UTHM
Universiti Tun Hussein Onn Malaysia

UNIVERSITI TUN HUSSEIN ONN MALAYSIA

FINAL EXAMINATION
SEMESTER I
SESSION 2017/2018

COURSE NAME	:	ELECTRICAL MACHINE
COURSE CODE	:	BBV 30203
PROGRAMME CODE	:	BBE
EXAMINATION DATE	:	DECEMBER 2017/JANUARY 2018
DURATION	:	3 HOURS
INSTRUCTION	:	ANSWER **ALL** QUESTIONS

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THIS QUESTION PAPER CONSISTS OF **FOUR(4)** PAGES

Q1   (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 50 Ω load and a current of 8 A flows. If the armature resistance is 0.8 Ω. The excitor voltage is 240 V

     (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)

Q2   (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, 415 V, 50 Hz induction motor rotate at 940 rpm at 0.8 lagging power factor. Stator losses is 1 kW and windage and friction losses is 2 kW. Determine

     (i)   slip
     (ii)   rotor copper losses
     (iii)   mechanical output power
     (iv)   efficiency

(12 marks)

Q3   (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 240 V shunt motor takes a total current of 30 A. 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)

Q4   (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 four (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

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(6 marks)

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Q5   (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 Q5 (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 40 kW and the stator losses are 1200 W. If the slip is 5%, 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 750 W
(iv)   the efficiency of the motor, neglecting rotor copper loss

(10 marks)

- END OF QUESTIONS -