UTHM
Universiti Tun Hussein Onn Malaysia

UNIVERSITI TUN HUSSEIN ONN MALAYSIA

FINAL EXAMINATION
SEMESTER II
SESSION 2018/2019

COURSE NAME	:	INDUSTRIAL ELECTRONIC
COURSE CODE	:	BND 22303
PROGRAMME CODE	:	BND
EXAMINATION DATE	:	JUNE / JULY 2019
DURATION	:	3 HOURS
INSTRUCTION	:	ANSWERS **FOUR (4)** QUESTIONS **ONLY**

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

Q1 (a) State a full name of:

    (i)   TRIAC
    (ii)   Op - Amp

(2 marks)

(b) By referring the op amp circuits given in **Figure Q1(b)**,
    (i)   derive the gain of the circuit.
    (ii)   calculate the value of feedback resistor, if $Vo = 6$ V, $R_1 = 10$ kΩ.

(8 marks)

(c) **Figure Q1(c)** shows a circuit that include four types of op-amp which are arrange in cascade configuration.
    (i)   Name the type of op-amp A, B, C and D referring to the circuit.
    (ii)   Calculate the value of Vo.

(15 marks)

Q2 (a) Draw the layer representation of a Silicon Controlled Rectifier (SCR).

(2 marks)

(b) Illustrate the **TWO (2)** transistor electrical equivalent circuits of SCR.

(3 marks)

(c) Briefly explain and illustrate the characteristic curves of SCR.

(10 marks)

(d) Referring to **Figure Q2(d)**, determine and redraw the circuit for gate triggering signal of SCR by the following applications:

    (i)   DC signals
    (ii)   AC signals

(10 marks)

Q3 (a) Differentiate the function OR and OR LD in a ladder logic diagram construction.

(4 marks)

(b) Construct the ladder logic diagrams for the following Boolean logic equations:

    (i) $A = (01 . 02' + 03) . 04 + (05 . 06')$
    (ii) $B = (07' . 08) + (08 + 09' . (10 . 11')) . 12$
    (iii) $C = 13' + (14 + 15' . (16 + 17') . 18 + 19) . 20'$

(9 marks)

(c) Construct the instruction list (mnemonic code) for the ladder diagram shown in **Figure Q3(c)**.

(12 marks)

Q4 (a) With the aid of diagram, illustrate the basic components of Programmable Logic Controller (PLC).

(5 marks)

(b) In the **Figure Q4(b)**, a tank will be filled with two chemicals, mixed, and then drained. When the Start button is pressed, the program will start Pump 1. Pump 1 runs for 10 seconds, filling the tank with the first chemical, then shuts off. The program then starts Pump 2 to fills the tank with second chemical until float switch is triggered then shut off automatically. At the same time, the program starts the mixer motor to mixes these two chemicals for 60 seconds. The program then opens the drain valve and starts Pump 3. Pump 3 shuts off after 15 seconds and the process stops. A manual Stop switch is also available in the system.

(i) Identify the input and output.

(5 marks)

(ii) Describe the process flow by motion diagram.

(5 marks)

(iii) Construct the PLC ladder diagram for the system.

(10 marks)

Q5 (a) Briefly explain the operation of double acting cylinder with 3/2 way directional valve.

(6 marks)

(b) A pneumatic system is operated at a pressure of 1000 kPa. Calculate the diameter of cylinder required to move a load at 500 N of force.

(5 marks)

(c) A hydraulic cylinder is to be used to move a work parts in a manufacturing operation through a distance of 30 mm in 6 seconds. A force of 15 kN is required to move the work parts. Determine the required working pressure and hydraulic liquid flow rate if a cylinder with a piston diameter as follows:

(i) 50 mm.
(ii) 120 mm.

(14 marks)

- END OF QUESTIONS -

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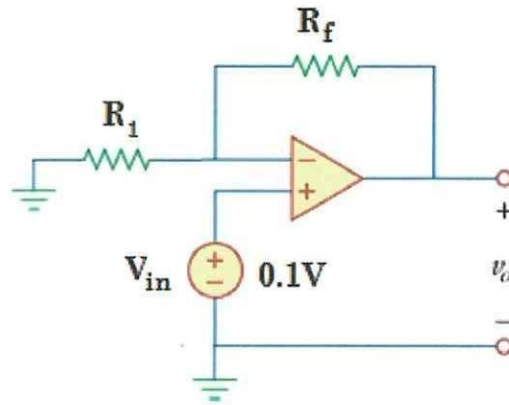
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Figure Q1(b)

Figure Q1(c)

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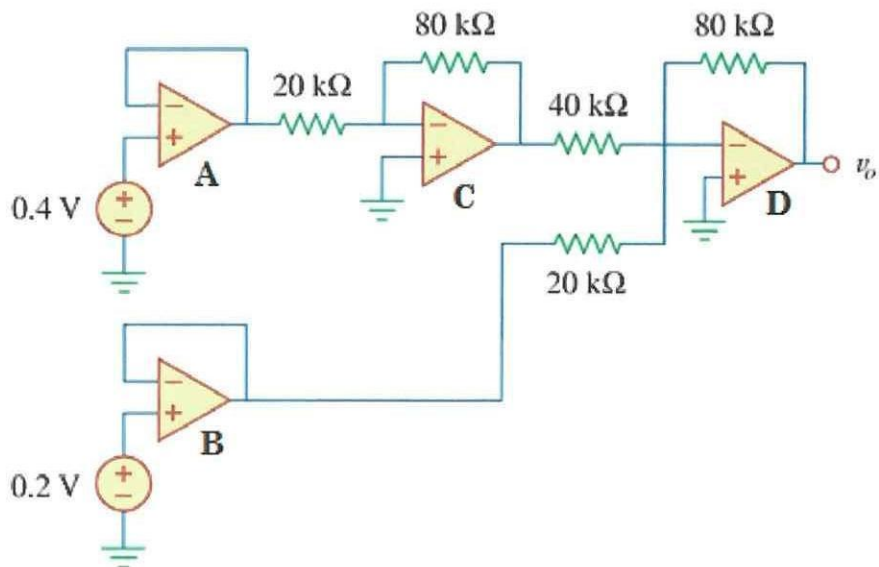
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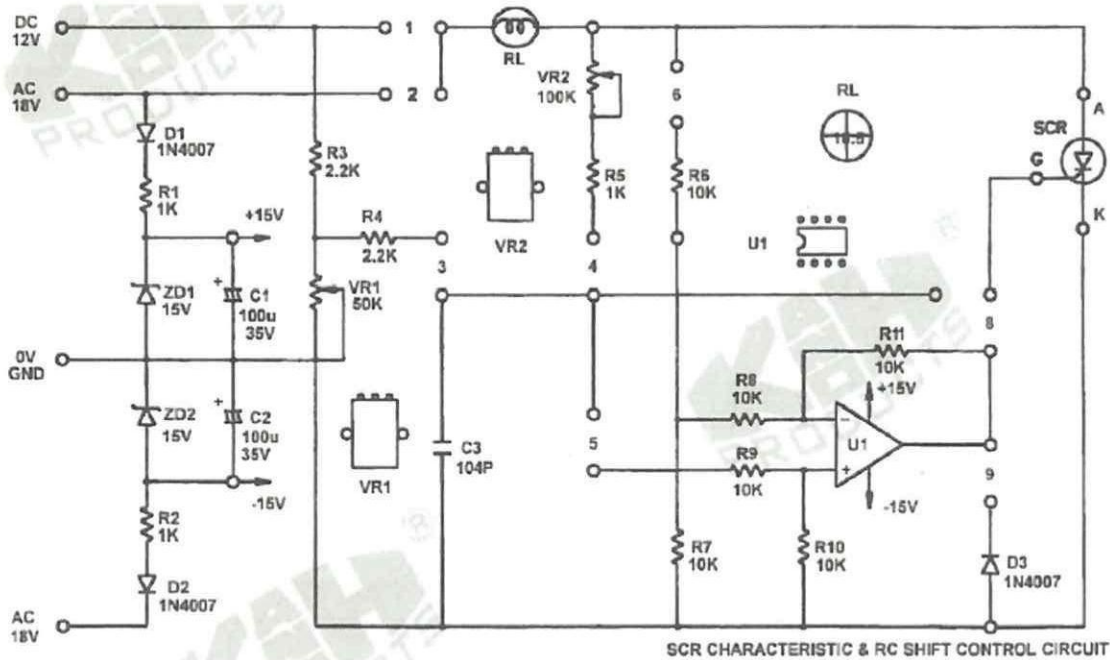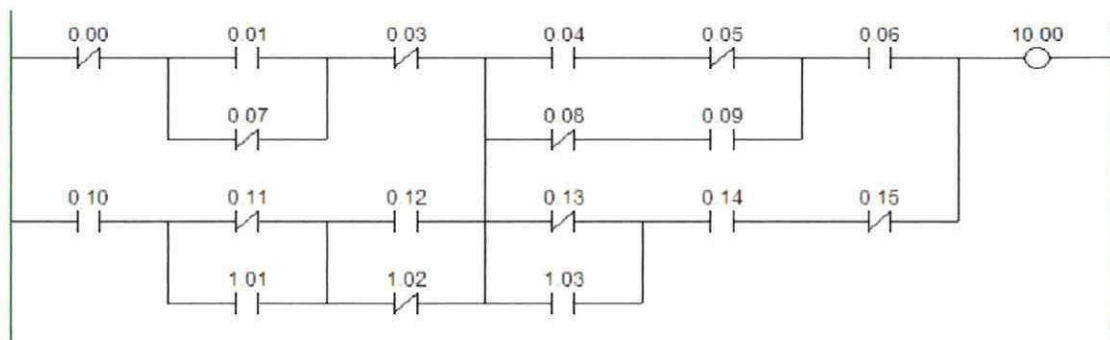
Figure Q2(d)

Figure Q3(c)

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Figure Q4(b)