

Electrical Control Circuit

TEST

Time allowed – 1 hour and 30 minutes

8 Pages in this Question Booklet

TOTAL MARKS AVAILABLE

SECTION	Possible Marks	Actual Marks
A	10	
B	40	
C	25	
TOTAL	75	

Student Feedback/Comments

The results of my performance have been discussed and explained to me.			
Student:		Date:	
If you would like to request a review of your results or if you have any concerns about your results, contact your teacher or head teacher.			
Teacher:		Date:	

Instructions to Students:

- All questions are to be answered in the space provided in this Question Booklet. Answers to Multi-choice Questions (Section A) are to be recorded on the Answer Sheet attached to this Question Booklet.
- You are not to use any reference book in this examination.
- The whole of this Question Booklet is to be handed to the Supervisor upon completion.

Aids permitted where indicated:

Standard Dictionaries	Bilingual Dictionaries	Technical Dictionaries	Programmable Calculators	Non-programmable Calculators	Mobile Phones	MP3 Players
No	Yes	No	No	Yes	No	No

- **Disallowed electronic devices are to be turned off and removed from your person.** If you access an electronic device during this examination you will be considered to be cheating. You will receive a Not Yet Competent (NC) result for the unit and disciplinary action will be taken.

Section A - (10 Marks)

Instructions: Select the best answer for the following statements and place the corresponding letter answer sheet provided. Each correct answer is worth one mark.

Question 1.

Another name for a schematic diagram :-

- (A) A wiring diagram
- (B) A block diagram
- (C) A circuit diagram
- (D) A rung diagram

Question 2.

The main purpose of a schematic diagram is to show:-

- (A) The route of the associated wiring
- (B) The equipment terminal numbers
- (C) How the equipment is to be mounted
- (D) The electrical operation of the equipment

Question 3.

In a basic stop/start relay circuit the latching contact is connected :-

- (A) In parallel with the stop button
- (B) In parallel with the start button
- (C) In series with the stop button
- (D) In series with the start button

Question 4.

When a normally open non latching pushbutton is pressed the contacts:-

- (A) Open until the button is released
- (B) Close and remain closed until the button is pressed again
- (C) Close as long as the button is pressed
- (D) Do not operate unless a retaining contact is connected in parallel

Question 5.

When an electrical relay is de-energised:

- (A) All contacts remain in the actuated state
- (B) The N/O contacts are open and the N/C contacts are closed
- (C) The coil is connected to the supply and all contacts change state
- (D) A pilot lamp supplied via a N/O contact will light

Question 6.

In a horizontally drawn circuit diagram:-

- (A) Energy flow is from top to bottom
- (B) Control devices are placed to the right of the diagram
- (C) All components and wiring are drawn horizontally
- (D) The sequence of events is from top to bottom

Question 7.

The contacts of an 'On delay' timer will:-

- (A) Open or close immediately the timer is energised
- (B) Open or close immediately the timer is de-energised
- (C) Open or close a set time after the timer is energised
- (D) Open or close a set time after the timer is de-energised

Question 8.

Jog or inch controls in a circuit allow:-

- (A) DOL operation
- (B) Limiting of starting currents
- (C) Small rotational movements of the motor
- (D) No automatic starting of the motor

Question 9.

Thermal Overload contacts will trip:-

- (A) When the power circuit draws excessive current
- (B) Inversely proportional to the current and time
- (C) Immediately the control circuit draws excessive current
- (D) After the temperature rise of the motor reaches 95°C

Question 10.

In a vertically drawn circuit diagram:-

- (A) Energy flow is from top to bottom
- (B) Control devices are placed to the right of the diagram
- (C) All components and wiring are drawn horizontally
- (D) The sequence of events is from top to bottom

Section B - (40 Marks)

Question 1.

List the specifications that must be considered to correctly select a relay for use in an electrical control circuit. *(4 marks)*

Question 2.

Certain conventions are followed when drawing electrical circuit diagrams. List the conventions followed when drawing a vertically oriented circuit diagram. *(4 marks)*

Question 3.

Explain the difference in operation between a manual switch and a pushbutton. *(3 marks)*

Question 4.

Briefly explain the difference between using detached symbols and semi-detached symbols in a circuit diagram. *(4 marks)*

Question 5.

Name four types of motor protection. *(4 marks)*

Question 6.

List the specifications that must be considered to correctly select a timer for use in an electrical control circuit.

Question 7.

Explain the meaning of the term 'Jog' or 'Inch' as applied to an electric motor. *(4 marks)*

Question 10.

Answer the following questions in regard to the operation of the control circuit shown in Figure 1. (5 Marks)

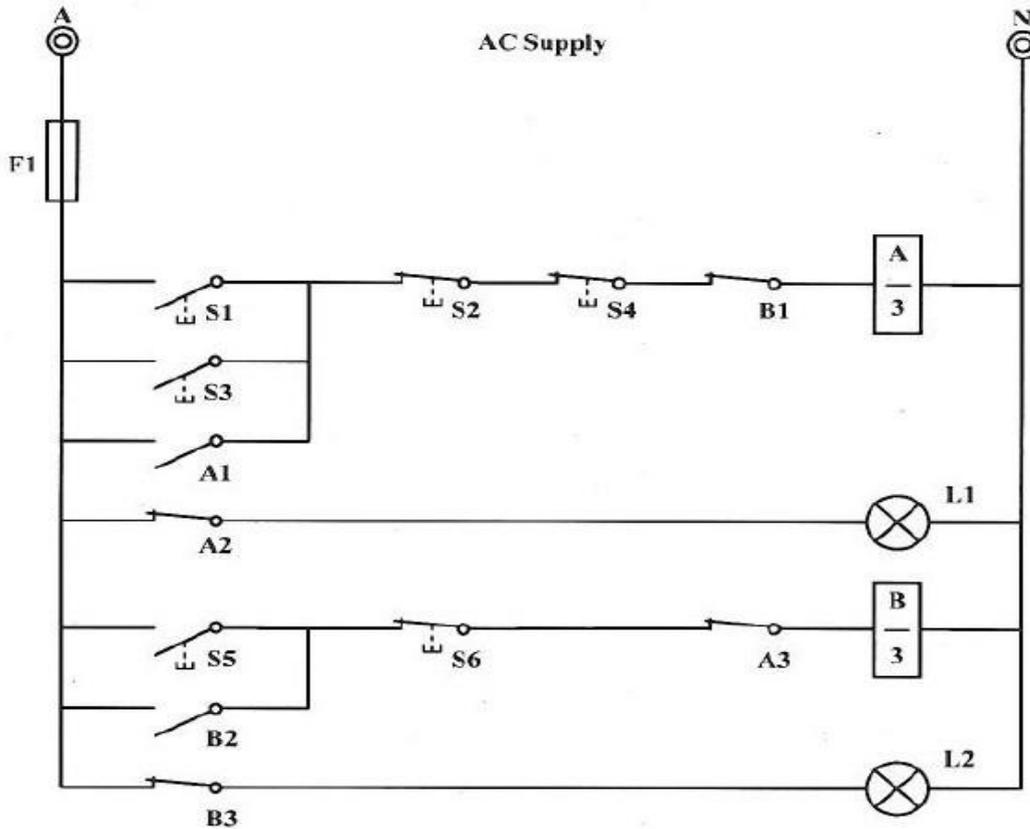


Figure 1

(a) Before any pushbutton is pressed what is the condition of Relay "B" and indicating lamp L1?

(b) If pushbutton S5 is pressed after relay 'A' is energised what will the effect be on contact A3, Relay 'B' and indicating lamp L3?

(c) The two contacts B1 and A3 provide

Section C - (25 Marks)

In the space provided, using a neat drawing, design a control circuit to satisfy the following operational criteria.

- When power is first applied and before any pushbutton is pressed all relays will be de-energised.
- Pressing either S1 or S2 will cause the Control relay CR1 to energise, remain on and indicator lamp L1 to turn on.
- When CR1 is energised Contactor 'A' will energise and indicator lamp L2 will tum on.
- After a time delay of 15 seconds contactor 'B' will energise and indicator lamp L3 will light.
- When contactor 'B' is energised contactor 'A' will de-energise and lamp L2 tum off.
- All relays and contactors will de-energise when either S3 or S4 is pressed.
- Number each wire and line in the circuit diagram
- Label all relays, contactors, contacts, pushbuttons and lamps.

