



TECHNICAL UNIVERSITY OF MOMBASA

FACULTY OF ENGINEERING AND TECHNOLOGY

DEPARTMENT OF MEDICAL ENGINEERING

UNIVERSITY EXAMINATION FOR:

DIPLOMA IN MEDICAL ENGINEERING

EEP 2350: PROGRAMMABLE LOGIC CONTROLLERS

END OF SEMESTER EXAMINATION

SERIES: APRIL 2016

TIME: 2 HOURS

DATE: 15 May 2016

Instructions to Candidates

You should have the following for this examination

-Answer Booklet, examination pass and student ID

This paper consists of **FIVE** questions. Attempt question ONE (Compulsory) and any other TWO questions.

Do not write on the question paper.

Question ONE

a) Distinguish between the following control systems;

- (i) Open loop
- (ii) Closed loop

(4mks)

b) With an aid of a truth table and ladder diagrams describe the following logic functions.

- i) Ex-NOR
- ii) NAND

(10mks)

c) i) With the aid of a single line diagram, explain the operation a three phase a.c motor controlled by a direct on line starter having overload and remote start – stop button.

ii) Implement the control circuit of c i) using ladder diagram. (12mks)

iii) State the four advantages of programmable logic controller over a relay control panel. (4mks)

Question TWO

a) With the aid of the Fig 1 diagram, implement it's instruction list program

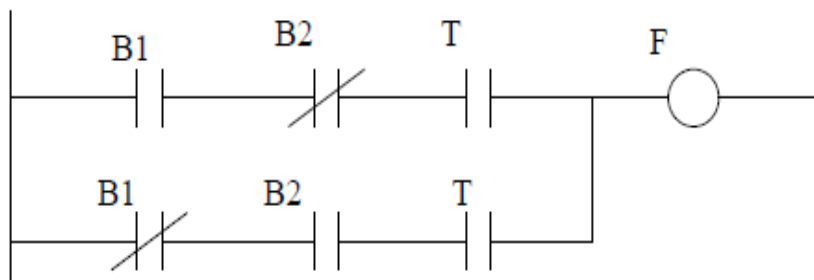


Fig 1

(7mks)

b) With an aid of a ladder diagram describe the operation of a latch circuit. (6mks)

c) With an aid of a circuit diagram, describe the operation of a series voltage regulator.

(7mks)

Question THREE

- a) State any three rules that must be observed when carrying out ladder programming. (3mks)
- b) With the aid of a block diagram describe functions of each block of an analogue process control system. (8mks)
- c) Derive a minimized logic expression to control an a.c. servo motor whose operation depends on three input variables A, B and C. The conditions for the motor to operate are; any two inputs variables are present but not three. B is present. Implement its operation using logic gates hence realize its ladder diagram (9mks)

Question FOUR

- a) i) State any four reasons for use of automatic control system.
- ii) A proportional controller with scale 0-10V, corresponds to 0 -100% output. If $R_2 = 10K\Omega$ and full scale error range is 10V, find the values of V_0 and R_1 to support 20% proportional band about 50% zero error controller output. (10mks)
- b) With an aid of a block diagram describe the function of each block of direct digital control for industrial processes (10mks)

Question FIVE

- a) i) State the four advantages of digital controllers (4mks)
- ii) Draw a circuit diagram to describe the operation of pulse width modulation Inverter. (6mks)
- b) Draw a block diagram of programmable logic controller hence describe the function of each block (10mks)