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:APRIL2016

TIME:2HOURS

DATE:15May2016

Instructions to Candidates

You should have the following for this examination

-Answer Booklet, examination pass and student ID

This paper consists of **FIVE** questions. Attemptquestion 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

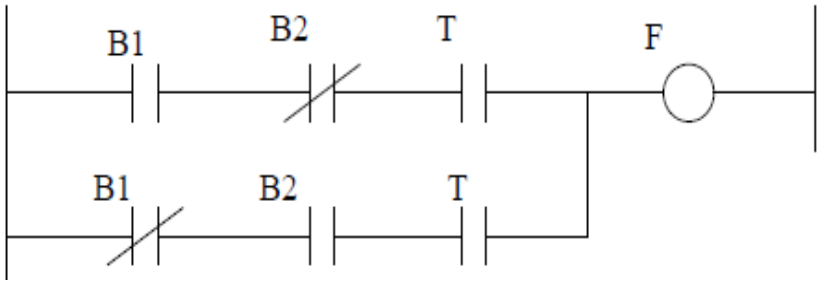

Fig 1

(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 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 it's operation using logic gates hence realize it's 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 $R_{2=}$ 10KΩ 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)**