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UNIVERSITI TUN HUSSEIN ONN MALAYSIA

**FINAL EXAMINATION
SEMESTER I
SESSION 2019/2020**

COURSE NAME : INDUSTRIAL AUTOMATION
COURSE CODE : BPC 41203
PROGRAMME CODE : BPB
EXAMINATION DATE : DECEMBER 2019 / JANUARY 2020
DURATION : 3 HOURS
INSTRUCTION : ANSWERS ALL QUESTIONS

THIS QUESTION PAPER CONSISTS OF **FOUR (4)** PAGES

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TERBUKA

- Q1** (a) Define industrial robot in the production system. (2 marks)
- (b) State **FOUR (4)** important reasons for in the industrial robots. (4 marks)
- (c) Explain **FIVE (5)** common body-and-arm configurations for industrial robot. (5 marks)
- (d) Illustrate an automation and control technologies in the production systems with an appropriate explanation. (9 marks)
- Q2** (a) Explain **FOUR (4)** of an automated elements in automated production systems. (4 marks)
- (b) Describe the following with an appropriate illustration.
- (i) Open-loop control system. (6 marks)
- (ii) Close loop feedback control system. (10 marks)
- Q3** (a) Explain the **FOUR (4)** principles of the industrial revolution of 4.0 towards focusing of the development of the country. (5 marks)
- (b) Differentiate the implementation of the basic in industrial revolution of IR1.0 compared to the development of IR4.0. (15 marks)

Q4 (a) Determine the output **Q** in **Figure Q4** and answered based on the input shown at **Table Q4**.

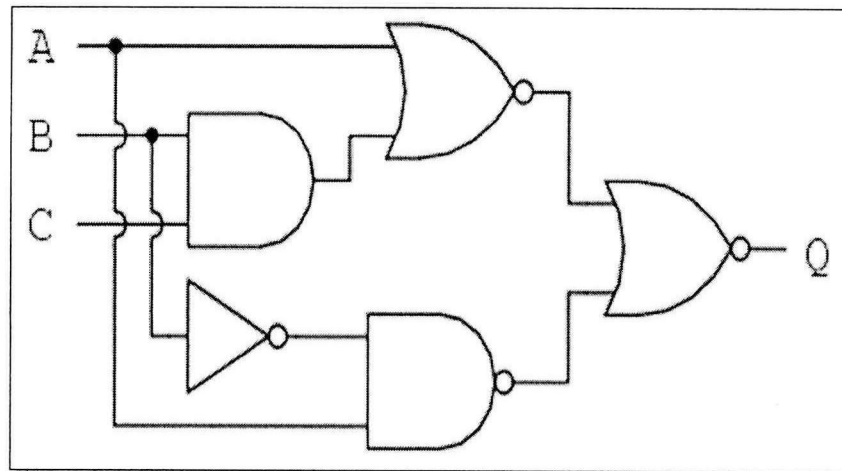


Figure Q4

Table Q4: Logic Circuit Output

INPUT			OUTPUT Q
A	B	C	
1	0	0	
1	0	1	
0	1	0	
1	1	0	
1	1	1	

(10 marks)

(b) Analyze to the simple expression using the identities, properties, rules, and theorems (De-Morgan's) of Boolean algebra based on **Figure Q4**.

(10 marks)

Q5 Vehicle travel counter-clock wise around the loop to deliver loads from the load and unload stations. Loading time at the load station is 0.8 minutes and unloading time is 0.5 minute. The total efficiency using AGVS is 60 delivery/hour. The performance parameters are velocity = 40 meter/minute, availability = 0.6, traffic factor = 0.9 and operator efficiency does not apply, so $E_w = 1.0$.

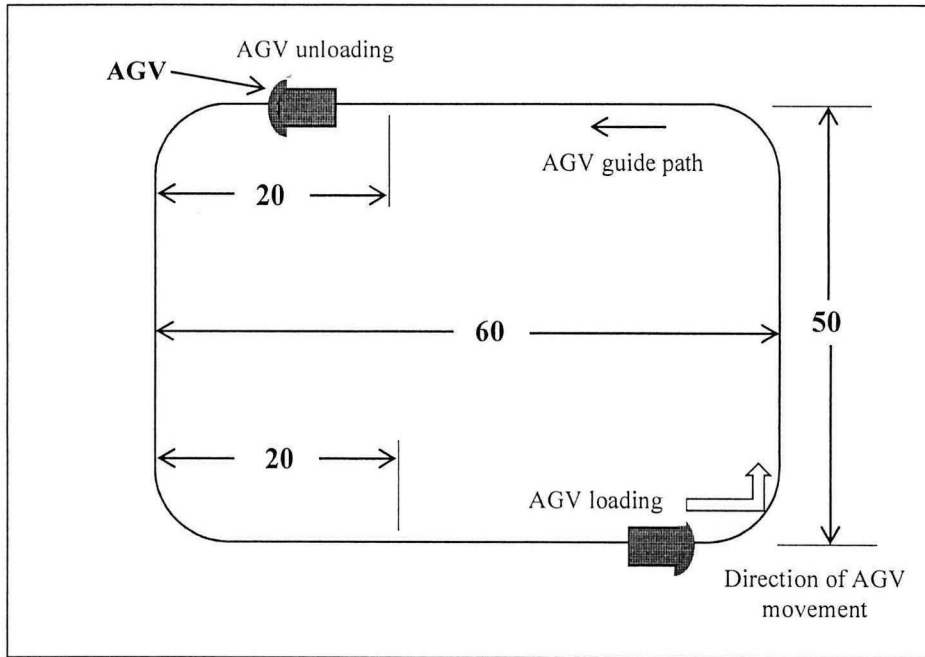


Figure Q5: AGV loop layout

Calculate:

- (a) Travel distances loaded and empty. (5 marks)
- (b) Ideal cycle time per delivery per vehicle. (5 marks)
- (c) Number of vehicle required to satisfy the demand for 50 delivery/hour. (10 marks)

- END OF QUESTIONS -