



Examination Answer Books

12 Pages

Instructions to Candidates

1. Please give the information requested in the boxes.
2. Enter your name in the space provided to the right and seal down (using the label provided) to hide your name.
3. The answers must be legibly written. The Examiners can either read your legible script or have it typed and the expense of typing is 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	2219439.
2	Title of Examination Paper	POWER ELECTRONICS AND DRIVES.
3	Module Code	ACDAG004.
4	Date and Time of Examination	22/05/26 09.30.
5	Examination Venue	IQ310.
6	Seat Number	13.
7	Number of Answer Books handed in	1

List the numbers of the questions you have attempted	Office Use
1	3 ✓
2	12 ✓
3	8 ✓
5	12 ✓
6	2 ✓
7	4 ✓
8	8 ✓
4	0
Total	44%

- ① - Speed of an induction motor is dependent on its load.
- Speed of a synchronous motor is dependent on the line frequency.
- EMF is produced in the stator by 3 coils spaced 120° apart.
- EMF produced in the stator opposes RMF.

3

✓

②

$$\frac{250,000}{6000} = 41.6 \text{ A. Load.}$$

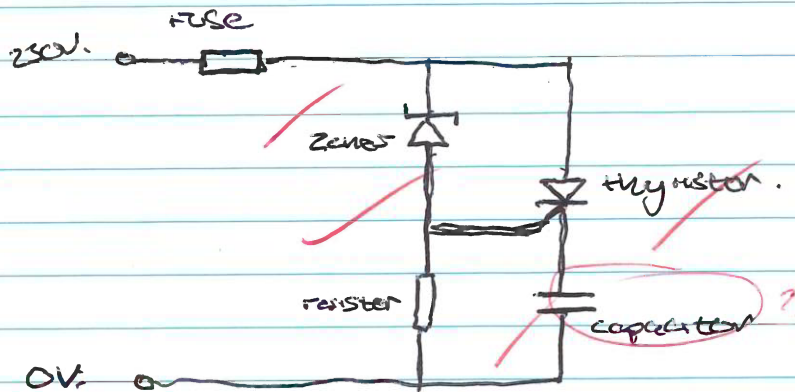
$$f = \frac{1000 \times 12}{60} = 200 \text{ Hz.}$$

I think an IGBT would be the best option :

- they can cope with higher voltages.
 - they can switch faster.
 - they can switch higher loads.
 - they can cope with higher frequencies.
- (Circuit is drawn on another page).

12.

③



- Under normal conditions the zener diode won't conduct.
- When the output voltage exceeds the maximum value, the zener diode conducts which turns the thyristor on.
- the overvoltage? blows the fuse which protects the output circuit.

8.

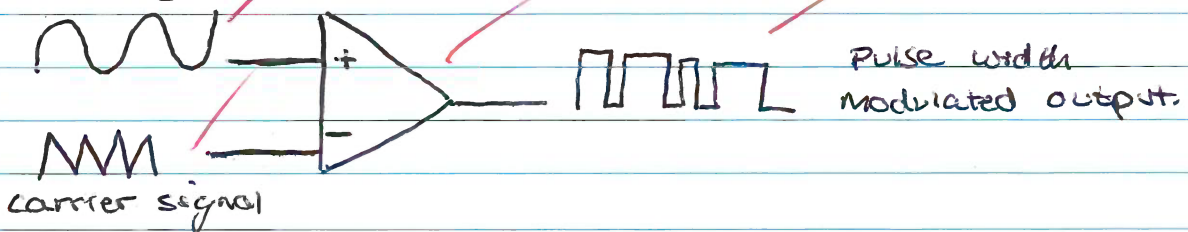
④ Dynamor

Q.

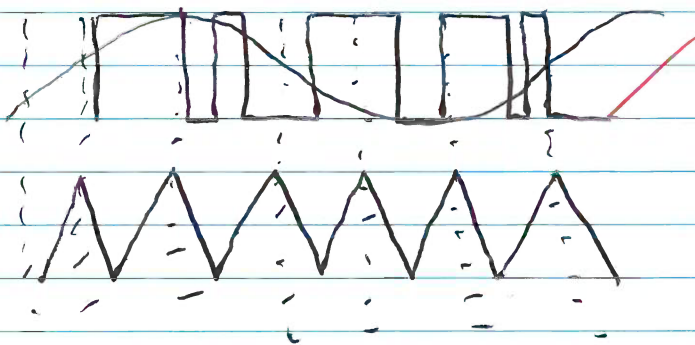
✓

5a

modulating signal



Waveform:



10

✓

5b

To control the speed of a synchronous AC motor using a VFD, the frequency can be adjusted higher / lower to increase / decrease the speed.

2.

✓

12

⑥

Sm poles = 3 pole pairs.

$$\frac{50}{3} = 16.6$$

$$16.6 \times 60 = 1000 \text{ r.p.m.}$$

2.

⑦

$$a) A = 150 \times 10^{-3} + 250 \times 10^{-3} = 0.0375$$

$$f = \frac{3000}{60} = 50 \text{ Hz}$$

$$1600 \times 0.75 \times 0.0375 \times 2 \times \pi \times 50 = 14137.17$$

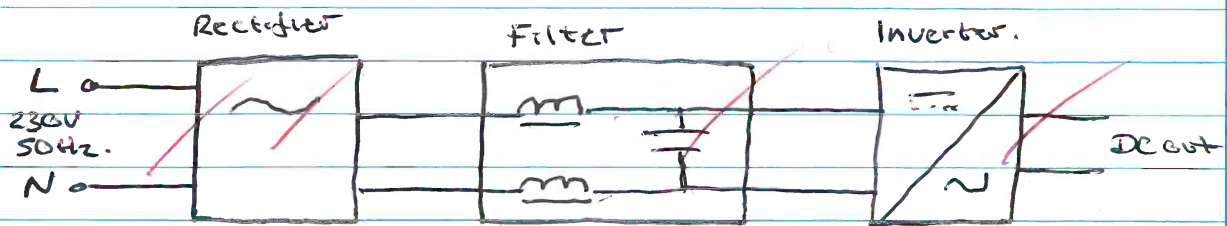
4.

$$b). 14137.17 \times 0.75 = 10602.88 \text{ W}$$

X

✓

8a

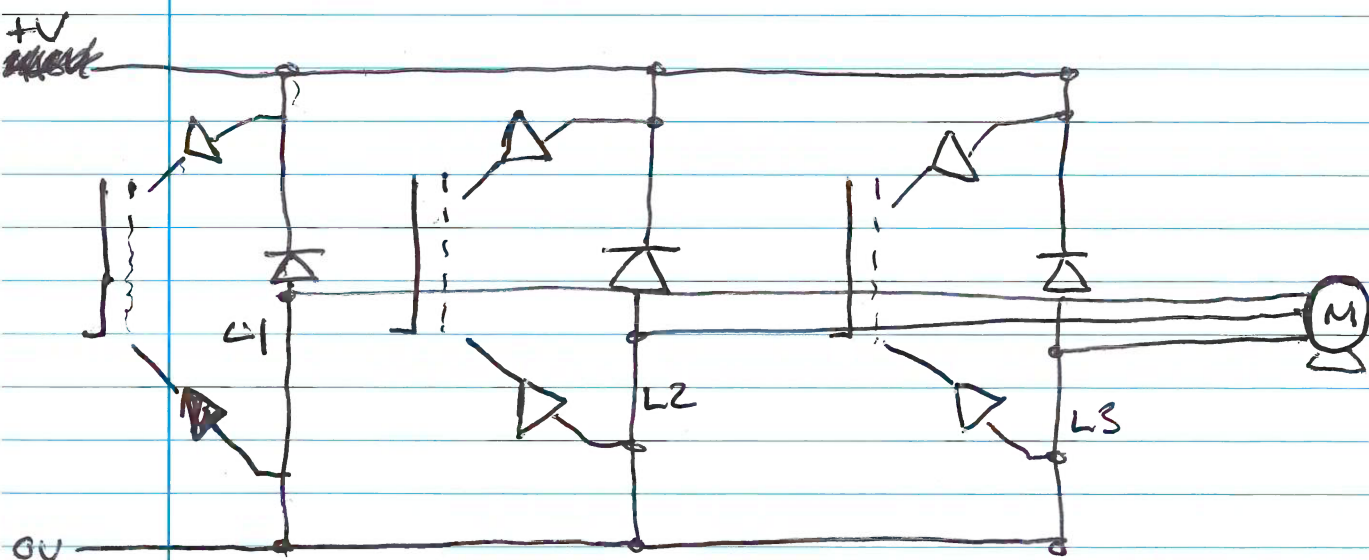


- The rectifier smoothes the input waveform.
- The filter removes noise / harmonics from the signal.
- The inverter changes it from AC-DC.

8b

The frequency can be altered to speed up / slow down the motor whilst the voltage applied maintains the torque of the motor.

② Circuit



8



Examiner Only

Question No.



Rhif y Cwestiwn

Arholwr yn unig