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CONFIDENTIAL

SET A

UNIVERSITI KUALA LUMPUR
Malaysia France Institute

FINAL EXAMINATION
JANUARY 2011 SESSION

SUBJECT CODE	:	FED 20102
SUBJECT TITLE	:	ELECTRICAL MACHINES
LEVEL	:	DIPLOMA
TIME / DURATION	:	12.30pm – 2.30pm (2 HOURS)
DATE	:	14 MAY 2011

INSTRUCTIONS TO CANDIDATES

1. Please read the instructions given in the question paper CAREFULLY.
2. This question paper is printed on both sides of the paper.
3. Please write your answers on the answer booklet provided.
4. Answer should be written in blue or black ink except for sketching, graphic and illustration.
5. Answer four (4) questions only.
6. Answer all questions in English.

THERE ARE 5 PAGES OF QUESTIONS, EXCLUDING THIS PAGE.

INSTRUCTION: Answer FOUR questions only.
Please use the answer booklet provided.

Question 1

(a) Derive the e.m.f (Eg) equation for the shunt dc generator. State clearly the meaning and units of the symbols used.

(5 marks)

(b) In a particular dc generator, if P = 8, Z = 400, N = 300 rpm and Φ = 100 mWb, calculate generated e.m.f (Eg) if winding in :-

i. Lap connected.

(2.5 marks)

ii. Wave connected.

(2.5 marks)

(c) A 4 pole, lap wound connected 750 rpm dc shunt generator has an armature resistance of 0. 4Ω and field resistance of 200Ω. The armature has 720 conductors and the flux is 30 mWb. If the load resistance is 15Ω, determine the terminal voltage.

(15 marks)

Question 2

(a) Explain the difference between a generator and a motor ?

(5 marks)

(b) A 500 V d.c shunt motor has an armature and field resistance of 1.5 Ω and 400 Ω respectively. When running on no load the current taken is 5 A and the speed is 1000 rpm.

Calculate :

i. The speed when motor is fully loaded and the total current drawn from the supply is 30 A.

(10 marks)

ii. The speed at this load if the field current is reduced by 15 %.

(10 marks)

Question 3

(a) Explain the transformer parameters that obtained from Open Circuit Test and Short Circuit Test ?

(5 marks)

(b) A 40 kVA, 400 / 200 V, 50 Hz single phase transformer has the following data :

Rc = 320 Ω (H.V. side) Xm = j82.6 Ω (H.V. side)

Req = 0.06 Ω (L.V. side) Xeq = j0.1908 Ω (L.V. side)

From the given data, determine :

i. Approximation equivalent circuit referred to L.V side.

(10 marks)

ii. Input voltage, Es and current, Ip' when transformer supplying load of (0.5 + j 1.5) Ω.

(10 marks)

Question 4

(a) List the various losses those take place in an induction motor.

(5 marks)

(b) A 415 V, 50 Hz, 6 pole, Y-connected three phase induction motor has the following data.

Stator impedance	= 0.5 ∟ 53.13^0 Ω
Equivalent rotor impedance	= 0.447 ∟ 63.43^0 Ω
Core resistance	= 80 Ω
Magnetizing reactance	= j18 Ω

Using the approximation equivalent circuit, calculate for a slip 4 % :

i. Motor speed.

(2 marks)

ii. Stator current.

(10 marks)

iii. Output power and efficiency if mechanical losses to be 1.5 kW.

(8 marks)

Question 5

(a) Define the following terms related to a stepper motor.

(5 marks)

i. Holding torque.

ii. Step angle.

(b) A single phase 120 V, 50 Hz four pole induction motor has the following constant in the equivalent circuit.

$R_1 = R_2 = 2\ \Omega$

$X_1 = X_2 = j2\ \Omega$

$X_m = j50\ \Omega$

There is a friction and windage loss of 35W.

For a 10% slip, calculate :

i. Motor input current.

(16 marks)

ii. Motor efficiency

(4 marks)

END OF QUESTION PAPER