



UNIVERSITI KUALA LUMPUR
Malaysia France Institute

FINAL EXAMINATION
JULY 2010 SESSION

SUBJECT CODE : FED 20202
SUBJECT TITLE : MOTOR STARTER & DRIVES
LEVEL : DIPLOMA
TIME / DURATION : 8.00pm – 10.00pm
(2 HOURS)
DATE : 12 NOVEMBER 2010

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. Answers should be written in blue or black ink except for sketching, graphic and illustration.
 5. This question paper consists of TWO (2) sections. Section A and B. Answer all questions in Section A. For Section B, answer two (2) questions only.
 6. Answer all questions in English.
 7. Graph paper is appended.
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THERE ARE 8 PAGES OF QUESTIONS, EXCLUDING THIS PAGE.

SECTION A (Total: 60 marks)

INSTRUCTION: Answer ALL questions.

Please use the answer booklet provided.

Question 1

Figure 1 and Figure 2 shows two types of 240V/415V induction motor connection

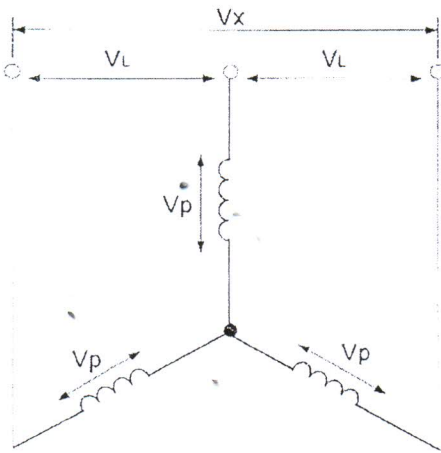


Figure 1

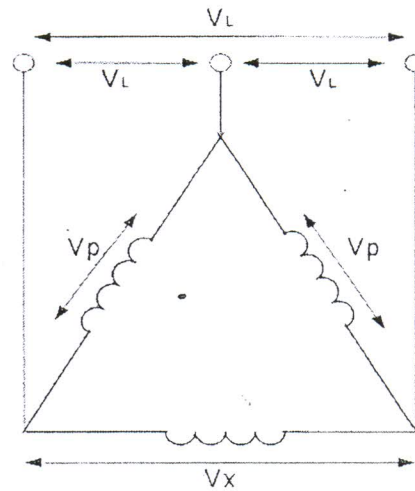


Figure 2

a) Answer the following questions

- i. What type of connection shown in figure 1 ?
- ii. Determine V_L , V_P and V_X for figure 1.
- iii. What type of connection shown in figure 2 ?
- iv. Determine V_L , V_P and V_X for figure 2.

(10 marks)

- b) A 3-phase 240 / 415 V motor is connected in STAR. Figure 3 shows name plate of that motor. The power supply available is 3-phase 240 V and 3-phase 415 V.

Determine;

- I. The suitable power supply, V_S ; Line voltage, V_L and phase voltage, V_P .
- II. The input power drawn from the supply.
- III. The efficiency of the motor.
- IV. The torque produced by the motor.

(10 marks)

3-phase Induction Motor Name Plate					
V	Hz	min ⁻¹	kW	cos ϕ	A
Δ 220/230	50	2770	.12	.7	.75
Δ 240	50	2810	.12	.65	.75
Y 380/400	50	2770	.12	.7	.45
Y 415	50	2810	.12	.65	.45

Figure 3

Question 2

A star-delta starting method is used to run a 415V/50Hz induction motor for a conveyor system. The specifications of the motors are given in Table 1;

Table 1

	Constant load
	Speed range : 1 to 3
	Motor speed : 480 to 1440 rpm
	Resistance torque : 7Nm
	No. of motors : 20 unit

In order to upgrade the existing system, you are required to

- i. Calculate the total power consumed by all motors having a derating factor of 0.8.
- ii. Refer to **Appendix 1**, Select an appropriate VSD for the new system to replace the Star Delta starting method.

(20 marks)

Question 3

Refer to Figure 4

- I. Identify the components S1, S2, F1 and KM1
- II. Identify and describe the function of X
- III. Describe the function of KM2 (13-14); KM2 (33-34) and KM3 (33-34)
- IV. Explain the operation of cutting saw (KM1)
- V. Explain what happen when motor conveyor overheats.

(20 marks)

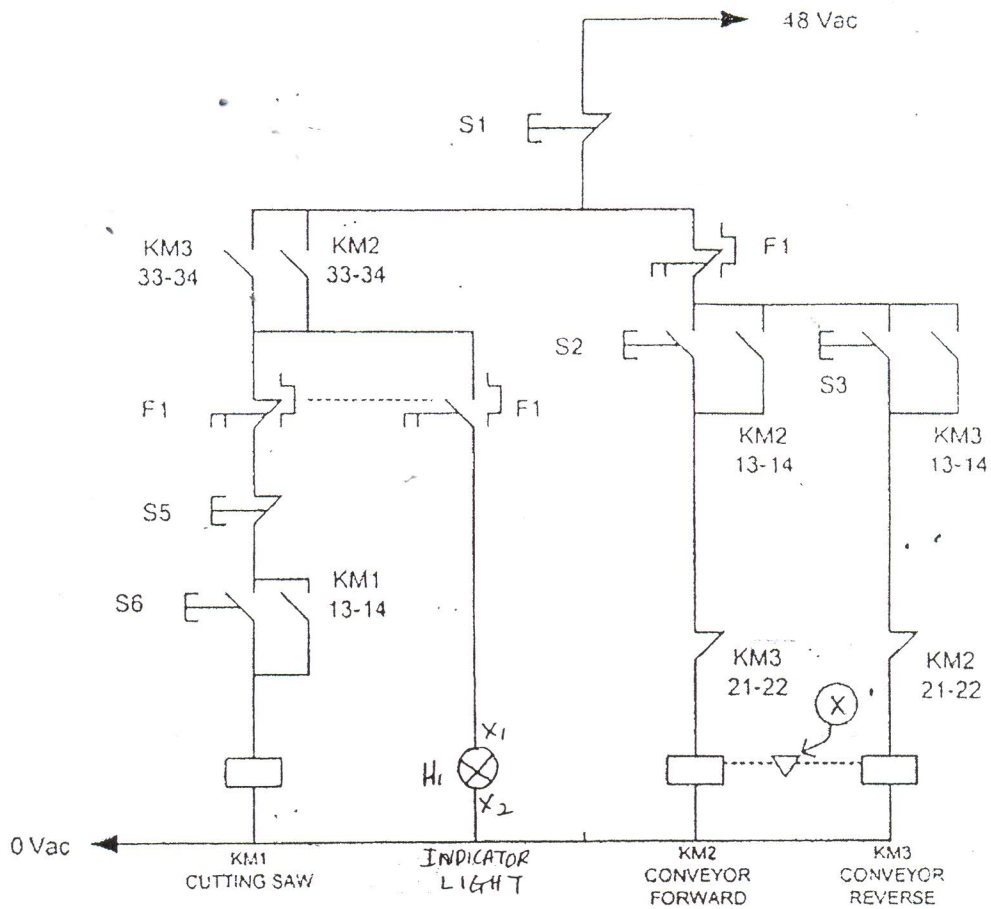


Figure 4

SECTION B (Total: 40marks)**INSTRUCTION : Answer TWO (2) questions only****Please use the answer booklet provided.****Question 4**

Figure 5 shows a Power circuit to control a Dahlander Motor. The motor had a single winding which can be divided into two parts to give a two to one pole-pair ratio depending on their connection.

- i. what is the name of the connection ?
- ii. What is the speed ratio of the motor ?
- iii. How to connect the motor in low speed ?
- iv. How to connect the motor in high speed ?
- v. How to Inverse the rotation of the motor ?
- vi. Explain the operation of the power circuit
- vii. Design a control circuit that would match the power circuit in part (vi).

(20 marks)

Question 5

In one application, a 3-phase induction motor is used with Rotor Resistance Starter. The power circuit of this system is shown in Figure 6.

- i. Name the type of induction motor and give the power rating (output power) that normally used with Stator Resistance starter.
- ii. Explain the principle operation of Stator Resistance Starter.
- iii. Draw the control circuit.
- iv. Plot the graph: Starting current/speed characteristic for Stator Resistance starter.

(20 marks)

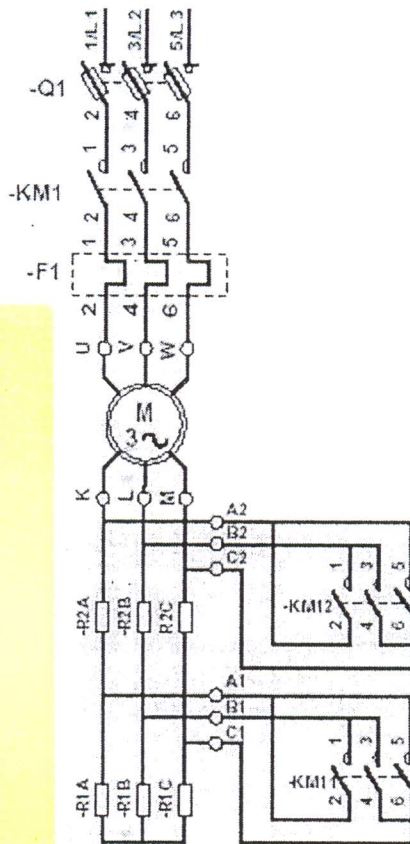


Figure 6: Power Diagram of Rotor Resistance Starter



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Question 6

- a) Design a control circuit of a Forward –Reverse Star-Delta Starter that operate:-
- i. Actuate pushbutton S 1 , the control circuit will receive supply of 48VAC. Indicator light H1 will lights on.
 - ii. Actuate pushbutton S 2, the motor will rotate in forward direction.
 - iii. Actuate pushbutton S 3, the motor will rotate in reverse direction.
 - iv. Actuate Pushbutton S4, the motor will stop.
 - v. Incase of emergency, there should have two emergency stop pushbuttons in the circuit.
 - vi. Incase of motor over loaded, the TOR will trip and indicator light H2 will lights on.
- b) Draw a power circuit of a Forward –Reverse Star-Delta Starter for the motor.

(20 marks)

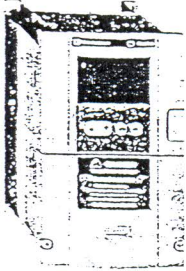
Variable speed controllers for asynchronous motors

Altivar 18

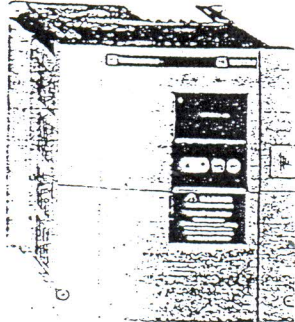
for asynchronous motors from 0.37 to 15 kW or 0.5 to 20 HP

References

Speed controllers with a frequency range of 0.5 Hz to 320 Hz



ATV-18U09M2



ATV-18U72N4

Mains supply Power supply voltage U1...U2 (1)	Line-current (2)		Motor Power indicated on rating plate (3)		Altivar 18 Continuous output current		Power dissipated at nominal load (4)	Reference (5)	Weight kg
	at U1 A	at U2 A	kW	HP	A	A			
200...240 50/60 Hz single phase	4.4	3.9	0.37	0.5	2.1	3.1	23	ATV-18U09M2	1.500
	7.6	6.8	0.75	1	3.6	5.4	39	ATV-18U18M2	1.500
	13.9	12.4	1.5	2	6.8	10.2	60	ATV-18U29M2	2.100
	19.4	17.4	2.2	3	9.6	14.4	78	ATV-18U41M2	2.800
200...230 50/60 Hz 3-phase	16.2	14.9	3	-	12.3	18.5	104	ATV-18U54M2	3.300
	20.4	18.8	4	5	16.4	24.6	141	ATV-18U72M2	3.300
	28.7	26.5	5.5	7.5	22	33	200	ATV-18U90M2	7.800
	38.4	35.3	7.5	10	28	42	264	ATV-18D12M2	7.800
380...460 50/60 Hz 3-phase	2.9	2.7	0.75	1	2.1	3.1	24	ATV-18U18N4	2.000
	5.1	4.8	1.5	2	3.7	5.5	34	ATV-18U29N4	2.100
	6.8	6.3	2.2	3	5.3	8	49	ATV-18U41N4	3.100
	9.8	8.4	3	-	7.1	10.6	69	ATV-18U54N4	3.300
	12.5	10.9	4	5	9.2	13.8	94	ATV-18U72N4	3.300
	16.9	15.3	5.5	7.5	11.8	17.7	135	ATV-18U90N4	8.000
	21.5	19.4	7.5	10	16	24	175	ATV-18D12N4	8.000
31.8	28.7	11	15	22	33	261	ATV-18D16N4	12.000	
	42.9	38.6	15	20	29.3	44	342	ATV-18D23N4	12.000

Dialogue options for ATV-18 speed controllers of all ratings

Description	Reference	Weight kg
RS 232 C "PC interconnection" option with software (6)	VW3-A18104	0.500
3 1/2 diskettes (software only)	VW3-A18105	0.100

(1) Nominal power supply voltages, minimum : U1, maximum : U2.

(2) Typical value without additional choke.

(3) These power values are given for a switching frequency of 4 kHz.

(4) For 60 seconds.

(5) Speed controllers supplied with user guide in four languages (German, English, Spanish, French).

(6) Kit comprising :

- a connection cable for the PC, fitted with connectors, 5 m long.
- a connection cable for the speed controller, fitted with connectors, 1.2 m long.
- an adaptation module;
- 3 1/2 diskettes containing the software.