



Prifysgol Cymru
Y Drindod Dewi Sant
University of Wales
Trinity Saint David

Examination Answer Books

12 Pages

Instructions to Candidates

1. Please give the information requested in the boxes below.
2. Enter your name in the space provided to the right, fold over and seal down (using the label provided) to hide your name.
3. The answers must be legibly written. The Examiners can either ignore illegible script or have it typed and the expense of typing charged to the candidate.
4. Write your answers in ink.
5. Begin each answer on a fresh page. Do all rough work in the answer book and cross it through.
6. No part of this book is to be torn out; it must be handed in complete.
7. If more books than one are used, fasten them together using the tags available from the invigilator(s).
8. Every book must be handed in. In no circumstances may answer books, used or unused, be taken out of the examination venue.

1	Student Number	1706135
2	Title of Examination Paper	Electrical Machines
3	Module Code	MG XQQ 373
4	Date and Time of Examination	17/05/19 3:00 pm
5	Examination Venue	IQ building Room 310
6	Seat Number	G065
7	Number of Answer Books handed in	1

Complete, fold and seal
(see note 2 below)

SURNAME: Davies

FORENAME(S): Nathan

List the numbers of the questions you have attempted	Office Use	
1	10	10
2	5	5
3	3	3
4	2	2
5	2	2
6	0	0
7	2	2
Total	24	24

(Gweler yr ochr arall am y fersiwn Cymraeg)

48 %

48%

1/1

$$B = 560 \mu Wb$$

$$N = 1200$$

$$\text{Core } L = 650 \text{ mm}$$

$$\text{Air gap} = 90 \text{ mm}$$

$$A = 40 \text{ mm} \times 100 \text{ mm}$$

$$\mu_{\text{gap}} H = \frac{560 \times 10^{-6}}{40 \times 10^{-3} \times 100 \times 10^{-3}}$$

$$\mu_{\text{gap}} H = 0.14 \text{ T}$$

from BH curve.

$$\begin{aligned} \text{mmf}_{\text{core}} &= 310 \times 650 \times 10^{-3} \\ &= 201.5 \text{ A.t} \end{aligned}$$

$$\text{mmf}_{\text{gap}} = \frac{0.14}{\mu_0} = 111408.4602 \text{ A.t} ?$$

$$\begin{aligned} &= 111408.4602 \times 90 \times 10^{-3} \\ &= 10026.76141 \text{ A.t.m} \end{aligned}$$

$$I = \frac{201.5 + 10026.76141}{1200} = 8.5 \text{ A}$$

10

10

$$N = 1600$$

$$\text{width} = 150 \times 10^{-3}$$

$$\text{depth} = 250 \times 10^{-3}$$

$$B = 0.75 \text{ T}$$

$$\text{Speed} = 3000 \text{ rpm}$$

a)

$$\text{e.m.f} = N B A \omega$$

$$A = 150 \times 10^{-3} \times 250 \times 10^{-3}$$

$$\text{e.m.f} = 1600 \times 0.75 \times \underline{0.0375} \times 2\pi \frac{3000}{60} = 0.0375 \text{ m}^2$$

$$= 13194.69$$

$$\omega = 2\pi f$$

$$\omega = 2\pi \frac{3000}{60}$$

2

2

b)

$$\Phi = B A$$

$$\Phi = 0.75 \times 0.0375$$

$$= 0.028125 \text{ Wb}$$

3

3



3)

Three phase synchronous motors work as follows. The motor is connected to a power supply which provides power along three different phases. These three phases are then used to operate the magnets within the motor allowing the rotor to spin. This works by energising the magnets one at a time to create rotation within the rotor.

The main difference between each motor is the amount of torque - speed they produce. Induction motors produce a good amount of speed but are restricted by the load they can carry. As the load increases the speed will drop this means not enough torque is being produced. As with synchronous motors, they produce constant torque under load allowing them to keep a more constant speed which under increased load.

very poor attempt

3

3

L)

$$B = 0.45$$

$$L = 150 \text{ mm}$$

$$V = 24$$

$$R = 0.5$$

$$I = \frac{24}{0.5} = 48 \text{ A}$$

$$F = B I L$$

$$F = 0.45 \times 48 \times 150 \times 10^{-3}$$

$$F = 3.24 \text{ N}$$

(2) (2)

$$Poles = 6$$

$$F = 50 \text{ Hz}$$

$$6 \text{ poles} = 3 \text{ pairs}$$

$$\frac{50}{3} = 16.67 \text{ Hz}$$

Rounded

$$16.67 \times 60 = 1000.2 \text{ rpm}$$

2

2

6)

~~By adding slip rings to a DC motor a ^{self exciting} generator can be made. This works as follows,~~

Dynamo's work as follows, by adding slip rings to a DC motor ~~current can be generated~~ generated. While the rotor spins this creates a rotating magnetic field which in turn induces a current onto the slip rings.

7)

A transformer is a device that changes ^{an} AC voltage value to a higher value or a lower value depending on the type of transformer. The way this works is through changing magnet fields within coils. This in turn affects the amount of current flowing through the coils.