UNIVERSITI TUN HUSSEIN ONN MALAYSIA

PEPERIKSAAN AKHIR
SEMESTER II
SESI 2008/2009

NAMA MATA PELAJARAN	:	MESIN ELEKTRIK DAN PEMACU
KOD MATA PELAJARAN	:	DEK 3143
KURSUS	:	3 DEE/DET/DEX
TARIKH PEPERIKSAAN	:	APRIL/MEI 2009
JANGKAMASA	:	2 1/2 JAM
ARAHAN	:	JAWAB EMPAT (4) SOALAN SAHAJA DARIPADA LIMA (5) SOALAN

KERTAS SOALAN INI MENGANDUNGI LIMA (4) MUKA SURAT

Q1 (a) Explain the differences between ideal and practical transformers by using schematic diagram.

(4 marks)

(b) A 20 kVA, 6000/415 V, 50 Hz transformer has the following equivalent circuit parameter:

$R_p = 30\ \Omega$	$R_s = 0.6\ \Omega$
$X_p = 40\ \Omega$	$X_s = 0.8\ \Omega$
$R_m = 100\ k\Omega$	$X_m = 40\ k\Omega$

(i) Draw the equivalent circuit with the necessary parameters of the transformer referred to the high voltage side.

(ii) Determine the efficiency of the transformer when its work at 400V , 15kW and 0.8 power factor lagging.

(11 marks)

(c) Briefly explain short-circuit and open-circuit tests to measure parameter of the transformer.

(10 marks)

Q2 (a) A compound DC motor rated at 415 V, 10 HP, 1500 rpm has armature resistance 0.35 Ω, series field resistance 0.65 Ω and shunt field resistance 80 Ω. The rotational losses are 500 W. The full load line current is 40 A. Draw the schematic diagram and calculate:

(i) Input power
(ii) Developed mechanical power
(iii) output power
(iv) Load torque
(v) Developed torque
(vi) Efficiency of the motor

(11 marks)

(b) Describe how to generate AC and DC signals for machinery application.

(8 marks)

(c) The performance characteristics of a dc machine are greatly influenced by the way in which the field winding is excited with direct current. There are two ways of exciting a dc machine, shunt and series excitation. Using a schematic diagram, explain the differences between shunt and series motors.

(6 marks)

Q3 (a) A 415 V, 50 Hz, 20-hp, 4-pole, Y connected induction motor has the following impedances in ohms per phase referred to the stator circuit:

$R_1 = 0.65\Omega$ $R_R' = 0.45\Omega$

$X_1 = 1.25\Omega$ $X_R' = 0.65\Omega$

$X_m = 25\Omega$ $R_c = \infty$

At full load condition , the rotational losses are 1200W and assumed to be constant. The core loss is lumped in with the rotational losses. For a rotor slip of 3% at the rated voltage and rated frequency, using approximate equivalent circuit, find the motor's

(i) Speed
(ii) Stator current
(iii) Power factor
(iv) Input power
(v) air gap power
(vi) converted power
(vii) torque induced by the motor
(viii) load torque
(ix) starting torque
(x) efficiency of the motor
(xi) power flow diagram

(25 marks)

Q4 (a) Sketch and explain the advantages of salient and cylindrical rotors.

(6 marks)

(c) A three phase, delta connected synchronous generator is rated 120 kVA, 1.5 kV, 50 Hz, 0.75 pf lagging. Its synchronous inductance is 2.0mH and effective resistance is 2.5 Ω.

(i) Determine the voltage regulation at this frequency.
(ii) Determine the rated voltage and apparent power if the supply frequency is going to be twice.
(iii) Determine the voltage regulation if the frequency is increased to 120% of the original frequency.
(iv) Draw the phasor diagram to represent E_a , I_a and V_t.

(19 marks)

Q5 (a) Explain the operation, sketch the output characteristic and the symbol of the following devices.

(i) IGBT, Insulated Gate Bipolar Transistor
(ii) SCR, Silicon-Controlled Rectifier

(10 marks)

(b) State and explain briefly three methods of speed control for DC motors.
(15 marks)