

Marks Scored:

KATHMANDU UNIVERSITY  
End Semester Examination  
July, 2018

Level : B.E.  
Year : IV

Course : COEG 402  
Semester: II

Exam Roll No. :

Time: 30 mins.

F. M. : 10

Registration No.:

Date **JUL 22 2018**

SECTION "A"

[20 Q × 0.5 = 10 marks]

Tick the most appropriate answer.

1. If one or more task is running in the operating system but fail to make any progress, this condition is termed as \_\_\_\_\_.  
a. deadlock                      b. starvation                      c. halted                      d. race condition
2. Board which intends to become bus master sends request to bus arbiter via \_\_\_\_\_.  
a. bus request line                      b. control line  
c. bus allocation line                      d. master allocation line
3. Which of the following is not the criteria for classifying CNC machine?  
a. Axis of operation    b. Machining tool                      c. Machining speed                      d. Control system.
4. In real time control system \_\_\_\_\_.  
a. CPU clock is never used  
b. sequential programming is done  
c. multitasking is possible  
c. single interrupt line is always dedicated to a single process
5. In Multibus II interrupts are handled using \_\_\_\_\_.  
a. multi master operation                      b. shared interrupt  
c. Daisy-chain connection                      d. interrupt as unsolicited message
6. In computer-based control system, sampling time depends upon \_\_\_\_\_.  
a. number of states of the system                      b. limitation of control signal  
c. measurement of the system                      d. bandwidth of the system
7. Which of the following is not real time operating system?  
a. RTLinux                      b. Linux                      c. AMX                      d. DeltaOS
8. Hysteresis controller is an example of \_\_\_\_\_.  
a. Feedforward control                      b. on/off control  
c. real time control                      d. PID control
9. In practical systems, Integral part of PID controllers may cause \_\_\_\_\_.  
a. anti-aliasing                      b. bumpless transfer  
c. unnecessary overshoot                      d. control signal limitation
10. The condition of several boards trying to be bus master at the same time, creating a conflicting situation, is called \_\_\_\_\_.  
a. bus arbitration                      b. bus contention                      c. block transfer                      d. none

11. Decide whether each of the following answer is true (T) or false (F). A digital ramp ADC \_\_\_\_\_.
- has large and fixed conversion time
  - 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
12. Decide whether each of the following answer is true (T) or false (F). In adistributed digital control system \_\_\_\_\_.
- microcomputers do not communicate with each other and perform task independently
  - feedback from physical world is fed to local computer
- a. (i) T (ii) T      b. (i) T (ii) F      c. (i) F (ii) T      d. (i) F (ii) F
13. Decide whether each of the following answer is true (T) or false (F). Can be used to measure temperature of molten metal in a furnace.
- Combination of thermistor and R to V converter.
  - Combination of thermocouple and signal conditioning unit.
- a. (i)T (ii)T      b. (i) T (ii) F      c. (i) F (ii) T      d. (i) F (ii) F
14. Which of the following is not true?
- In multitasking environment with one processor, more than one task can be running in CPU.
  - In Static Priority allocation, the low priority tasks may not execute at all.
  - Shared resources are accessed in Critical Region of the code.
  - Rendezvous can be used for Inter Process Communication.
15. Adaptive system with gain scheduling is implemented for system \_\_\_\_\_.
- with linear control requirement.
  - which operates in various operating region.
  - whose response is very slow.
  - whose sources of disturbances are known.

Fill in the blanks.

16. In hierarchical control system two console at level four are \_\_\_\_\_ and \_\_\_\_\_.
17. VMEBus has \_\_\_\_\_ interrupt lines.
18. IEC 381 standard value for voltage signal is \_\_\_\_\_.
19. In closed loop PID controller a condition where there is large change in controller output due to step change in set point is termed as \_\_\_\_\_.
20. Cables are shielded and grounded to reduce \_\_\_\_\_ coupling.

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Time : 2 hrs 30 mins.

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F. M. : 40

SECTION "B"

[5Q × 8 = 40 marks]

Attempt *ANY FIVE* questions. Assume missing parameters suitably.

1. a. Write about the significance of multiplexers and demultiplexers in computer-based control system and explain with an appropriate block diagram how they can be used to reduce system size and complexity. [4]  
b. Draw the functional block diagram and compare centralized and distributed computer-based control system [4]
2. A two axis CNC machine should be able to cut wood to user defined length and width. HMI of the machine includes input area for length and width to be cut and start/stop button.  
For above mentioned control objective design following parameters.
  - Mechanical layout of the machine.
  - 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 and real-time programming. [8]
3. a. Write down computer program or algorithm to implement position and velocity form of PID controller. Also explain the significance of sampling time in your program. [3]  
b. What are the methods of synchronizing control loop in a computer-based control system. [5]
4. a. Draw operational block diagram and explain the working of MRAC. [2]  
b. Justify with an appropriate example how unprotected resource in an operating system can bring race condition. [4]  
c. Write about digital filter and its benefits over analog filter. [2]
5. a. Explain with an example how mutual exclusion can bring deadlock in an OS. [3]  
b. Distinguish synchronous and asynchronous data transfer. [2]  
c. Explain the working of successive approximation ADC. [3]
6. Write short notes on (*ANY FOUR*) [4Q × 2 = 8]
  - a. Discrete and continuous level sensor
  - b. Computer numeric control
  - c. Human interface design principle.
  - d. Inter process communication.
  - e. SCADA
  - f. Task scheduling strategies.

