UNIVERSITI TUN HUSSEIN ONN MALAYSIA

PEPERIKSAAN AKHIR
SEMESTER II
SESI 2010 / 2011

NAMA KURSUS	:	TEKNOLOGI KAWALAN PEMBUATAN
KOD KURSUS	:	BDD 4083
PROGRAM	:	4 BDD
TARIKH PEPERIKSAAN	:	APRIL/MEI 2011
JANGKAMASA	:	2 JAM 30 MINIT
ARAHAN	:	JAWAB **EMPAT (4)** SOALAN DARIPADA ENAM (6) YANG DISEDIAKAN

KERTAS SOALAN INI MENGANDUNGI ENAM (6) MUKASURAT BERCETAK

Q1 One of the most common methods of shaping plastic resins is a process called injection moulding which is accomplished by large machines called injection moulding machines.

(a) Identify the inputs and outputs for the injection moulding machine system shown in Figure Q1 for the following units.

(i) Clamping Unit
(ii) Injection Unit
(iii) Hydraulic unit

(6 marks)

(b) Using to the above inputs and outputs, derive a block diagram for every sub units in the injection moulding machine. Assume every sub units are controlled by a PLC.

(9 marks)

(c) If only one PLC is to used to control the whole system, suggest the following PLC specification to be used in the system.

(i) Analog and Digital Input/Outputs (I/O)
(ii) Number of PLC bit
(iii) Voltage supply and current for each I/O
(iv) Type of communication for data transfer

(10 marks)

Q2 A controller is a device which monitors and affects the operational conditions of a given dynamical system. Depending on the application some types of controllers are better suited than others.

(a) Tabulate the differences between Programmable Logic Controller (PLC) and Microcontroller in term of its setup difficulties, robustness, cost and control flexibilities.

(8 marks)

(b) Using appropriate diagram, describe the features, capabilities and applications of Programmable Automation Controller (PAC).

(6 marks)

(c) The sequence motion of a typical actuator is represented as below.

A+ B+ C+ B- A- B+ C- B-

During step C-, the sequence step will halt for 10 seconds. **A** represents linear cylinder at x-axis, **B** represents linear cylinder at z-axis and **C** represents a pneumatic gripper (**C+** means clamp, **C-** means release). Assume that each components is controlled by 5/2 way Directional Control Valve Single Solenoid and has two reed switches.

(i) Sketch the sequence diagram

(3 marks)

(ii) Generate the PLC programming for the above sequence.

(8marks)

Q3 Communication medium can be classified as cable based (or wired) and wireless.

(a) For cable-based, describe examples of each medium and the differences between the types of communication below.

(i) Serial Communication
(ii) Parallel communication.

(7 marks)

(b) Describe the capabilities and application areas for FOUR (4) types of wireless communication medium below.

(i) WiFi
(ii) Bluetooth
(iii) Infrared
(iv) Radio frequency

(8 marks)

(c) Using appropriate diagram explain briefly the types and applications of the following FOUR (4) network topologies.

(i) Star topology
(ii) Bus topology
(iii) Ring topology
(iv) Mesh topology.

(10 marks)

Q4 (a) Robot controllers can be classified into the following four categories:

(i) Limited sequence control
(ii) Playback with Point-to-point Control
(iii) Playback with continuous path control
(iv) Intelligent control.

Explain each one highlighting the differences between each other.

(10 marks)

(b) For accurate machining or other processing performed by an NC system like robot, the positioning system must possess a high degree of precision. Using appropriate diagram explain the following measures of precision.

(i) Control resolution
(ii) Accuracy
(iii) Repeatability

(9 marks)

(c) One axis of a RRL robot is a linear slide with a total range of 950 mm. The robot's control memory has a 10-bit capacity. It is assumed that the mechanical errors associated with the arm are normally distributed with a mean at the given taught point and an isotropic standard deviation of 0.10 mm. Determine:

(i) the control resolution for this robot,
(ii) the accuracy, and
(iii) the repeatability for the robot.

(6 marks)

Q5 (a) Automated Guided Vehicle (AGV) is an option to deliver materials in the factory. Justify the pros and cons of using AGV compared to fixed type roller conveyors as the material transporters.

(10 marks)

(b) Discuss the methods used to navigate and control the movement of Automated Guided Vehicle (AGV).

(7 marks)

(c) Supervisory Control and Data Acquisition (SCADA) usually refers to centralized systems which monitor and control entire sites, or complexes of systems spread out over large areas. Describe an application of a SCADA system that can help achieve an agile manufacturing level for a factory.

(8 marks)

Q6 (a) The performance of a storage system in accomplishing its function must be sufficient to justify its investment and operating expense. Define each performance measure below and describe its impact on the investment.

(i) Storage Capacity
(ii) Storage density
(iii) Accessibility
(iv) System throughput

(8 marks)

(b) Describe the Automatic Data Capture (ADC) technologies below. Include the advantages and disadvantages of each technology.

(i) Radio Frequency Identification (RFID)
(ii) Magnetic Stripes
(iii) Optical Character Recognition (OCR)

(9 marks)

(c) There are ten types of different size of boxes stored in an Automated Storage and Retrieval System (ASRS). Each of these box types has its own storage compartment and barcode. Each of these compartments can be loaded up to 50 boxes. Storage and retrieval process can be done via their own conveyor accordingly. One Cartesian robot at the storage area is utilized for storing and retrieving purpose. The operator needs to scan the barcode by the box for storing and scan the barcode in the checklist for retrieving the box. Information such as number of the stored boxes, types of boxes and number of retrieved boxes can be accessed by warehouse manager and also by managers from all other departments in the factory.

Sketch an architecture model for this ASRS control system.

(8 marks)

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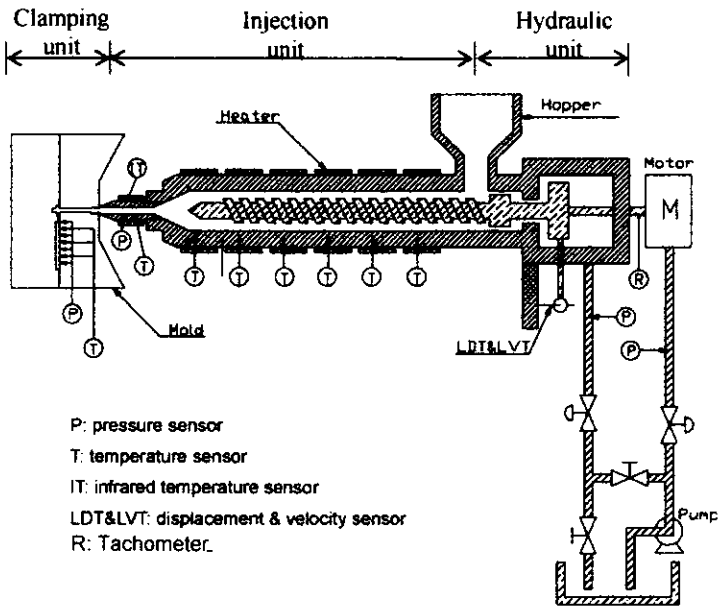

Figure Q1 : Injection Moulding Schematic Diagram