Tanta University	Department: Elec. Computers & Control Engineering Total Marks: 90 Marks	Faculty of Engineering

Course Title: Digital Control Date: 7-6 -2023	Course Code: CCE3220 (Second term exam)	Year: 3rd Allowed time: 3.0

Question (1)   (30 Marks)

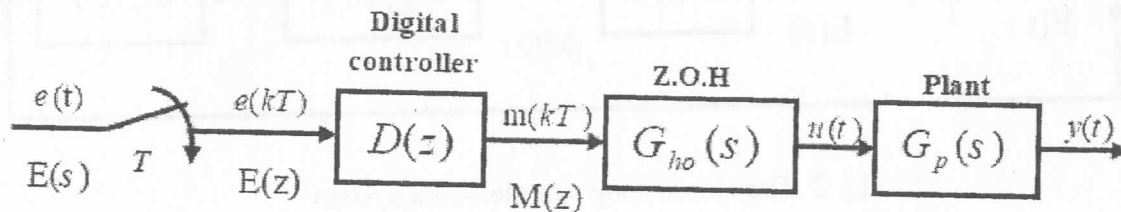Consider the open-loop sampled-data system of Fig. 1. The sampling period is $T = 1$ *sec*.

Fig. 1 Discrete-time system

The plant transfer function $\left(G_p(s) = \dfrac{1}{s+0.2}\right)$ and the digital control signal is given by

$$\left(m(k+1) = (0.9)m(k) + (0.2)e(k+1)\right)$$

i)   Find the transfer function $\dfrac{Y(z)}{E(z)}$

ii) Find $y(0)$ as $\left(\lim_{k\to 0} y(k)\right)$ when a unit step input is applied.

iii) Calculate the unit-impulse response.

Question (2)   (25 Marks)

Consider a sampled-data system with input $e(k)$ and output $y(k)$ and is represented by the following difference equation:

$$y(k+2) - \left(\frac{3}{4}\right)y(k+1) + \left(\frac{1}{8}\right)y(k) = e(k)$$

where

$$e(k) = \begin{cases} 1 & k = 0,1 \\ 0 & k \geq 2 \end{cases} \quad \text{and} \quad y(0) = y(1) = 0$$

Solve the given difference equation for $y(k)$ using:

i)   The recursive technique.

ii) The z-transform.

iii) Will the final value property give the correct value of $y(k)$ as $k \to \infty$.

iv) Discuss the system stability.

Question (3)   (35 Marks)

Consider the closed-loop sampled-data system shown in Fig. 2. The sampling period $T = 1$ sec. The digital controller transfer function $D(z) = K$ and the plant transfer function $G_p(s) = \dfrac{1}{s(s+1)}$
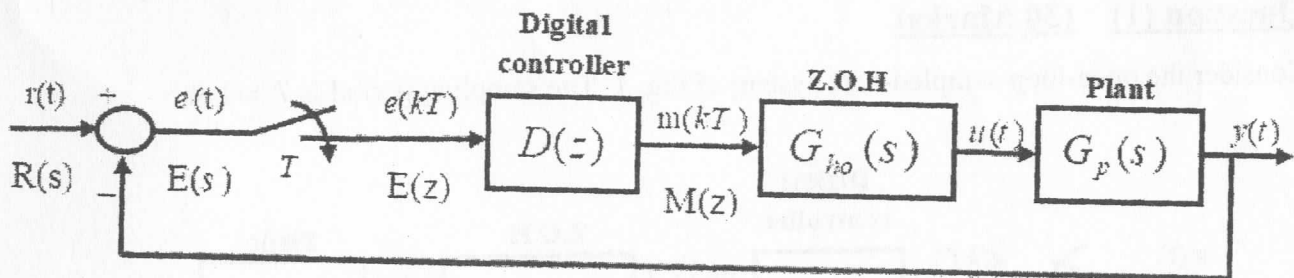

Fig. 2 The closed-loop sampled-data system

i)   Find the open loop transfer function $(D(z)G(z))$

ii) Find the system type

iii) Determine the steady state error (e_{ss}) when the gain $(K = 1)$

iv) Determine the range of the gain (K) for which the system is stable

Tanta University

Department: Computers and Control Eng.
Total Marks: 85 Marks
Academic Year: 2022/2023(Second Semester)

Faculty of Engineering

Course Title: **Modeling and Simulation** Date: 4-6-2023 (End-of-Semester Exam)	Course Code: **CCE3221** Time Allowed: **3 hours**	**Third Year Students** No. of Pages: (4)

Model (A)

Hint: Round numbers to three decimal places (e.g. 5.7675→5.768 and 5.7673→5.767)
Answer all the following questions.

Question (1 - a)   (50 Marks)
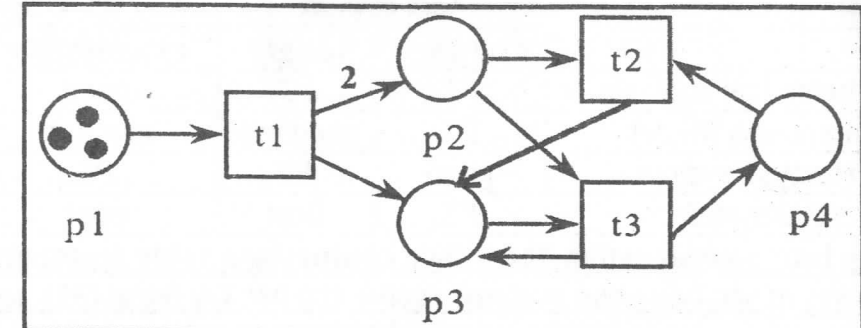Shade the circle of the most appropriate answer in your electronic answer sheet:

Customer	Arrival Time	Server 1			Server 2		
		Service Time	Time Service Begins	Time Service Ends	Service Time	Time Service Begins	Time Service Ends
1	0	5	0	5	-	-	-
2	2	-	-	-	3	2	5
3	6	3	6	9	-	-	-
4	10	5	10	15	-	-	-
5	12	-	-	-	6	12	18
6	13	1	15	16	-	-	-

Taking into consideration the Table above (The simulation table for the multi-server queuing system), solve the MCQs from (1) to (12):

1) The Average waiting time of those who wait in queue d(n) is
   a) 2   b) 0   c) 3   d) 1   e) None of these
2) The Time-average number in queue q(n) is
   a) 0.065   b) 0.111   c) 0.056   d) 0.281   e) None of these
3) The total busy time B(t) (system) is
   a) 11.5   b) 13.5   c) 12.5   d) 6.5   e) None of these
4) The utilization u(n) (System) is
   a) 0.794   b) 0.823   c) 0.901   d) 0.639   e) None of these
5) The average service time is
   a) 2.782   b) 4.167   c) 3.833   d) 0.512   e) None of these
6) The average waiting time is
   a) 0.234   b) 0.167   c) 0.427   d) 0.333   e) None of these
7) The average time customer spends in the system is
   a) 4.167   b) 5.362   c) 3.218   d) 2.333   e) None of these
8) The Throughput is
   a) 0.333   b) 0.466   c) 0.244   d) 0.198   e) None of these
9) Average time between arrivals is
   a) 1.5   b) 3.9   c) 2.6   d) 4.7   e) None of these
10) Probability (wait) is
   a) 0.258   b) 0.167   c) 0.401   d) 0.334   e) None of these
11) The maximum time customer spends in the system is
   a) 2   b) 5   c) 7   d) 6   e) None of these
12) The minimum time customer spends in the system is
   a) 2   b) 3   c) 4   d) 5   e) None of these

P={p1,p2,p3,p4}
T={t1,t2,t3}

Taking into consideration the petri net above, solve the MCQs from (13) to (24):

13) The preset for transition t3 is:
   a) °t3 = {p2,p4}   b) °t3 = {p4}   c) °t3 = {p2}   d) °t3 = {p2,p3}   e) None of these
14) The postsets for transition t2 is:
   a) t2° = {p3}   b) t2° = {p3, p2}   c) t2° = {p4}   d) t2° = {p4, p2}   e) None of these
15) The above Petri Net is ordinary Petri Net?
   a) Yes   b) No   c) None of these
16) The above Petri Net is pure Petri Net?
   a) Yes   b) No   c) None of these
17) The above Petri Net is..............
   a) Safe Petri Net   b) 2-Boundedness   c) 3-Boundedness   d) None of these
18) The above Petri Net is conservative?
   a) Yes   b) No   c) None of these
19) The above Petri Net is persistent ?
   a) Yes   b) No   c) None of these
20) What is the initial state (marking) ?
   a) M=(3 0 1 0)   b) M=(0 0 3 0)   c) M=(3 0 0 0)   d) None of these
21) Which transitions are enabled at initial state (M0)?
   a) t1 and t2   b) t1 and t3   c) t1   d) t3   e) None of these
22) If the current state M=(3 0 0 0), the next state after enabled transitions are fired is
   a) M=(1 2 1 0)   b) M=(2 2 1 0)   c) M=(1 1 1 0)   d) None of these
23) If the current state M=(1 0 0 1), the next state after enabled transitions are fired is
   a) M=(0 2 2 0)   b) M=(1 0 0 1)   c) M=(0 1 1 0)   d) None of these
24) The transition t2 and t3 are enabled if the current state (marking) M=
   a) (0 2 1 1)   b) (1 1 2 1)   c) (0 2 1 0)   d) Both a and b   e) None of these

Complete the pseudocode below for the Monte Carlo simulation to estimate the area of a 2-dimensional donut (or toroid) with outside radius of 3 inches and inside radius of 2 inches. Solve the MCQs from (25) to (30):

Generate two sequence of N (Ri,R j)
i& j=1,2,....,N
xi=............. ➝(25)
yj=............. ➝(26)
start from h=0
L= .... ➝(27)
If L............. ➝(28)
then h=h+............. ➝(29)
Area=............. ➝(30)

25) xi=......... a) -3+Rand (6)   b) -2+Rand (6)
   c) -3+Rand (5)   d) None of these
26) yj=......... a) -3+Rand (6)   b) -2+Rand (6)
   c) -3+Rand (5)   d) None of these
27) L=...... a) (x^2+y^2) b) $(x+y)^{0.5}$
   c) $(x^2+y^2)^{0.5}$ d) None of these
28) L......... a) >=3 and L<=5   b) >=2 and L<=3
   c) <=5 and L>=3   d) None of these
29) h=h+...... a) 3   b) 2   c) 1   d) None of these
30) Area=...... a) 36(h/N)   b) 16(h/N)   c) 36(N/h)   d)16(N/h)   e)None of these

50) Discrete .... simulation is a special case of the discrete .... simulation
a) event, time   b) time, event   c) None of these

49) Given the matrix A = [1,2,3; 3,3,6; 4,6,8; 4,7,7], which of the following is the correct value for the expression x = mean(A,2)
a) x=[3 4 6]   b) x=[3;4;6]   c) x=[2; 4; 6; 6]   d) x=-4.5   e) None of these

48) To see the sub-matrix with Y_{ij} for $2<=i<=4$ and $1<=j<=2$ of a matrix a, of order 5*6, which code is used?
a) Y(2,4;1,2)   b) Y(2,4;1,2)   c) Y(2:4;1:2)   d) Y(2:4;1:2)   e) None of these

47) Executing in the command window the following code returns, y = [1:3]'; z=size(y)
a) error message   b) z=[1 3]   c) z=[3 1]   d) z=3   e) z=1

46) What is the nature of the arrangement of the coefficients to store the following expression in MATLAB? $y=3x^5+x^2+6$
a) poly(p,k)   b) polyfit(p,k)   c) polyint(p,k)   d) polyval(p,k)   e) None of these

45) The function to evaluate the value of a polynomial for a constant value of the independent variable (say k) in the polynomial,   p is a row vector
a) legend   b) display   c) gtext   d) mtext   e) None of these

44) To specify different curves in the graph, we use the _____ function.
a) x=linspace(15,4,20)   b) x=linspace(4,20,15)   c) x=4:15:20   d) None of these

43) Which of the following expressions generates an evenly spaced vector x containing 15 values between 4 and 20.
a) x=[0 -2 -5]   b) x=[3 0 -2]   c) x=[1 -4 3]   d) x=[2 0 -2]   e) None of these

42) Given the matrix p = [1   0   -2   -5], which of the following is the correct value for the expression x= polyder(p)
a) x=[3 2 1]   b) x=[2 3 1]   c) x=[3 2 1]   d) x=[2 1 3]   e) None of these

41) Given the matrix p = [-1   -2], which of the following is the correct value for the expression x= poly(p)
a) H=[0 2; 2 0]   b) H=[2; 3; 2]   c) error   d) None of these

40) What would be the output of the following code (in editor window)?
K = [0 1; 1 0] ;   M=2 ;   H=K + M
a) Y=[0   14]   b) Y=[7 0 6]   c) error   d) None of these

39) What is output of N = [1 0 2] ; V = [3 0 7] ; Y=N*V ;
a) 0   b) 1   c) Depends on the class of array   d) None of these

38) Index of an array in MATLAB Start with

	accuracy	insight	extensibility	time to develop
Mathematical analysis	....P1	....P2	good	good
Simulation Model	medium	medium	medium	medium
Prototype system	good	....P4	....P3	....P6
Real system	....P5	best	poor	very poor

Taking into consideration the above comparison table (comparison between the four ways of studying the system) , solve the MCQs from (31) to (37):

31) P1 is ....   a) poor   b) best   c) good   d) None of these
32) P2 is ....   a) poor   b) best   c) good   d) None of these
33) P3 is ....   a) poor   b) best   c) good   d) None of these
34) P4 is ....   a) poor   b) best   c) good   d) None of these
35) P5 is ....   a) poor   b) best   c) good   d) None of these
36) P6 is ....   a) poor   b) best   c) good   d) None of these
37) P7 is ....   a) poor   b) best   c) good   d) None of these

Question (1 - b)   (35 Marks)

Shade the circle in your electronic answer sheet (choose True / False):

1) In discrete event simulation, system state transitions are asynchronous.
2) Resolution is the level of detail at which we see a system.
3) Mathematical modeling is used when systems are highly complex
4) The simulation is to try to duplicate the features, and characteristics of a real system.
5) Attributes are a set of variables that is capable of characterizing the system at any time.
6) Verification comes after validation
7) Discrete-Event Simulation is simpler than Discrete-Time Simulation to code.
8) Validation answers the question " Did you correctly build the model?"
9) The abstracted model may be logical or mathematical.
10) The time information is explicit in discrete event simulation
11) The time information is implicit in discrete time simulation
12) A static simulation model is a representation of a system at a particular time.
13) Completion of service of a customer is endogenous variables.
14) Abstraction is the level of detail at which we see a system.
15) A Monte Carlo simulation model will produce the different result regardless of the set of random numbers used
16) Monte Carlo simulation is related to discrete-event simulation
17) In inventory system, the events are inventory level, time of the last event
18) In inventory system, the state variables are arrival of an order from the supplier, demand for the product, end of the simulation
19) Time compression is the simulation is the simulation of a long period of "real" time in a short period of calendar time
20) Validation implies testing to see if the model correctly predicts the activities of the system under study, i.e., Did you build the right model?
21) Ordinary Petri net has all of its arcs weighted 1's
22) The state changes occur only at event times for a discrete event simulation
23) The Monte Carlo cannot be generalized to multi-dimensional integrals.
24) The service time of a customer is exogenous variables.
25) Mean waiting time in the queue is endogenous variables
26) Building and studying models are usually safer than studying the real object.
27) The simulation cannot optimize the system's performance; it can only describe the system behavior under the given conditions.
28) The utilization factor for a system is defined as the proportion of the time the service facility is in use.
29) First step in the Monte Carlo simulation process is to set up probability distributions
30) The first step in simulation is to develop the simulation model
31) In assigning random numbers in a Monte Carlo simulation, it is important to develop cumulative probability distributions
32) Verification implies testing to see that the responses produced by the model are the ones that you would expect, based upon the mathematics and logic of the model.
33) Monte Carlo simulation is a special case of the discrete time simulation
34) If the demand exceeds the inventory level, the excess of demand over supply is backlogged and satisfied by future deliveries.
35) To test a point by drawing a ray, if the number of times that the ray crosses the boundary of the object is an odd number of times then the test point is outside the object

Tanta University	Department: Computer & Control Engineering	Faculty of Engineering

Course Title: Software Engineering	Course Code: CCE3218	Year: 3rd
Date: 11/6/2023	Allowed time: 3Hour	Total degree:90

Answer all of the following questions:

Question (1) Choose the correct answer :   (50 points)

1. In a .... at the end of each iteration, the Product Owner and other customer stakeholders review progress and receive feedback for that iteration?

A. Daily standups   B. Scrum master   C. Sprint review   D. Sprint Planning

2. In Scrum, when is a Sprint Over?

A. When all the Sprint Backlog Items are completed   B. When the Product Owner suggests

C. When all the Sprint Backlog tasks are completed   D. When the time box expire

3. Which of the following is delivered at the end of the Sprint?

A. A document containing test cases for the current sprint
B. An architectural design of the solution
C. An increment of Done software
D. Wireframes designs for User Interface

4. Which of the following is a key principle of the Agile Manifesto?

A. Comprehensive documentation   B. Following a plan regardless of changes
C. Emphasizing individuals and interactions over processes and tools
D. Heavy emphasis on contract negotiation

5. .... is a structural design pattern that allows objects with incompatible interfaces to collaborate.

A. Factory   B. Adapter
C. Flyweight   D. Chain of responsibility

6. The reason for holding regular retrospectives is:

A. It allows learning which can be used to improve team performance during the project.
B. It allows the team to take a welcome break from work.
C. It gives management information to use in team members? performance reviews.
D. It prevents deviation from the process that the team has been following.

7. .... is a document that describes what the software will do in detail and how it will be expected to perform.

A. Business Requirements Document (BRD)   B. Business Case
C. Software Requirements Specifications (SRS)   D. None of these

8. Which design patterns are specifically concerned with communication between objects?

A. Creational Patterns   B. Structural Patterns
C. Behavioral Patterns   D. J2EE Patterns

9. .... is an agile software development framework that aims to produce higher quality software, while focusing on customer satisfaction by delivering what's needed when needed.

A. SCRUM   B. KANBAN   C. Extreme Programming (XP)   D. None of these

10. In which project phase the project scope is defined, the project is divided into manageable tasks and the resources required are estimated?

A. Initiation   B. Planning   C. Execution   D. Closing down

11. Which of the following is correct about Structural design patterns?

A. These design patterns are specifically concerned with communication between objects.
B. These design patterns provide a way to create objects while hiding the creation logic, rather than instantiating objects directly using a new operator.
C. These design patterns are concerned with classes and objects' composition to form larger structures and provide new functionality. In these patterns, inheritance is used to compose interfaces or implementations.
D. None of the above.

12. Agile is a .... approach.

A. Sequential   B. Iterative   C. Incremental   D. Both b and c

13. Gantt chart is used for ....

A. Resource management   B. Project scheduling
C. Large number of tasks   D. One time update

14. .... is a path through the graph where every activity has zero slack.

A. PERT chart   B. Slack   C. Critical path   D. None of these

15. .... is an iterative process during which the software requirements are analyzed and converted into a description of the internal structure and organization of the system.

A. Software implementation   B. Software Testing
C. Software design   D. Requirements collection

16. A design should be modular; that is, the software should be logically partitioned into elements or subsystems.

A. True   B. False

17. .... is a creational design pattern that provides an interface for creating objects in a superclass, but allows subclasses to alter the type of objects that will be created.

A. Factory   B. Adapter
C. Flyweight   D. Chain of responsibility

18. What does a burndown chart display?

A. Project Budget   B. The velocity of the team
C. The capacity of the team members   D. Amount of remaining work with respect to time

19. .... is a behavioral design pattern that decouples classes by passing a request from one class to another until the request is recognized.

   A. Factory   B. Adapter

   C. Flyweight   D. Chain of responsibility

20. .... is a graphical representation of a project's timeline, tasks, and the dependencies between those tasks.

   A. Bar chart   B. PERT chart   C. Critical path   D. None of these
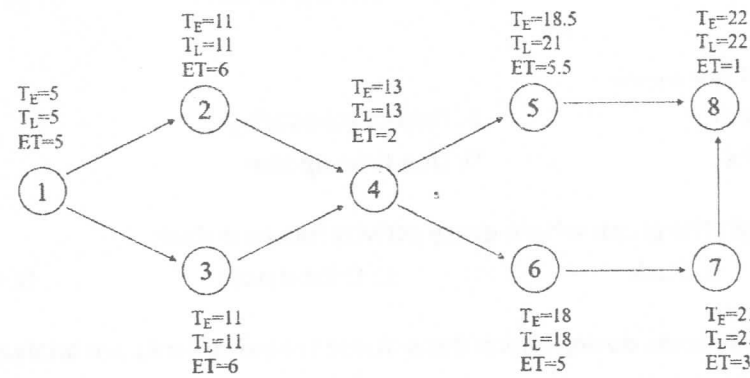
21. Who is responsible for enacting the sprint meeting and other Scrum values and practices?

   A. Product owner   B. Scrum master   C. Scrum team   D. None of these

22. Slack time is equal to:

   A. The difference between an activity's latest and earliest start date

   B. The latest expected completion time

   C. The difference between the start time and realistic time for each activity

   D. The sum of an activity's latest and earliest expected completion time

23. The critical path of the following diagram can be ....

   A. 1-2-3-4-5-6-7-8   B. 1-2-4-6-7-8   C. 1-3-4-5-8   D. 1-2-4-5-8

24. A design should NOT lead to interfaces that reduce the complexity of connections between components and with the external environment.

   A. True   B. False

25. When forming an Agile project team it is BEST to use:

   A. Top management officials   B. Highly specialized developers

   C. Generalized Specialists   D. All of the above

Question (2):   (40 points)

(a) What are the characteristics of a good software?   (10 points)

(b) What is meant by SDLC and what are the types of its models?   (10 points)

(c) How to reduce Software Process RISK using the SCRUM methodology? (10 points)

(d) Develop a context diagram and level 0 diagram for the hospital pharmacy system described in the following narrative.

> Perfect Pizza wants to install a system to record orders for pizza and chicken wings. When regular customers call Perfect Pizza on the phone, their phone number goes automatically into the Pizza system. The phone number invokes the name, address, and last order date comes automatically up on the screen. Once the order is taken, the total, including tax and delivery, is calculated. Then the order is given to the cook. A receipt is printed. يتم طباعة الفاتورة
> Occasionally, special offer (coupons) is printed so the customer can get a discount. Drivers who make deliveries give customers a copy of the receipt and coupon (if any). Weekly totals are kept for comparison with last year's performance . أداء السنة الماضية

يستدعي

(10 points)

Good Luck
Dr. Amr Elkholy & Dr. Marwa Badr