Universiti Tun Hussein Onn Malaysia

# UNIVERSITI TUN HUSSEIN ONN MALAYSIA

## FINAL EXAMINATION
## SEMESTER II
## SESSION 2013/2014

| | | |
|---|---|---|
| COURSE NAME | : | ELECTRIC POWER AND MACHINES |
| COURSE CODE | : | BNJ 20502 |
| PROGRAMME | : | BNE |
| EXAMINATION DATE | : | JUNE 2014 |
| DURATION | : | 2.5 HOURS |
| INSTRUCTION | : | ANSWER **FIVE (5)** QUESTIONS ONLY |

THIS QUESTION PAPER CONSISTS OF **SIX (6)** PAGES

**Q1** (a) Discuss about electric current.

(3 marks)

(b) A small desktop radio has a resistance of 1k Ω. The voltage is 220V

(i) How much current does it draw?

(3 marks)

(ii) How much power does it use?

(3 marks)

(c) An AC voltage is expressed as $v(t) = 100\sin(2\omega - 45°)V$ with frequency of 200Hz. Sketch the waveforms and label all parameters clearly.

(5 marks)

(d) Explain **THREE(3)** advantages of three-phase system over a single phase power system.

(6 marks)

**Q2** (a) Referring to Figure **Q2(a)**, state **THREE(3)** main components of electric power system and explain their functions.

(9 marks)

(b) A single-phase motor is connected to 230V, 50 Hz line and draws a current of 12A. Given the power factor of the motor is 70%.

(i) Calculate active power absorbed by the motor

(3 marks)

(ii) Calculate the reactive power supplied to the motor

(3 marks)

(c) Explain the important of high power factor in electric power system.

(5 marks)

**Q3** (a) State Faraday's Laws using diagram shown in Figure **Q3(a)**, .

(4 marks)

(b) An ideal transformer, connected to a 240 V mains, supplies a 12 V, 150 W lamp. Calculate :

(i) the transformer turns ratio

(3 marks)

(ii) secondary current

(3 marks)

(iii) the current taken from the supply (primary current)

(3 marks)

(c) The transformer has a turn ratio of 3 and the primary winding is connected to a voltage source of $230V_{AC}$.

(i) Calculate the secondary voltage.

(3 marks)

(ii) If the turn ratio is changed to 0.2, determine the new secondary voltage. Compare and discuss the difference in your finding.

(4 marks)

**Q4** (a) Name **THREE(3)** types of DC motors and sketch the schematic diagram for each of them.

(6 marks)

(b) The counter-emf of a motor is always slightly less than the applied armature voltage. Explain.

(3 marks)

(c) A shunt DC motor rating at 1200 r/min is fed by a 100V source. The line current is 25A and the shunt-field resistance is 100Ω. If the armature resistance is 0.2Ω, calculate the following:

(i) the current in the armature

(3 marks)

(ii) the counter-emf

(4 marks)

(iii) the mechanical power developed by the motor

(4 marks)

**Q5** (a) Name the principal components of an induction motor.

(3 marks)

(b) Explain the operating principles of induction motor using diagram as in Figure **Q5(b)**.

(8 marks)

A 208V, 10hp, four-pole, 60Hz induction motor has a full-load slip of 5%.

(c) Calculate :

(i) the synchronous speed of the motor

(3 marks)

(ii) the rotor speed at the rated load

(3 marks)

(iii) the rotor frequency of this motor

(3 marks)

**Q6** (a) Briefly explain :

(i) electromagnetsim.

(3 marks)

(ii) electromagnetic induction

(3 marks)

(b) The maximum working flux density of a lifting electromagnet is 1.8 T and the effective area of a pole face is circular in cross-section. If the total magnetic flux produced is 353 mWb, determine the radius of the pole face.

(5 marks)

(c) An ideal transformer has primary winding of 90 turns and secondary winding of 2250 turns. The primary side is connected to a 120V, 60Hz AC source. Calculate :

(i) the voltage across the secondary terminals

(3 marks)

(ii) the peak voltage across the secondary terminals

(3 marks)

(iii) the instantaneous voltage across the secondary when the instantaneous voltage across the primary is 37V.

(3 marks)

**— END OF QUESTION —**

**FINAL EXAMINATION**

SEMESTER/ SESSION : SEM II 2013/2014 PROGRAMME : BNL
COURSE : ELECTRIC POWER AND MACHINES COURSE CODE : BNJ 20502

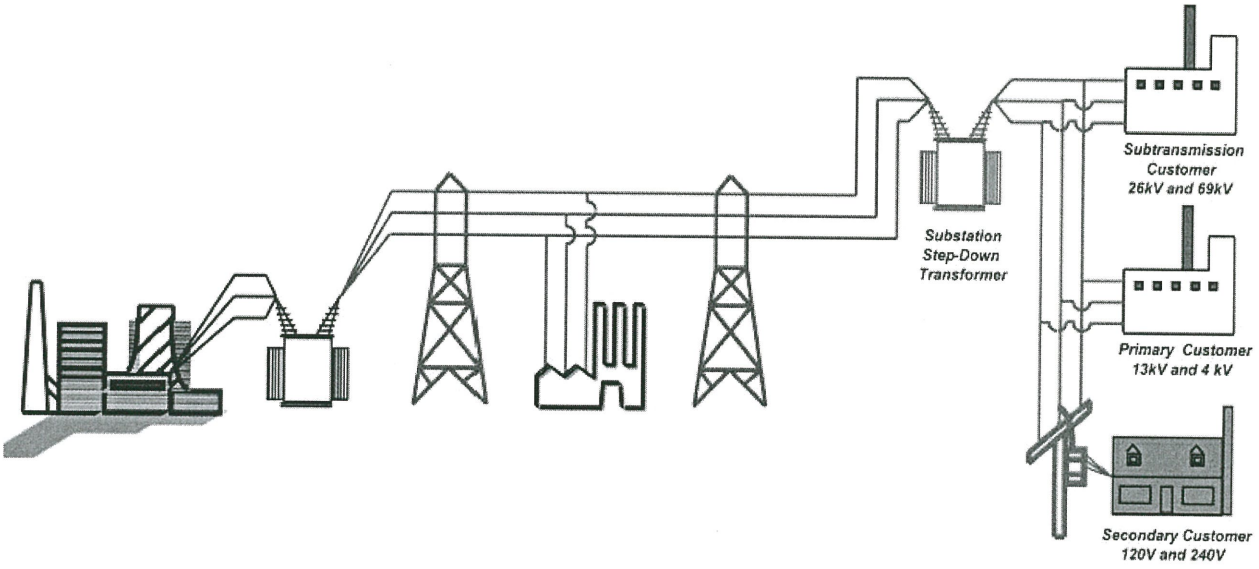


**FIGURE Q2(a)**

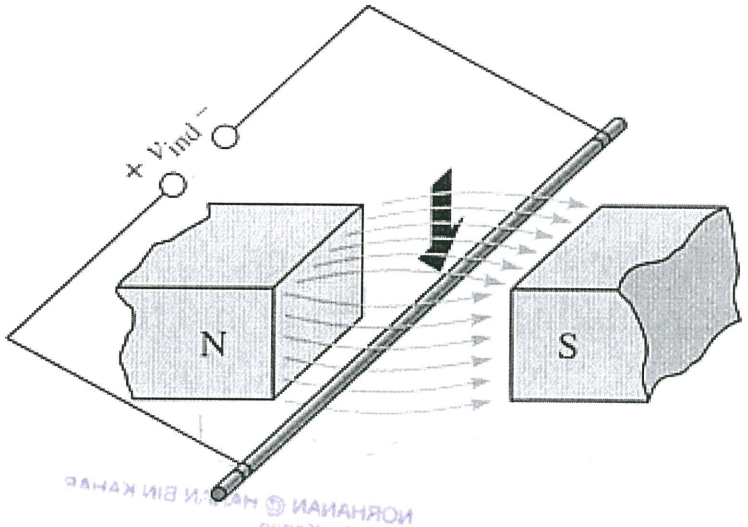


**FIGURE Q3(a)**

**FINAL EXAMINATION**

SEMESTER/ SESSION : SEM II 2013/2014 PROGRAMME : BNL
COURSE : ELECTRIC POWER AND MACHINES COURSE CODE : BNJ 20502

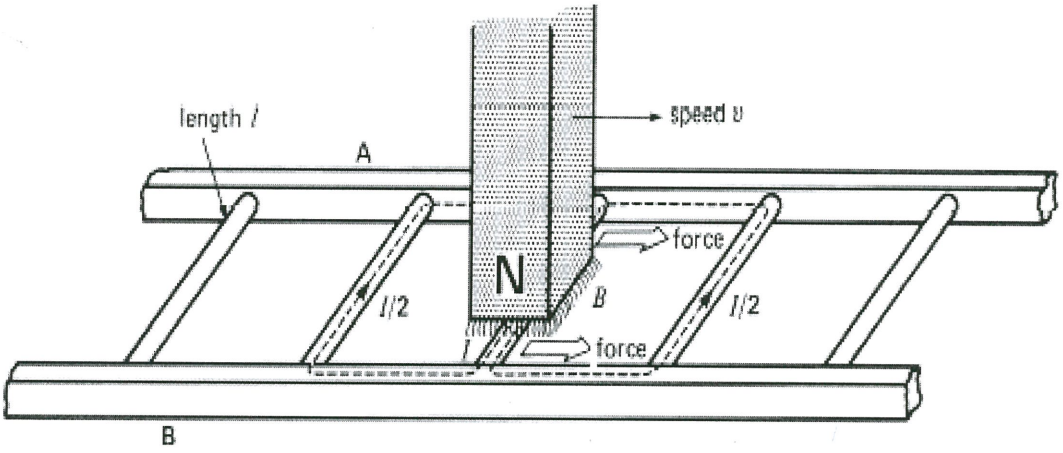


**FIGURE Q5(b)**