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CONFIDENTIAL

SET A

UNIVERSITI KUALA LUMPUR
Malaysia France Institute

FINAL EXAMINATION

SEPTEMBER 2014 SESSION

SUBJECT CODE	:	**FEB24083**
SUBJECT TITLE	:	**ELECTRICAL MACHINES**
LEVEL	:	**BACHELOR**
TIME / DURATION	:	**3.00 PM – 5.30 PM (2.5 HOURS)**
DATE	:	**2 JANUARY 2015**

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.) Describe a method for obtaining a no-load saturation (open circuit characteristic) curve for separately excited d.c generator.

(8 marks)

b.) The Open Circuit Characteristic (O.C.C) of d.c generator running at 800 r.p.m is as follows :

Field current, If (A)	: 0.5	1.0	1.5	2.0	2.5	3.0	3.5
Generated voltage, Eg (V)	: 60	120	140	150	156	158.7	160

If the machine is run as a shunt generator at speed of 1200 rpm, and its field resistance is adjusted at 90 Ω , determine :

(17 marks)

i.) The open circuit voltage.

ii.) The value of external field circuit resistance if the generator is to build up 200 V when its field coils are grouped in series with field resistance.

iii.) Without additional resistance, calculate load current supplied by the generator when its terminal voltage is 180 V. take armature resistance = 0.5 Ω.

Question 2

a.) What is the mode of excitation? If iron loss in d.c motor increases with increasing load.

(5 marks)

b.) A 240 V d.c shunt motor with constant field drives a load whose torque is proportional to the speed. When running at 1000 rpm it takes 35 A armature current. Find the speed at which it will run is a 20 Ω resistance is connected in series with its armature circuit. The resistance of armature is 0.8 Ω.

(10 marks)

c.) A 240 V d.c shunt motor has an armature circuit resistance of 0.5 Ω and field resistance of 200 Ω. This motor drives a constant torque load and takes an amature current of 25 A at 1000 rpm. If motor speed is to be raised from 1000 to 1800 rpm, find the resistance that must be inserted in the field circuit.

(10 marks)

Question 3

a.) What are the two components that contribute to the copper losses in transformer ?

(4 marks)

b.) What useful information is obtained from open circuit test ?

(3 marks)

c.) A 4kVA, 400/200 V, 50 Hz single phase transformer has the following test data :

O.C. Test (L.V. Side) :	200 V	1A	64 W
S.C. Test (H.V. Side) :	15 V	10A	80 W

(18 marks)

Determine :

i.) Equivalent circuit referred to L.V side .

ii.) Secondary load voltage on full load at 0.8 lagging power factor.

Question 4

a.) Derive an expression for the torque of an induction motor .

(8 marks)

b.) A 3 phase, star-connected, 415 V (line to line), 50 Hz, 4-pole induction motor has the following constants in ohm per phase referred to stator.

(17 marks)

$R_1 = 0.29\ \Omega$ $R_2 = 0.14\ \Omega$

$jX_1 = j\ 0.5\ \Omega$ $jX_2 = j\ 0.21\ \Omega$ $jXm = j\ 13.25\ \Omega$

The total friction, windage and core loss may be assumed to be constant at 600 W. For a slip of 2%, calculate :

i.) Rotor speed.

ii.) Stator current.

iii.) Output power.

Question 5

a.) List two applications and disadvantages of single phase induction motor.

(8 marks)

b.) The following tests result were obtained in case of 220 V single phase induction motor.

(17 marks)

No load test	:	220 V	5.8 A	310 W
Locked rotor test	:	120 V	13.8 A	530 W

Stator winding resistance = 1.4 Ω

At slip,s = 0.05 , determine :

i.) Motor parameters and approximate equivalent circuit .

ii.) Input current

END OF QUESTION