Universiti Tun Hussein Onn Malaysia

UNIVERSITI TUN HUSSEIN ONN MALAYSIA

FINAL EXAMINATION
SEMESTER II
SESSION 2014/2015

COURSE NAME	:	ELECTRICAL MACHINE
COURSE CODE	:	BBV 30203
PROGRAMME	:	BACHELOR OF VOCATIONAL EDUCATION (ELECTRICAL AND ELECTRONIC)
EXAMINATION DATE	:	JUNE / JULY 2015
DURATION	:	3 HOURS
INSTRUCTION	:	ANSWER **FIVE (5)** QUESTIONS ONLY

THIS QUESTION PAPER CONSISTS OF **FIVE (5)** PAGES

S1 (a) The basic parts of DC machine are stator and rotor. Describe:

(i) Rotor
(ii) Stator

(4 marks)

(b) A commutator is important part of DC generator.

(i) Describe the function of commutator in a DC generator.
(ii) Explain how commutator work in a DC generator by using a suitable diagram.

(6 marks)

(c) A DC shunt generator supplies a 15 kW load at 200 V through cable of resistance, R=100 mΩ. If the field winding resistance R_f=50Ω and the armature resistance, R_a = 40mΩ, determine:

(i) the terminal voltage.
(ii) Generated EMF in the armature.

(10 marks)

S2 (a) Describe types of losses below:

(i) Copper loss.
(ii) Iron loss.
(iii) Windage loss.
(iv) Friction loss.

(8 marks)

(b) A separately excited DC generator is connected to a 50Ω load and a current of 8A flows. If the armature resistance is 0.8Ω. The excitor voltage is 240V.

(i) Draw and label the equivalent of this generator.
(ii) State the equation for the equivalent circuit of the DC generator.
(iii) Calculate the terminal voltage.
(iv) Calculate the generated EMF.

(12 marks)

S3 (a) Draw and label the equivalent circuit of DC motor listed below:

(i) shunt-wound motor.
(ii) series-wound motor.
(iii) compound wound motor.

(6 marks)

(b) Explain how reversal of rotation can be made for shunt wound DC motor.

(4 marks)

(c) A 240V shunt motor takes a total current of 30A. If the field winding resistance $R_f = 150\Omega$ and the armature resistance $R_a = 0.3\Omega$. Determine :
(i) the armature current.
(ii) back EMF.
(iii) efficiency of the motor.

(10 marks)

S4 (a) Define what is a generator.

(2 marks)

(b) By using a suitable diagram, explain how single phase AC voltage is generated form AC generator.

(4 marks)

(c) For the large AC three phase generator, it is more practical to rotate the magnetic field and fix armature winding. By using a suitable diagram, explain how the three phase AC voltage is generated by the large three phase generator.

(8 marks)

(d) A synchronous generator with 4 poles is attached to prime mover. Determine the speed of generator in order to produce a voltage with frequency of:
i) 50 Hz.
ii) 60 Hz.

(6 marks)

S5 (a) Describe what is the meaning of slip in three (3) phase induction motor.

(3 marks)

(b) Draw the rotation of stator magnetic field in squirrel cage three phase motor according to the three phase supply waveform.

(8 marks)

(c) A three phase squirrel cage induction motor with 4 poles running 1460 rpm at full load. If the motor supplied by 415V 50 Hz, determine:

(i) Synchronous speed.
(ii) Slip .
(iii) Slip percentage.

(9 marks)

S6 (a) List down two (2) types of single phase induction motor.

(3 marks)

(b) Draw the equivalent circuit for two types of single phase induction motor in question S6 (a).

(4 marks)

(c) Induction motor is a great invention in history of electrical machine evolusion. Describe three (3) advantages of induction motor.

(3 marks)

(d) The power supplied to a three-phase induction motor is 40kW and the stator losses are 1200W. If the slip is 5 per cent, determine:

(i) the rotor copper loss.
(ii) the total mechanical power developed by the rotor.
(iii) the output power of the motor if friction and windage losses are 750W .
(iv) the efficiency of the motor, neglecting rotor copper loss.

(10 marks)

S7 (a) Describe why an induction motor have a lagging power factor.

(3 marks)

(b) By using a suitable diagram explain the stage of losses for an induction motor.

(5 marks)

(c) A six(6)-pole three phase, 415V, 50 Hz induction motor rotate at 940 rpm at 0.8 lagging power factor. Stator losses is 1kW and windage and friction losses is 2 kW. Determine :

(i) Slip.
(ii) Rotor copper losses.
(iii) Mechanical output power.
(iv) Efficiency.

(12 marks)

END OF QUESTIONS