Marks Scored:

KATHMANDU UNIVERSITY
End Semester Examination
July/August, 2017

Level : B.E.
Year : IV
Course : COEG 402
Semester : II
Exam Roll No. :
Time : 30 mins.
F. M. : 10
Registration No. :
Date AUG: 2 2 2017

SECTION "A"
[20 Q. × 0.5 =10 marks]

Tick the most appropriate answer.

1. What is the drawback of centralized computer control over hierarchical control system?
   a. Complexity b. Unreliable c. Lack of operator d. Low speed

2. Which of the following is true for Digital Control System?
   a. Unable to combine with analog controller.
   b. Uses Z transform.
   c. Decentralized control cannot be achieved.
   d. Has infinite precision.

3. Current signal is used in control system because it is _____.
   a. prone to disturbance b. prone to EMI
   c. prone to signal drop d. prone to resistive coupling.

4. Which of the following is ***not true*** for real time control system?
   a. Program flow cannot be determined.
   b. Both event and interval based interrupts may be used.
   c. Can only be achieved using Real Time OS.
   d. CPU clock may be used for synchronization of control loop.

5. Which of the following is ***not*** the role of Message Passing Coprocessor (MPC) in MultibusII ?
   a. Bus arbitration b. Division of message
   c. Data/Address multiplexing d. Message reconstruction

6. Which of the following is done in preliminary design of product development cycle?
   a. Component design b. Evaluation of alternatives
   c. Trade-off studies d. Functional analysis

7. What is the address bus width of VMEbus (IEEE 1014) bus system?
   a. 8/16 b. 16/32 c. 32/64 d. 64/128

8. Which of the following is ***not*** the problem of sample and hold?
   a. Finite aperture time b. Signal feedthrough
   c. Aliasing d. Signal drop

9. Which of the following is ***not*** the ergonomic aspect influencing acquisition of information from user?
   a. Perception facility b. Relative understanding
   c. Coding d. Organizing and structuring

10. Decide whether each of the following answer is true (T) or false (F). A Flash ADC:
(i) Can be used for very high sampling rate
(ii) Requires start/stop signal to initiate/terminate conversion process.
a. (i) T (ii) T b. (i)T (ii)F c. (i)F (ii)T d. (i)F (ii)F

11. Decide whether each of the following answer is true (T) or false (F). A R-2R network DAC has:
(i) faster conversation time than weighted summing amplifier based DAC
(ii) higher conversion accuracy foranalog signal with wide range.
a. (i) T (ii) T b. (i) T (ii) F c. (i) F (ii) T d. (i) F (ii) F

12. In case of more than one task waiting for semaphore task selection may be done by_____.
a. first in, first out b. priority order
c. non-deterministic d. all

13. Which of the following is solution to eliminate capacitive coupling in industrial control system?
a. Using twisted cable.
b. Crossing power and signal cable at right angel.
c. Separate power supply for sensitive devices.
b. Grounded electrostatic shield for conductors

14. Adaptive system with gain scheduling is implemented for system _____.
a. with linear control requirement. b. which operates in various operating region.
c. whose response is very slow. d. whose sources of disturbances are known.

15. Which of the following sensor/transducer can be implemented to measure industrial weight above 1 ton?
a. Combination of piezo electric sensor and bridge circuit.
b. Combination of resistive position sensor and LVDT.
c. Load cell with high resolution signal conditioning.
d. Combination of bellows and LVDT.

Fill in the blanks.

16. Unit dedicated to interface object in a physical world to a SCADA system by transmitting data between each otheris _____.

17. The concept of relating real world object with its metaphor to present pictorial concept in man machine interface is termed as _____.

18. In a digital filter number of previous inputs used to calculate current output is given by _____ of filter.

19. Reference clock period that governs operation of bus is _____.

20. Real time threats in a RTLinux can communicate with Linux process via _____ _____.

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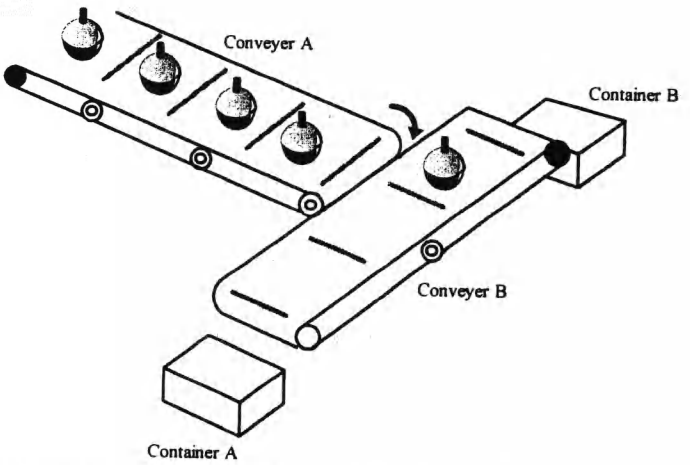
SECTION B
[5Q × 8 = 40 marks]

Attempt *ANY FIVE* questions. Assume missing parameters suitably. [Question no 1 is compulsory]

1. In a conveyor based industrial process control shown in figure, objective is to separate damaged product based on its weight. Conveyor A is used to transport object to Conveyor B. Conveyor B separates and places object in Container A or Container B based on the weight of the object.



For above mentioned control objective design following parameters.
- Sensor selection and placement.
- Actuator selection and placement.
- Selection and design of control system architecture.
- Overall system layout with placement of sensors, actuators and controller.
- Control algorithm using conventional andreal-time programming. [8]

2.
a. Draw and explain different types of feed forward control structure and write about its benefits and limitation over feedback control. [4]
b. Draw the block diagram of interfacing computer based control system to physical world and explain the role and importance of multiplexers/demultiplexes and ADC/DAC. [2.5]
c. Explain how synchronization of control loop is influenced by finite aperture time of sample and hold unit. [1.5]

3.
a. Draw and explain different types of bus interface electronics. Explain how data and address exchange can be achieved using tri-state logic. [2]
b. Explain why interrupt is very important to implement Real Time Control System. Also explain different mechanism of handling interrupt in computer system. [4]
c. Write about digital filter and its benefits over analog filter. [2]

4.

a. Explain the methods with appropriate examples how can control loop be synchronized so that the execution of control loop can be carried out in fixed and pre-defined interval without missing any samples. [4]

b. What are the problems of practical PID controller, explain mechanisms of mitigating these problems. [4]

5.

a. Explain the need and methods of resource protection in a computer based control system. [5]

b. Explain with and example how inter process communication is achieved in OS. [3]

6. Write short notes on. (*ANY FOUR*)

a. Digital communication protocol. [2]
b. Supervisory Control and Data Acquisition (SCADA). [2]
c. Memory model based on human cognition. [2]
d. Real Time OS. [2]
e. Computer numeric control. [2]
f. Task states in operating system. [2]
g. Distributed digital control system. [2]