEKNIK**  
Jabatan Pengajian Politeknik

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

MECHANICAL ENGINEERING DEPARTMENT

FINAL EXAMINATION  
DECEMBER 2011 SESSION

**E 2063: ELECTRICAL TECHNOLOGY 2**

**DATE: 02 MEI 2012(WEDNESDAY)**  
**DURATION: 2 HOURS (8:30AM-10:30AM)**

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

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**DO NOT OPEN THIS QUESTION PAPER UNTIL INSTRUCTED BY THE**  
**CHIEF INVIGILATOR**

**INSTRUCTION**

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

**QUESTION 1**

- a) Describe the definition of electromagnetic. ( 3 marks)
- b) There are **FOUR (4)** factors of magnetic strength in one conductor. Identify the four factors and explain any two of the factors. ( 8 marks)
- c) One soft iron solenoid with 350 turns of wires and 4A current is given through it. The average length for the solenoid is 14cm and mean diameter is 3cm. Calculate:-
- i) Magneto motive force ( 3 marks)
  - ii) Magnetic Field Strength ( 3 marks)
  - iii) Find the total magnetic flux density If the value of relative permeability is 320 . ( 4 marks)
  - iv) Reluctance ( 4 marks)

**QUESTION 2**

- a) A 4 pole, long shunt compound generator supplies 40A at terminal voltage of 200V. If armature resistance is  $0.25\Omega$ , series field resistance is  $0.03\Omega$  and shunt resistance is  $40\Omega$ , Find the generator emf. Take drop per brush as 2V. (10 marks)
- b) A short-shunt cumulative compound dc generator supplies 7.5kW at 230V. The shunt field, series field and armature resistances are  $100\Omega$ ,  $0.3\Omega$  and  $0.4\Omega$  respectively. Calculate the induced emf and the load resistance. (15marks)

## QUESTION 3

- a) The generated emf in an armature winding is given by  $E_g = ZN\Phi P/60A$ . State what Z, N, P and A represent. ( 5 marks)
- b) Explain the principal losses in DC generator. (8 marks)
- c) A shunt generator supplies 80 A at a terminal voltage of 240 volts. The armature and shunt field resistance are  $0.25 \Omega$  and  $65 \Omega$  respectively. The iron and frictional losses are 3000 W. Find :
- i) Emf generated
  - ii) Copper losses
  - iii) Efficiency of transformer

(12 marks)

## QUESTION 4

- a) State **THREE (3)** method how to control the speed of a DC motor (6 marks)
- b) A DC shunt motor has an armature resistance and shunt resistance value of  $0.4 \Omega$  respectively, and  $60 \Omega$ . The motor is supplied with a supply voltage of 120 V and a current 30 A. Calculate:
- i) Shunt current.
  - ii) Armature current
  - iii) Copper losses
  - iv) If iron loss is 350 watts, what is the efficiency of the motor.

(19 marks)

## QUESTION 5

a) State **THREE (3)** of starting methods for induction motors. (3 marks)

b) A 12-pole, 3-phase, 50Hz induction motor runs at 475 rpm at full load. Calculate;

- i. Speed of slip
- ii. Percentage slip
- iii. The frequency of rotor current

(12 marks)

c) A 6 pole, 3 phase, star connected alternator has 12 slots with 6 conductors per slot and the flux per pole is 0.125Wb. Calculate the line emf generated when the alternator is driven at 1200 rpm.

(10 marks)

## QUESTION 6

a) Define the auto-transformer. State **THREE (3)** the advantages of an auto transformer (5 marks)

b) State **TWO (2)** losses occur in a transformer. (6 marks)

c) A 40 kVA single-phase transformer, 1000V/100V, 50 Hz with a secondary winding of 60 turns. Calculate:

- i. Primary current and secondary current
- ii. Number of turns in primary
- iii. Maximum value for the flux

(14 marks)