GENERAL CERTIFICATE OF EDUCATION BOARD

Technical and Vocational Education Examination

AUTOMATION 3
7150

JUNE 2022 **ADVANCED LEVEL**

Specialty Name and Acronym	**AUTOMOBILE CONSTRUCTION AND MAINTENANCE (AM-LV & AM-HD)**
Subject Title	**AUTOMATION**
Subject Code No.	7150
Paper No.	3

Duration: 3 hours

QUESTION BOOKLET

INSTRUCTIONS TO CANDIDATES

Answer all Questions

You are reminded of the necessity for good English and orderly presentation in your answers.

You are advised to read carefully through the question paper, before you begin your answers.

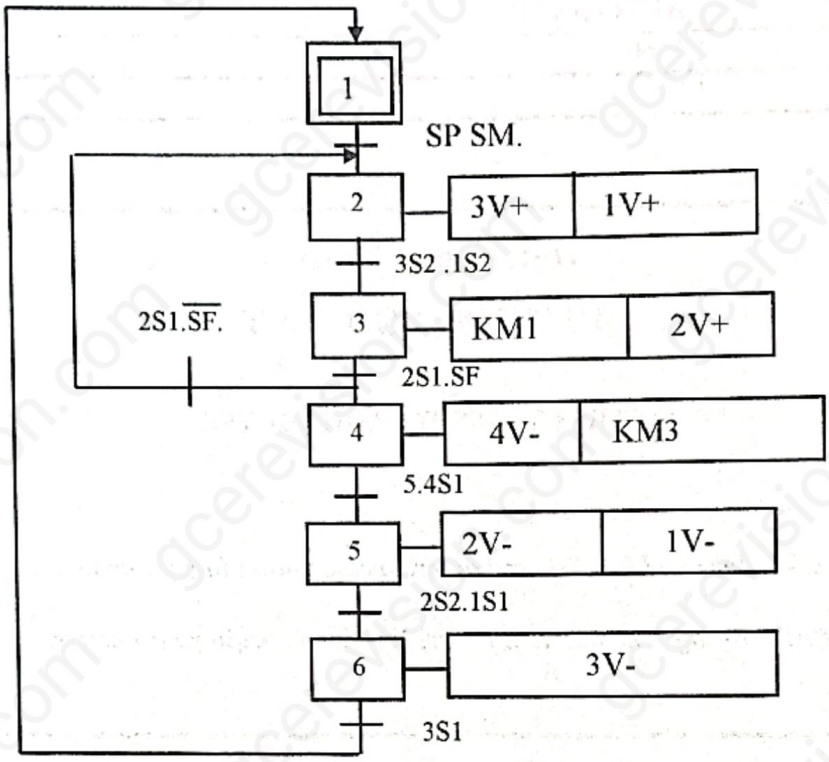
PROGRAMMING

We are to use a TSX 27, PLC with PL7-2 GRAFCET language, or the Programmable Logic Controller **SLC 100 of Allen Bradley**, or a microprocessor, or a microcontroller, available in your Laboratory.

Let's consider the GRAFCET view from the control part as shown below.

Use the GRAFCET view from the control part, the table of INPUT/OUTPUT codes and stages codes given in the technical file, to answer the questions below.

GRAFCET VIEW FROM THE CONTROL PART



WORK TO BE DONE

WRITING OF A PROGRAM

From the GRAFCET view from the control part above:

Question 1

Established the activation and deactivation equations of the GRAFCET from the table on the answer booklet page 2

(15 marks)

Question 2

Address the input/output in automaton codes.

(10 marks)

Question 3

Complete the GRAFCET view from the control part on page **2** of the answer booklet, by writing down actions and receptivities in automaton codes

(3 marks)

Question 4

Using the GRAFCET view from the control part, the table of INPUT/OUTPUT codes and stages codes, write the program that enables you to control the post with Allen Bradley **SLC 100 Automaton** or the algorithm, the flowchart and the program with a microprocessor or a microcontroller placed at your disposal by examiners. This program should include:

a) The sequential treatment *(35 marks)*

b) The posterior treatment *(25 marks)*

VARIABLES RECOGNIZED BY AUTOMGEN

TYPE	AUTOMGEN SYNTAXE	CEI 1131-3 SYNTAXE	COMMENTARY
Inputs	10 to 19999	% 10 to 19999	Pcc's physical inputs
Outputs	00 to 9999	% Q0 to % Q9999	Plc's physical output
System bits	U0 to U99 or b0 to b99	%MO to %M99	See user's manual
User's bits	U100 to U9999 or b100 to b9999	%M100 to %M9999	Binary variables general used bits
Stages	X0 to X9999	%X0 to %X9999	Bits for stages
Counters	C0 to C9999	%C0 to % C9999	Counter (numerical variables of 16 bits) can be initialized, incremented, decremented and tested
System words	M0 to M199	%MW0 to %MW199	See user manual
User's words	M200 to M9999	%MW200 to %MW9999	General used words(16 bits numerical variables)
Time delay	T0 to T9999	%T0 to %T9999	Turning between 0 and $65535/10^{th}$ seconds

INFORMATION ON SCL100AB OF ALLEN BRADLEY

I – INSTRUCTIONS

CONDITIONAL INSTRUCTIONS

INSTRUCTIONS	SIGNIFICATION
	Examine ON
	Examine OFF

OUTPUT INSTRUCTIONS

INSTRUCTIONS	SIGNIFICATION
—( )—	Output Energize
—(L)—	Latch
—(U)—	Unlatch
—(RTF)—	Retentive Timer On-Delay
—(RTO)—	Retentive Timer Off-Delay
—(CTU)—	Up Counter
—(CTD)—	Down Counter

II – INTERNAL ADDRESSES

ADDRESSES	FUNCTION
From 001 to 010	INPUT Addresses
From X01 to X10	INPUT Addresses of Address Blocks. (X changing from 1 to 6)
From 011 to 016	OUTPUT Addresses
From X11 to X16	OUTPUT Addresses of Address Blocks. (X changing from 1 to 6)
From 017 to 018	Internal Addresses Associated with I/O Address Blocks
From X17 to X18	Internal Addresses Associated with I/O Address Blocks (X changing from 1 to 6)
From 701 to 867	Relay Type Instructions
868	Program Initialization
876	Auto / Manual Switch
From 901 to 932	Timer / Counter / Sequencer and Reset
From 951 to 982	Overflow and underflow Timer /Counter/Sequencer and Reset

REGISTRATION CENTRE NUMBER	CENTRE NAME	
CANDIDATE'S FULL NAMES		
CANDIDATE IDENTIFICATION NUMBER	SUBJECT CODE 7150	PAPER NUMBER 3
FOR OFFICIAL USE ONLY (Candidate Random CODE): ▶		

GENERAL CERTIFICATE OF EDUCATION BOARD

Technical and Vocational Education Examination

Advanced Level

SUBJECT TITLE	SUBJECT CODE	PAPER NUMBER
AUTOMATION	**7150**	**3**
Specialty: AUTOMOBILE CONSTRUCTION AND MAINTENANCE : (AM-LV & AM-HD)	EXAMINATION DATE: **JUNE 2022**	

Duration: 3 hours

ANSWER BOOKLET

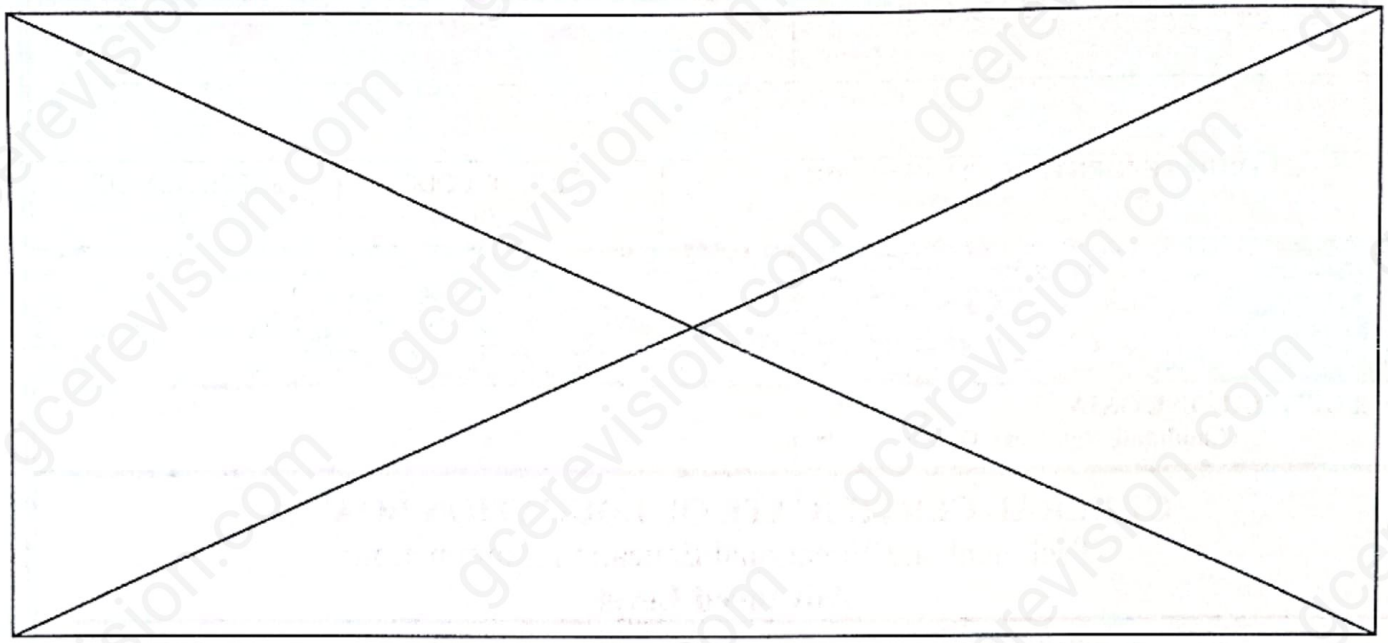
INSTRUCTIONS TO CANDIDATES

Candidates are required to use the answer booklet provided, to plan and accomplish the tasks.

You are reminded of the necessity for good English and orderly presentation in your answers.

You are advised to read carefully through the question paper, before you begin your answers.

FOR EXAMINERS' USE ONLY	
Marked by:.....	***SCORE***
Signature: .... *Date:*	
Checked by:.....	
Signature: .... *Date:*	



Question 1

The activation and deactivation equations of the GRAFCET *15 marks*

Stages	Activation	Deactivation	Associated action(s)

Question 2

Addressing the input/output in automaton codes *10 marks*

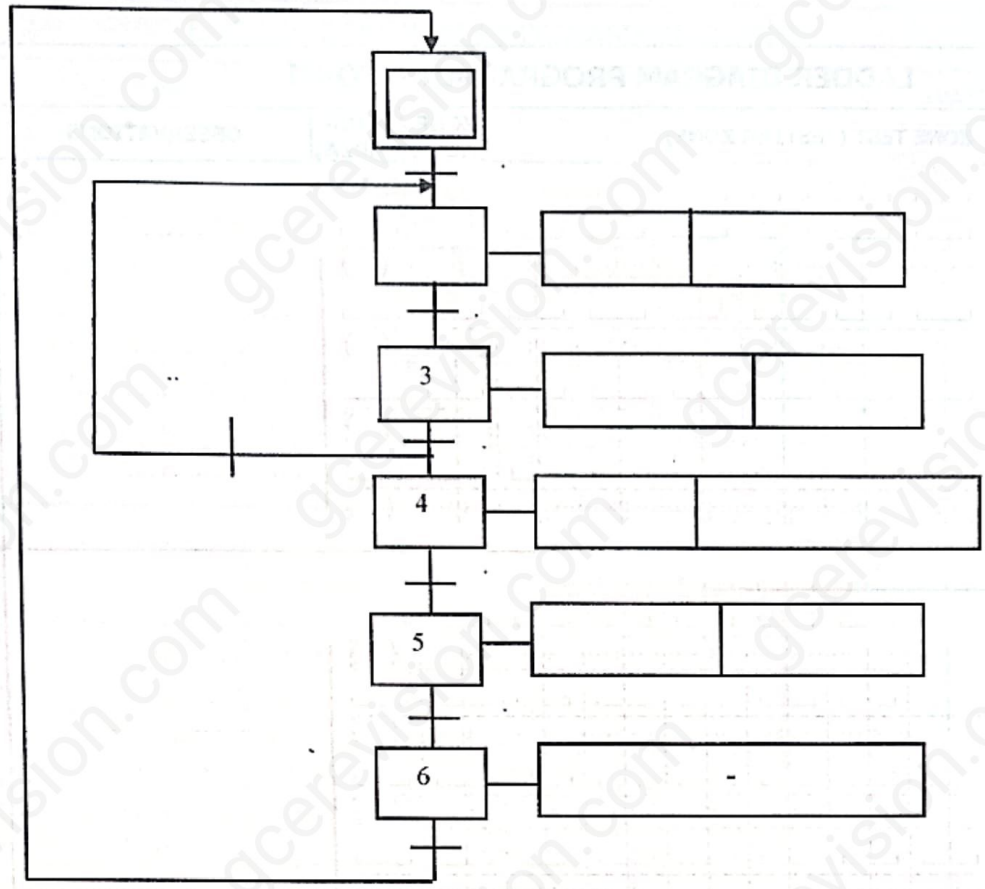
Inputs										
Addresses										

Outputs										
Addresses										

stages								
Addresses								

Question 3

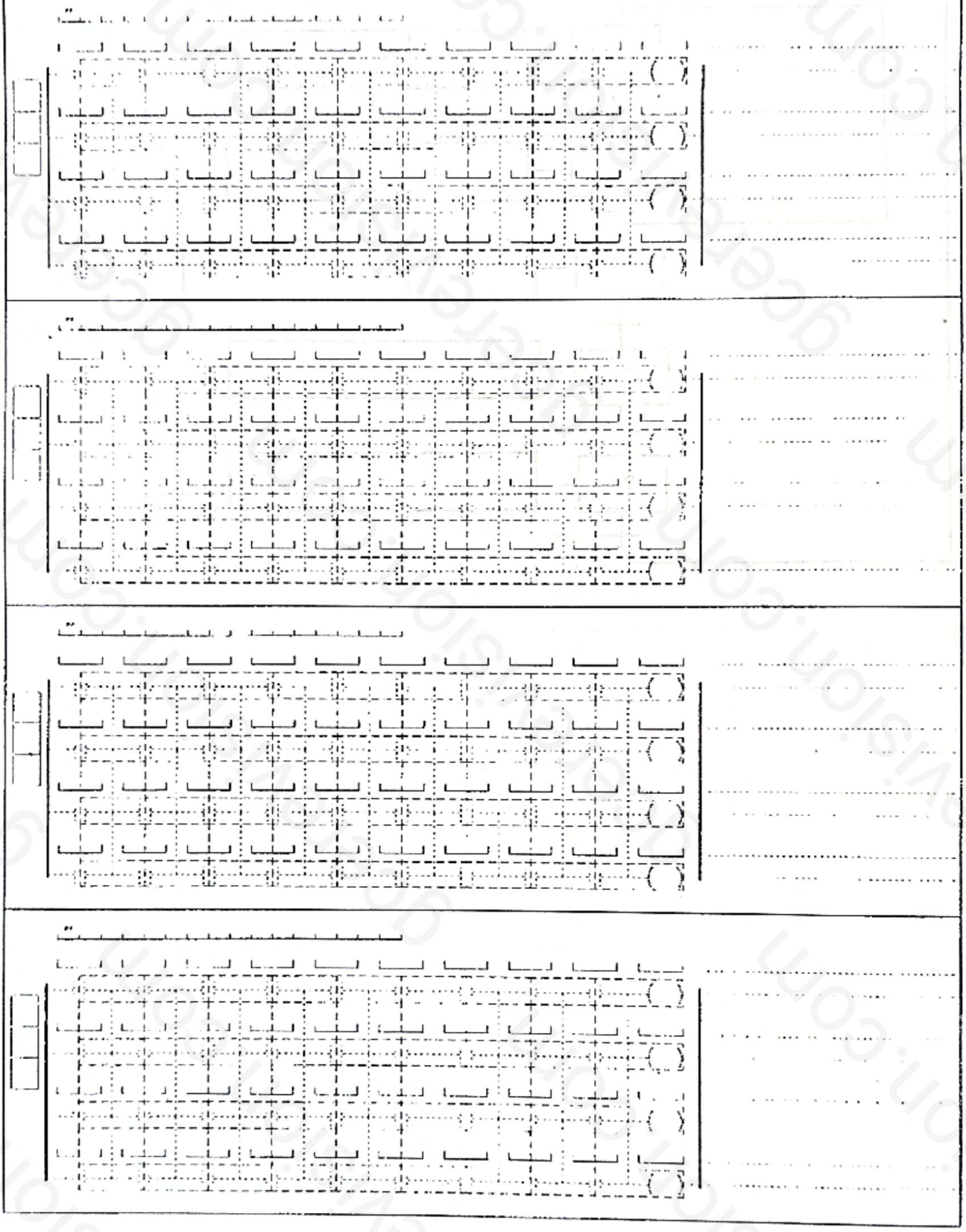
The GRAFCET view from the control part on page in automaton codes ***15 marks***



a) Sequential treatment of the program *35 marks*

LADDER DIAGRAM PROGRAMMING FORM

N°	ZONE TEST (TESTING ZONE)	ZONE ACTION (ACTION AREA)	OBSERVATIONS



b) Posterior treatment of the program **25 marks**

LADDER DIAGRAM PROGRAMMING FORM

N°	ZONE TEST (TESTING ZONE)	ZONE ACTION (ACTION AREA)	OBSERVATIONS