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**UNIVERSITI TUN HUSSEIN ONN MALAYSIA**

**FINAL EXAMINATION  
SEMESTER I  
SESSION 2016/2017**

COURSE NAME : ELECTRONIC CONTROL  
TECHNOLOGY

COURSE CODE : BNR 23003

PROGRAMME CODE : BNE

EXAMINATION DATE : DECEMBER 2016 / JANUARY 2017

DURATION : 3 HOURS

INSTRUCTION : ANSWERS ALL QUESTIONS

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THIS QUESTION PAPER CONSISTS OF **SIX (6)** PAGES

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- Q1** (a) Explain **TWO (2)** types of industrial control classification and give an example for each class. (5 marks)
- (b) **Figure Q1(b)** shows the closed loop antenna system. From this figure:
- Draw the equivalent block diagram for the system
  - Demonstrate what will be the error signal and antenna movement when the azimuth angle output:
    - equal to the desired azimuth angle input,
    - less than the desired azimuth angle input
    - greater than the desired azimuth angle input.(10 marks)
- (c) Explain and elaborate the basic steps of converting analog signal into digital signal. (5 marks)
- Q2** (a) **Figure Q2(a)** shows the summing amplifier. If  $R_1 = 42\text{k}\Omega$ ,  $R_2 = 13\text{ k}\Omega$ ,  $R_3 = 12\text{ k}\Omega$  and  $R_F = 11\text{ k}\Omega$ , calculate,
- Current flow through  $R_1$ ,  $R_2$ ,  $R_3$  and  $R_F$ ,
  - $V_{\text{out}}$ .
- (9 marks)
- (b) **Figure Q2(b)** shows the digital to analog converter (DAC).
- Calculate the analog output voltage ( $V_{\text{out}}$ ) if a binary 1001 is applied.
  - Find the resolution of the DAC.
- (11 marks)
- Q3** (a) **Figure Q3(a)** shows a logic circuit consist of OR, AND and NOT gate.
- By analysing the logic circuits using truth table, identify the equivalent logic function that the logic circuit represent.
  - Using the logic circuit in Figure Q4(a), construct the ladder diagram. (9 marks)
- (b) **Figure Q3(b)** shows the overload protection circuit.
- Develop the ladder diagram for the whole circuit.
  - Using the ladder diagram developed in Q4(b)(i), explain how the overload protection circuit work.

(11 marks)

- Q4** (a) Illustrate ladder diagram that correspond to digital logic given by Boolean function below.
- (i)  $F = A+B+C$
  - (ii)  $F = A'.B + A.B'$
  - (iii)  $F = A.B + B.C$
- (6 marks)
- (b) List **FOUR (4)** functions in PLC and explain the role of each function.
- (4 marks)
- (c) **Figure Q5(c)** shows the motor start-stop control circuit using PLC interface with programmed ladder diagram.
- (i) Draw an appropriate input and output connections that correspond to the given ladder diagram
  - (ii) Explain start stop mechanism of this control circuit.
- (10 marks)
- Q5** (a) 555 timer is an 8-pin IC that is capable of producing accurate time delays and/or oscillators. Name and elaborate all 3 operating modes of 555 Timer IC.
- (6 marks)
- (b) A one shots is triggered by a short pulse input. Sketch the one shots output if the firing time is 5 ms.
- (4 marks)
- (c) Based on successive approximation register (SAR) analog to digital converter shown in **Figure 5(c)**, answer the following questions.
- (i) Given an analog input of  $V_{in} = 6.75V$ , clearly explain step-by-step process of converting from analog to digital signal using SAR.
  - (ii) Draw an approximation graph from the process in obtained (i).
  - (iii) Provide the digital output that correspond to  $V_{in} = 6.75V$
- (10 marks)

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-END OF QUESTIONS -

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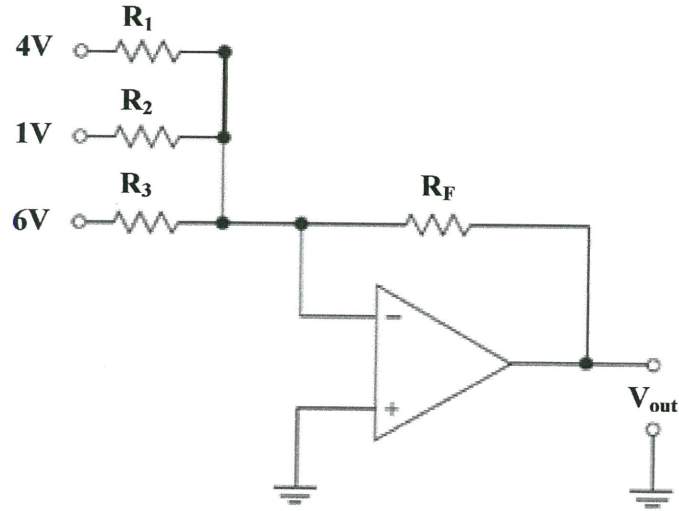


FIGURE Q2(a)

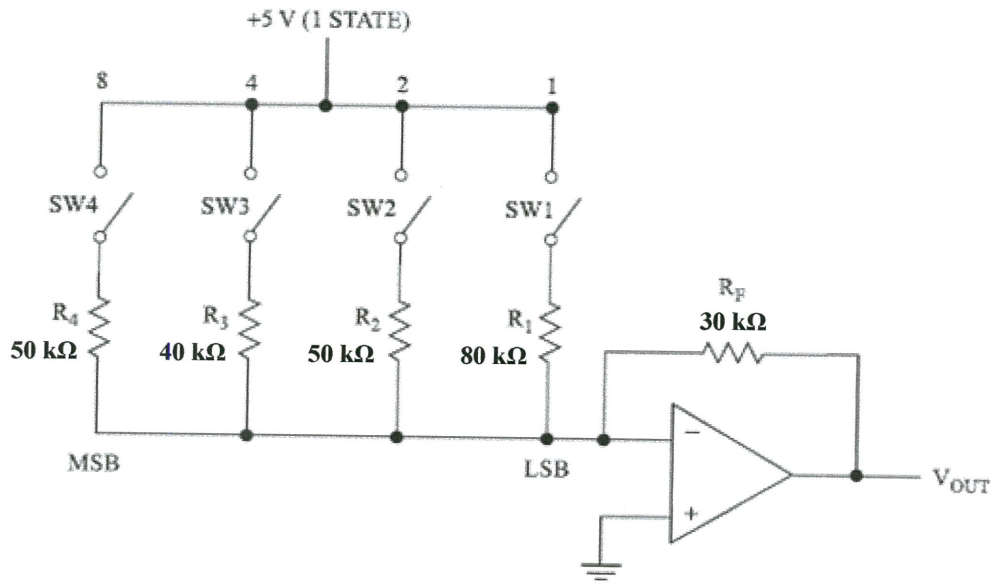


FIGURE Q2(b)

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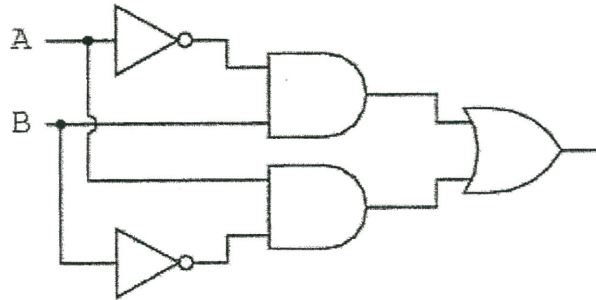


FIGURE Q3(a)

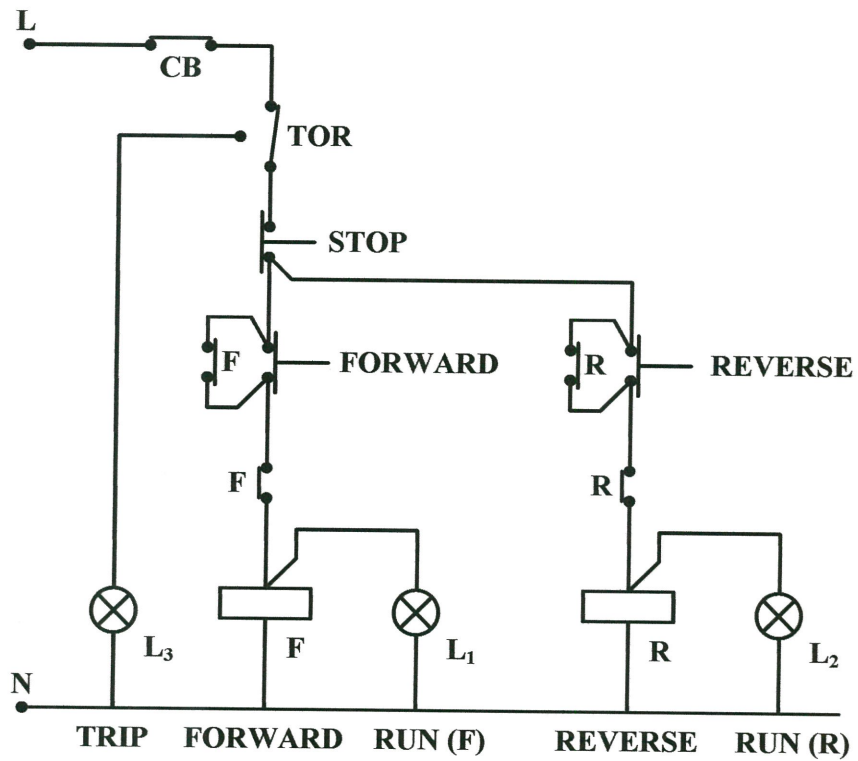


FIGURE Q3(b)

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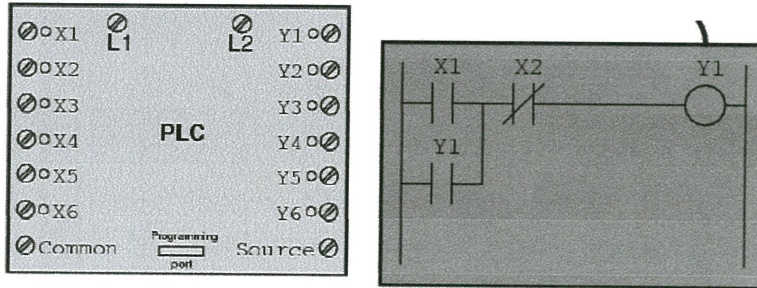
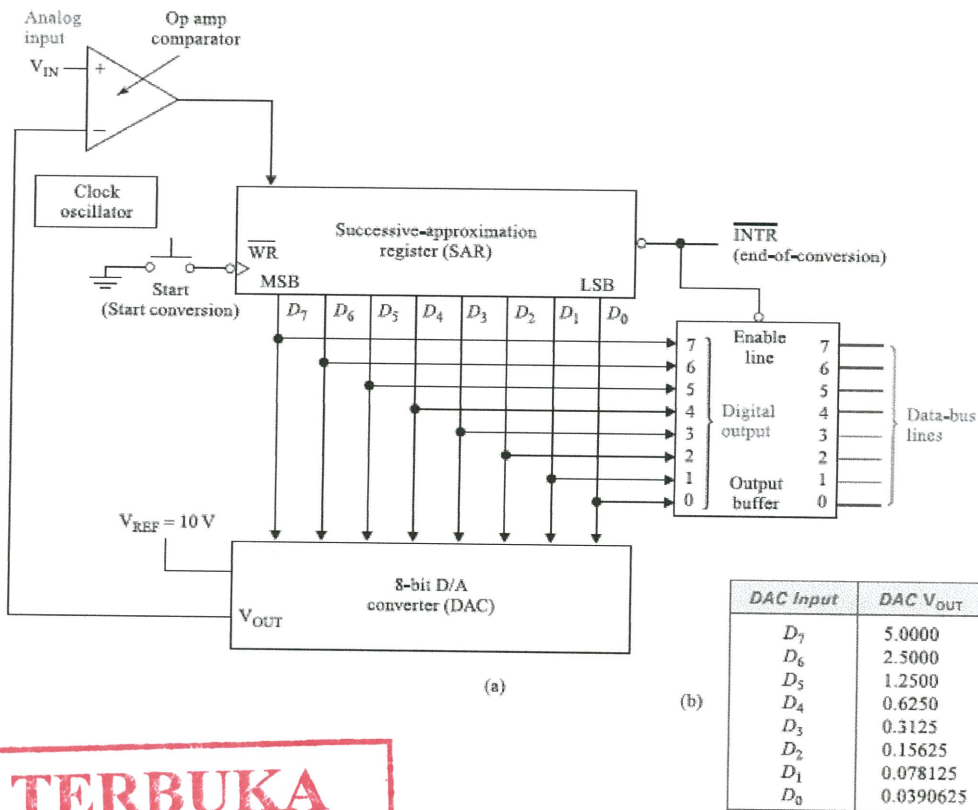


Figure Q4(c)



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Figure Q5(c)