| Tanta University | Department: Elec. Computers & Control Engineering Total Marks: 75 Marks | Faculty of Engineering |
| --- | --- | --- |

| Course Title: Control Engineering | Course Code: CCE3115 | Year: 3$^{rd}$ |
| --- | --- | --- |
| Date: 18-1 -2022 (First term exam) | Allowed time: 3.0 hrs | No. of Pages: (2) |

## Question (1)    (25 Marks)

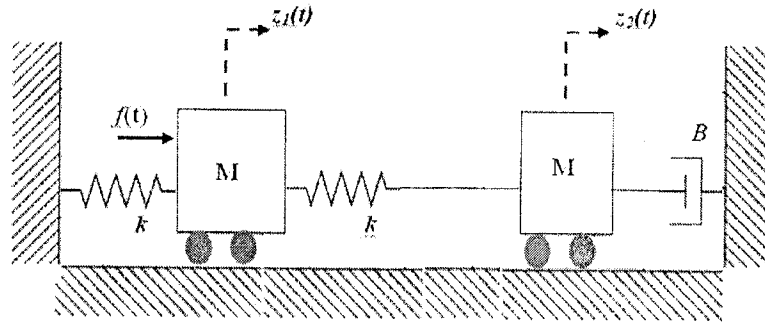a) A coupled mass–spring mechanical system is shown in Fig. 1. Obtain the transfer function $Z_1(s) / F(s)$.



Fig. 1 Coupled mass–spring mechanical system

b) When the unity feedback second order system shown in Fig. 2 is subjected to a unit–step input, the system response contains overshoot of **77%**, occurring after time of **0.0325 (sec.)** has elapsed. **Calculate**:

   i)  The rise time and the time to settle down to within **2%** of the final value.

   ii) The steady–state error ($e_{ss}$) for unit–step, unit ramp, and unit–parabolic inputs.
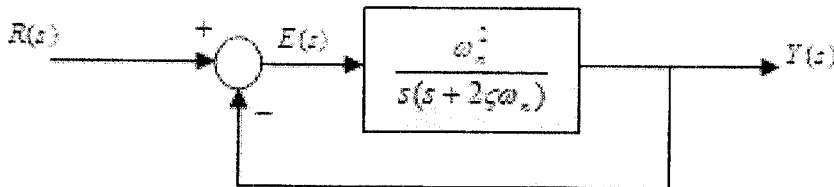


Fig. 2 Unity feedback second order system

## Question (2)    (25 Marks)

a) Consider a unity negative feedback system shown in Fig. 3. By using Routh stability, **find the range** of $k$ for which the transient part of the system response will die out after the settling time.
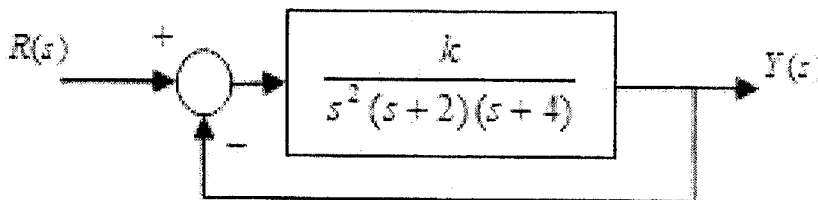


Fig. 3 Closed–loop system

b) A unity feedback closed–loop system has open–loop transfer function which is given by:

$$G(s) = \frac{2k}{s(s+1)(s+2)}$$

i) If $k = 1.5$ (sec$^{-1}$), **determine** the steady–state error ($e_{ss}$) for unit–step and unit–parabolic inputs.

ii) For unit ramp input, **what is the minimum** value of $k$ for $e_{ss} < 0.1$.

## Question (3)    (25 Marks)

Consider a unity negative feedback system shown in Fig. 4.

i) Sketch the root locus of the system

ii) Find the value of the dynamic gain $k$ and the corresponding closed loop poles at which the damping ratio is equal to **0.707**
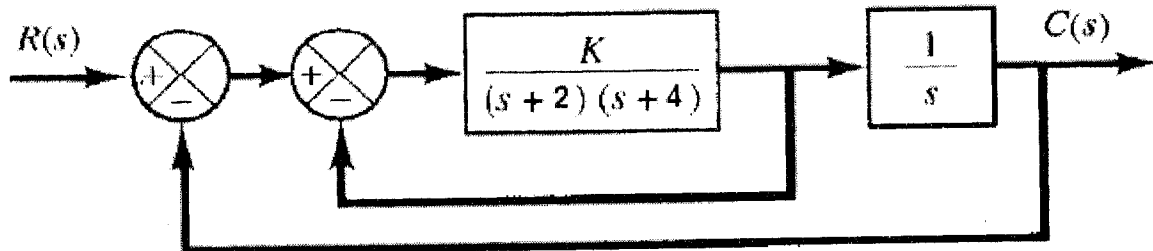


Fig. 4 Closed–loop system

*Good luck*

| Course Title | Digital Signal Processing | Academic Year 2021/2022 | Course Code | CCE3116 |
|---|---|---|---|---|
| Year/ Level | Third | **First Semester Exam** | Total Marks | 70 |
| Date | 29-1-2022 | No. of Pages (2) | Allowed time | 3 hrs |
| **Remarks:** Answer all the following questions | | ممنوع استخدام القلم الرصاص فى الإجابة إلا بغرض الرسم فقط – | | |

## Question Number (1)    (20 Points)

(a) Consider the following discrete-time sequence which is periodic every 7 samples:    **(6 Points)**

$$x((n))_7 = \{-3, -2, -1, 0, 1, 2, 3\}$$

**Find in the sequence form**:

1) $y_1(n) = x((-n))_7$
2) $y_2(n) = x((-n-2))_7$
3) $y_3(n) = x((2-n))_7$
4) $y_4(n) = x((2n-1))_7$

(b) Compute the linear convolution, $y(n) = x(n) * h(n)$, for the following sequence:    **(6 Points)**

$$x(n) = \{1, 2, 3, 4\} \text{ and } h(n) = \delta(n) - \delta(n-2)$$

(c) Using Z-T, solve the following difference equation to find $y(n)$,    **(8 points)**

$$0.5\, y(n-2) - 1.5\, y(n-1) + y(n) = x(n-2)$$

where $x(n) = \begin{cases} 1, & at\ n\ even \\ -1, & at\ n\ odd \end{cases}$

## Question Number (2)    (20 Points)

(a) Find the inverse Z-Transform of the following functions:    **(8 points)**

1. $X(z) = \dfrac{2Z+3}{Z^2 - 1.5Z + 4}$

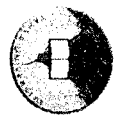2. $X(z) = \dfrac{z^3}{(Z+1)(Z-0.5)^2}$

(b) Determine the 4-point DFT of the following sequence:    **(6 points)**

$$x(n) = \{2, -1, -2, 1\}$$

Sketch the magnitude and phase of the result 4-point DFT

(c) Compute the circular convolution of the following sequences:    **(6 Points)**

$$x_1(n) = \{1, 1, 0, -1, 2\} \text{ and } x_2(n) = \{-1, 0, 1, 0, 1\}$$

## Question Number (3)    (30 Points)

(a) Explain the main differences between the recursive and non-recursive filters.    **(3 points)**

(b) Explain the usage of the DFT and the radix-2 DIT-FFT algorithm. Compare also between them in terms of complex additions and complex multiplications.    **(4 points)**

(c) Using Radix-2 DIT-FFT algorithm, obtain the 8-point DFT of the following sequence:    **(7 points)**

$$x(n) = \{-1, -2, 0, 1, 1, 2, 0, -1\}$$

Follow exactly the corresponding signal flow graph and <u>show all of the intermediate calculations</u> on the graph.

(d) Consider the filter transfer function,    **(9 points)**

$$H(z) = \frac{(2 + 4 Z^{-1} + 5 Z^{-2})}{(1 + 3 Z^{-1})(1 + Z^{-1} + Z^{-2})}$$

**Draw**

(1) Direct form I                (2) Direct form II                (3) Parallel form

(e) Design a second order digital high pass filter with cutoff frequency 40 rad/sec and sampling rate 60 Hz.    **(7 points)**

*End of questions..............*

*Prof. M. Arafa*                                                                 *Dr. Basma Elkilany*

| $x(n)$ | $X(z)$ | $x(n)$ | $X(z)$ | $x(n)$ | $X(z)$ |
|---|---|---|---|---|---|
| $\delta(n)$ | $1$ | $u(n)$ | $\dfrac{z}{z-1}$ | $n\,a^n$ | $\dfrac{a z}{(z-a)^2}$ |
| $a^n$ | $\dfrac{z}{z-a}$ | $e^{-an}$ | $\dfrac{z}{z-e^{-a}}$ | $n$ | $\dfrac{z}{(z-1)^2}$ |
| $Sin\,(wn)$ | $\dfrac{z \sin(w)}{z^2 - 2z\cos(w) + 1}$ | $Cos(wn)$ | $\dfrac{z\,(z - \cos(w))}{z^2 - 2z\cos(w) + 1}$ | | |

| Course Title | Operating Systems | Academic Year 2021/2022 | | |
|---|---|---|---|---|
| Year/Level | Third Year | First-Semester Exam | Course Code | CCE3114 |
| Date | 1-2-2022 | No. of Pages (4) | Allowed time | 3 hrs |

**Question (1)**    Choose the correct answer    (75 Points)

1- ......program is loaded at power-up or reboot.
A-Bootstrap   B-Malware   C-Dispatcher   D-Scheduler

2-If a process is executing in its critical section, then no other processes can be executing in their critical section. What is this condition called?
A-mutual exclusion   B-critical exclusion   C-synchronous exclusion   D-asynchronous exclusion

3-Concurrent access to shared data may result in......
A-data consistency   B-data insecurity   C-data inconsistency   D-none of the mentioned

4-The segment of code in which the process may change common variables, update tables, write into files is known as......
A-program   B- critical section   C-non – critical section   D-synchronizing

5-Which one of the following is a synchronization tool?
A-thread   B- pipe   C- semaphore   D- socket

6-As a benefit of using threads, user interfaces may ......
A-Prohibited from   B- Allowed for   C- Blocked from   D- Postponed From

7- ...... Means that two or more processes are waiting indefinitely for an event that can be caused by only one of the waiting processes
A-Locking   B- Mutex   C- Semaphore   D- Deadlock

8-A situation where several processes access and manipulate the same data concurrently and the outcome of the execution depends on the particular order in which access takes place is called ......
A-data consistency   B- race condition   C- aging   D- starvation

9- ......means distributing subsets of the same data across multiple cores, same operation on each
A-Data Parallelism   B-Task Parallelism   C-Input Parallelism   D-Output Parallelism

10- ......means distributing threads across cores, each thread performing unique operation
A-Data Parallelism   B-Task Parallelism   C-Input Parallelism   D-Output Parallelism

11-threads share resources of process, ...... than shared memory or message passing
A-Easier   B-Harder   C-Smaller   D-Larger

12-A minimum of _____ variable(s) is/are required to be shared between processes to solve the critical section problem.
A-one   B- two   C- three   D- four

13-An un-interruptible unit is known as
A-single   B- atomic   C- static   D- none of the mentioned

14-TestAndSet instruction is executed ......
A-after a particular process   B-periodically   C-atomically   D-none of the mentioned

15-Semaphore is a/an _____ to solve the critical section problem.
A-hardware for a system   B-special program for a system   C-integer variable   D-none of the mentioned

16-Which of the following conditions must be satisfied to solve the critical section problem?
A-Mutual Exclusion   B- Progress   C-Bounded Waiting   D-All of the mentioned

17- ...... Occurs when the CPU moves from one process to another.
A-Context switch   B- Starvation   C-Fork   D-Process termination

18- ...... Means keeping the CPU as busy as possible
A-Throughput   B- Response time   C-CPU Utilization   D-Turnaround time

19-while processes are executed, the stack memory section contains ......
A-Program Code   B-Global Variables   C-Dynamically Allocated Variables   D-Function Parameters

20-An SJF algorithm is simply a priority algorithm where the priority is ......
A-the predicted next CPU burst   B-the inverse of the predicted next CPU burst   C-the current CPU burst   D-anything the user wants

21- The real difficulty with SJF in short term scheduling is
A- it is too good an algorithm   B- knowing the length of the next CPU request   C- it is too complex to understand   D- none of the mentioned

22- Process execution consists of a cycle of CPU execution and ......
A- CPU wait   B- Interrupt wait   C- User wait   D- I/O wait

23- ......... is the amount of time to execute a particular process
A- Throughput   B- Response time   C- CPU Utilization   D- Turnaround time

24- Apps written in languages that includes a Virtual Machine (VM) containing the running app (like Java) are ......
A- OS specific   B- File systems   C- More Efficient   D- Supporting Multiple OSs

25- ......... Is a set of software frameworks that provide addition services to application developers such as databases, multimedia and graphics.
A- Hardware   B- Firmware   C- Software   D- Middleware

26- In Shared Memory process communication, The communication is under the control of the ......
A- Operating System   B- CPU   C- Kernel   D- users processes

27- What is Scheduling?
A- allowing a job to use the processor   B- making proper use of processor   C- all of the mentioned   D- none of the mentioned

28- ......... combines object files into single binary executable file
A- Loader   B- DLLs   C- Compiler   D- Linker

29- ......... process can take advantage of ...... architectures by using multithreading
A- Multitasking   B- Multiprocess   C- Multicore   D- Multilnput

30- ......... amount of time it takes from when a request was submitted until the first response is produced
A- Throughput   B- Response time   C- CPU Utilization   D- Turnaround time

31- An I/O bound program will typically have ......
A- a few very short CPU bursts   B- many very short I/O bursts   C- many very short CPU bursts   D- a few very short I/O bursts

32- The strategy of making processes that are logically runnable to be temporarily suspended is called
A- Non preemptive scheduling   B- Preemptive scheduling   C- Shortest job first   D- First come First served

33- ......... Is the process of copying information into faster storage system
A- Caching   B- Compression   C- Uploading   D- Mirroring

34- Scheduling Algorithms try to ......
A- Minimize waiting time   B- Maximize response time   C- Minimize CPU utilization   D- Minimize throughput

35- Applications are Operating System Specific because of the uniqueness of ......
A- Memory size   B- File systems   C- System Calls   D- CPU registers

36- Disk ...... is the total number of bytes transferred, divided by the total time between the first request for service and the completion of the last transfer.
A- Scheduling   B- Throughput   C- Efficiency   D- Bandwidth

37- When multiple users or multiple jobs running concurrently, resources must be ...... each of them
A- Installed to   B- Approved for   C- Prevented from   D- Allocated to

38- Single-threaded process has one ...... specifying location of next instruction to execute
A- PCB   B- Parameter   C- Variable   D- Program Counter

39- ......... Stores information associated with each process
A- PCB   B- FTP   C- UDP   D- TCP

40- ......... is a Scheduling problem when lower-priority process holds a lock needed by higher-priority process
A- Aging   B- Priority inversion   C- Deadlock   D- Starvation

41- ......... Is a program in execution
A- Program counter   B- Heap   C- Stack   D- Process

42- In producer-consumer problem, when the buffer is empty, the ...... must wait/s
A- Producer   B- item   C- Buffer   D- Consumer
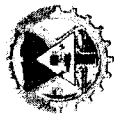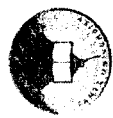
43- One of the CPU scheduling motivations is that ...... processes have Long CPU burst cycles.
A- Many    B- No    C- All    D- Few

44- CPU registers are ...... than main memory
A- Slower    B- Deeper    C- Larger    D- Faster

45- Which is the most optimal scheduling algorithm?
A- FCFS – First come First served    B- SJF – Shortest Job First    C- RR – Round Robin    D- None of the mentioned

46- ........ Brings the contents of the executable file to memory to be executed
A- Loader    B- DLLs    C- Compiler    D- Linker

47- Which of the following scheduling algorithms gives minimum average waiting time
A- FCFS    B- SJF    C- Round – robin    D- Priority

48- Device controller informs CPU that it has finished its operation by causing a/an......
A- Signal    B- Deadlock    C- Lock    D- Interrupt

49- Producer- Consumer problem is an example of ......... Interprocess communication
A- Message Passing    B- Direct    C- Critical Section    D- Shared Memory

50- ......... is logical extension in which CPU switches jobs so frequently that users can interact with each job while it is running.
A- Multitasking    B- Scheduler    C- Dispatcher    D- Multiprogramming

51- ......... Means that low priority processes may never execute
A- Aging    B- Scheduling    C- Waiting    D- Starvation

52- ........ Are programming interface to the services provided by the OS
A- DLLs    B- Linkers    C- System Calls    D- Loaders

53- ........Time is the time to move disk arm to desired cylinder.
A- Response    B- Waiting    C- Seek    D- Positioning

54- ........ Is to keep track of which users use how much and what kinds of computer resources.
A- Caching    B- Communication    C- Logging    D- Protection

55- Round robin scheduling falls under the category of
A- Non-preemptive scheduling    B- Preemptive scheduling    C- All of the mentioned    D- None of the mentioned

56- The one program running at all times on the computer is the ...... part of the operating system
A- Scheduler    B- Dispatcher    C- Kernel    D- Shell

57- What are the two steps of a process execution?
A- I/O & OS Burst    B- CPU & I/O Burst    C- Memory & I/O Burst    D- OS & Memory Burst

58- ......... Is the number of processes that complete their execution per time unit
A- Throughput    B- Scheduling    C- CPU Utilization    D- Turnaround time

59- A process is selected from the ...... queue by the scheduler, to be executed.
A- blocked    B- waiting    C- ready    D- I/O

60- Choose one of the disadvantages of the priority scheduling algorithm?
A- it schedules in a very complex manner    B- its scheduling takes up a lot of time    C- it can lead to some low priority process waiting indefinitely for the CPU    D- none of the mentioned

Consider the following table which describes the scheduling data of processes p1 to p5 where the higher priority number indicates a higher priority process:

| Process | Arrival time | Burst time | Priority |
|---------|--------------|------------|----------|
| P1 | 0 ms | 5 ms | 1 |
| P2 | 1 ms | 3 ms | 2 |
| P3 | 2 ms | 8 ms | 1 |
| P4 | 3 ms | 6 ms | 3 |

---

61- If we use **non-pre-emptive Priority** scheduling algorithm, the order of CPU burst execution will be:
A- P1|P2|P3|P4    B- P4|P2|P3|P1    C- P1|P4|P2|P3    D- P4|P2|P1|P3

62- The writing time of process P1 is:   A-0ms   B-5ms   C-10ms   D-12ms
63- The writing time of process P2 is:   A-0ms   B-5ms   C-10ms   D-13ms
64- The writing time of process P3 is:   A-0ms   B-5ms   C-10ms   D-12ms
65- The writing time of process P4 is:   A-0ms   B-2ms   C-4ms   D-6ms
66- The turnaround time of process P1 is:   A-0ms   B-5ms   C-10ms   D-13ms
67- The turnaround time of process P2 is:   A-0ms   B-5ms   C-10ms   D-13ms
68- The turnaround time of process P3 is:   A-0ms   B-8ms   C-20ms   D-15ms
69- The turnaround time of process P4 is:   A-0ms   B-8ms   C-20ms   D-15ms
70- The average waiting time of the all processes is: A-4ms B-6ms C-8ms D-10ms
71- The average turnaround time of the all processes is: A-9.5ms B-11.5ms C-12ms D-13ms

Suppose we have a magnetic disk with the following parameters:

| | |
|---|---|
| Average seek time | 12 ms |
| Rotation rate | 7200 RPM |
| Transfer rate | 4 M Byte/second |
| Controller overhead | 2 ms |
| Sector size | 8 KB |

72- The average rotational delay is:   A-3.17ms   B-4.17ms   C-5.17ms   D-6.17ms
73- The transfer time for one sector is:   A-1ms   B-2ms   C-3ms   D-4ms
74- The average disk access time for one sector is:   A-16ms   B-18ms   C-20ms   D-25ms
75- The average disk access time for 80KB is:   A-200ms   B-38ms   C-48ms   D-80ms

Question (2)    True or False    (10 Points)

1- Deadlock will not occur if process are allowed to hold a resource while requesting another resource
2- DMA is a mechanism for allowing an I/O device to transfer data to and from memory by involving the CPU in the transfer.
3- A process is identical to one thread.
4- One can have concurrent execution of threads/processes without having parallelism.
5- Concurrency execution does not requires existence of multiple processors.
6- Threads within the same process can not share the same Program Counter (PC)
7- The scheduler is the part of an Operating System that determines the cpu-burst time of each process
8- Load balancing attempts to keep workload assigned to a single processor.
9- In disk scheduling, the SSTF (shortest seek time first) algorithm can not lead to starvation.
10- Switching among threads in the same process is more efficient than switching among processes.

End of Questions.
Dr. Reda Elbasiony

Faculty of Engineering,
Tanta University

Department of Computer Automatic Control Engineering

Database Systems (Final Exam)
Date : Jan 22th, 2022

Student Name:

Exam time: 3 hours

# Part 1: Choose the right answer
**(70 marks)**

1. The big data _____ refers to the uncertainty about how accurate or turstworthy the dataset may be.

   A. Variety   B. Value   C. Vulnerability   D. Veracity

2. _____ is responsible for identifying the data to be stored in the database and choosing the appropriate structure to store it.

   A. Database administrator   B. Database designer   C. Application developer   D. End user

3. Relational data model is an example of _____ data models.

   A. Physical   B. Conceptual   C. Representational   D. Self-describing

4. Database _____ refers to the actual data stored in the database at a particular moment in time.

   A. schema   B. instance   C. model   D. design

5. _____ statements are used to specify database retrievals and updates.

   A. DML   B. DDL   C. SDL   D. VDL

6. _____ attributes are those that can be computed from other attributes.

   A. Computational   B. Logical   C. Derived   D. Composite

7. In ER diagrams, total participation is represented as _____.

   A. arrowhead   B. dashed line   C. double line   D. underlined attribute

8. Any subset of the relation attributes that are sufficient to identify a unique tuple of each possible relation state is called _____.

   A. primary key   B. candidate key   C. super key   D. foreign key

9. The selection $\sigma$ operator is used to select a subset of the _____ from its input relation.

   A. tuples   B. columns   C. values   D. keys

10. When the selection $\sigma$ operator is applied on a relation R that have $n > 0$ tuples, the output relation will have _____ tuples.

    A. MIN: 0, MAX: n   B. MIN: 1, MAX: n   C. exactly n

11. When the project $\pi$ operator is applied on a relation R that have $n > 0$ tuples, the output relation will have _____ tuples.

    A. MIN: 0, MAX: n   B. MIN: 1, MAX: n   C. exactly n

12. The relational algebra _____ operator is a binary operator that can be applied only to two relations with compatible schemas.

    A. Cartesian Product ×   B. Join ⋈   C. Division ÷   D. Union ∪

13. Consider the following table schema:

    Employee(number, name, age, salary, department, mgr_id)

    The field mgr_id is a foreign key that references the primary key attribute number of the same relation.

   Which of the following statements is **NOT** true:

   A. This schema allows for an employee without a direct manager.

   B. This schema allows for an employee with multiple direct managers.

   C. This schema allows for a manager who manages more than one employee directly.

14. Consider the same schema in Question 13, Which of the following relational algebra expressions is the right way to find the names and ages of employees who earn more than 1000$ as salary.

    A. $\sigma_{salary>1000}(\pi_{name,age}(Employee))$

    B. $\pi_{name,age}(\sigma_{salary>1000}(Employee))$

    C. $\sigma_{name,age}(\pi_{salary>1000}(Employee))$

    D. $\pi_{salary>1000}(\sigma_{name,age}(Employee))$

15. Consider the same schema in Question 13, Which of the following relational algebra expressions is the right way to find the names and ages of managers who directly manage any employee with more than 1000 salary.

    A. $\pi_{name,age}(Employee \bowtie_{mgr\_id=A} \rho_{(A,B,C,D,E,F)}(\sigma_{salary>1000}(Employee)))$

    B. $\pi_{name,age}(Employee \bowtie_{number=F} \rho_{(A,B,C,D,E,F)}(\sigma_{salary>1000}(Employee)))$

    C. $\pi_{B,C}(Employee \bowtie_{mgr\_id=A} \rho_{(A,B,C,D,E,F)}(\sigma_{salary>1000}(Employee)))$

    D. $\pi_{B,C}(Employee \bowtie_{number=F} \rho_{(A,B,C,D,E,F)}(\sigma_{salary>1000}(Employee)))$

16. SQL _____ command is used to add new attributes to an existing table schema.

    A. create   B. update   C. alter   D. insert

17. SQL _____ keyword is used to remove duplicate tuples from the result of SELECT queries.

    A. unique   B. distinct   C. dedup   D. exists

18. Using the condition (name LIKE "_m___") will match all tuples that have their attribute 'name' containing at least two characters and its second character is letter m.

    A. _m   B. _m%   C. %m_   D. %m%

19. Assume the table student has 3 tuples and the table course has 4 tuples, then the result of the following query will have exactly _____ tuples.

    ```
    SELECT * FROM student, course
    ```

    A. 3   B. 4   C. 7   D. 12

20. Assume the table instructor has the following data,

    Table 1: Sample data snapshot for **instructor** table

    | name | department | salary |
    |------|------------|--------|
    | Ahmed | CS | 100 |
    | Aly | EE | NULL |
    | Asmaa | CS | NULL |
    | Mona | CIVIL | $0 |

    then the result of the following query will have exactly _____ tuples.

    ```
    SELECT * FROM instructor WHERE salary <> NULL
    ```

A. 4  B. 2  C. 1  D. 0

21. Assume the table instructor has the same data shown in table 1, then the result of the following query will have exactly ___ tuples.

SELECT department, AVG(salary) FROM instructor WHERE salary > 50 GROUP BY department

A. 3  B. 2  C. 1  D. 0

22. The ___ clause is used to sort the results of SQL query in ascending or descending order.

A. arrange by  B. order by  C. sort by  D. rank by

23. Assume two relations R(a, b), and S(a, c). Without making any assumptions about the primary keys. If relation R has 3 tuples and relation S has 4 tuples, then the result of the following query could have a minimum number of ___ tuples and a maximum number of ___ tuples.

SELECT * from R NATURAL JOIN S

A. MIN: 0, MAX: 7
B. MIN: 0, MAX: 12
C. MIN: 3, MAX: 7
D. MIN: 3, MAX: 12

24. Assume two relations R(a, b), and S(a, c). Without making any assumptions about the primary keys. If relation R has 3 tuples and relation S has 4 tuples, then the result of the following query could have a minimum number of ___ tuples and a maximum number of ___ tuples.

SELECT * from R NATURAL LEFT OUTER JOIN S

A. MIN: 0, MAX: 7
B. MIN: 0, MAX: 12
C. MIN: 3, MAX: 7
D. MIN: 3, MAX: 12

25. Assume two relations R(a, b), and S(a, c). Attribute a is a primary key in each relation. If relation R has 3 tuples and relation S has 4 tuples, then the result of the following query could have a minimum number of ___ tuples and a maximum number of ___ tuples.

SELECT * from R NATURAL JOIN S

A. MIN: 0, MAX: 7
B. MIN: 0, MAX: 3
C. MIN: 0, MAX: 12
D. MIN: 3, MAX: 7

26. SQL ___ is used to create a virtual relation that shows/hides certain parts of the data to given users.

A. index  B. view  C. foreign key  D. schema

27. Which of the following is NOT true about the SQL grant statement:

A. grant could be used to give privilege to either a certain user, a group of users, or all users.
B. The grantor of the privilege must already hold the privilege on the specified item.
C. Granting a privilege on a view will imply granting the same privilege on the underlying relations.
D. Granting a privilege to a role will imply granting the same privilege to all members of that role.

28. ___ SQL command is used to withdraw authorization privilege from a certain user or group of users.

A. remove  B. disallow  C. deny  D. revoke

29. MongoDB is an example of ___ databases.

A. Key-Value Store  B. Columnar  C. Document Store  D. Graph

30. ___ scaling is achieved by adding more machines.

A. Vertical  B. Horizontal  C. Optimal  D. Limited

31. RDBMS systems are more suitable for ___ scaling.

A. Vertical  B. Horizontal  C. Optimal  D. Limited

32. ___ databases are more suitable for bigdata applications where the data could be semi-structured and the schema is not fixed.

A. RDBMS  B. NoSQL  C. File-based  D. Embedded

33. CAP theorem states that any distributed datastore system can guarantee ___ of the: consistency, availability, and partition-tolerance properties.

A. all  B. at least two  C. at most two  D. at least one

34. NoSQL database systems satisfy BASE properties, therefore they are considered ___

A. always consistent  B. eventually consistent  C. inconsistent  D. strongly consistent

35. ACID properties are enforced by ___ databases.

A. relational  B. NoSQL  C. Graph  D. both relational and NoSQL

## Part 2: Answer the following    (20 marks)
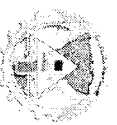
Consider the following table schema:

Employee(number, name, age, salary, department, mgr_id)

where the field number is a primary key storing the employee ID number. The field department stores the department name of an employee. The field mgr_id is a foreign key that references the primary key attribute number of the same relation.

Write SQL queries that retrieves each of the following:

1. The employee name and department name of all employees who are more than 50 years old. Results should be sorted by their age in descending order.
2. The name of each manager and the number of employees he/she directly manages.
3. For each department: the department name and the name(s) of employee(s) who have the maximum salary in that department. If there are more than one employee with an equal (maximum) salary in the department, then return them all.
4. The names and department names of employees who earn a salary higher than the salary of their managers.

Best wishes:  Dr. Moustafa Alsantot

**Tanta University**

**Computers & Control Engineering Department**

**Faculty of Engineering**

| Course Title | Fundamentals of Stochastic Process | Academic Year 2021/2022 | Course Code | CCE3317 |
|---|---|---|---|---|
| Year/ Level | Third | First Semester Exam | Total Marks | 70 |
| Date | 25-1-2022 | No. of Pages (4) | Allowed time | 3 hrs |

**Remarks:** Answer all the following questions — يجب الاجابة في نفس الورقة أمام كل سؤال

## Question Number (1)    (20 Points)

### a) Choose the correct answer and explain your answer:

1. A card is chosen at random from a deck of 52 playing cards . What is the probability the card chosen is a Queen or King?
   - a) 3/13
   - b) 5/13
   - c) 2/13
   - d) 4/13

2. A fair coin is tossed four times. What is the probability of obtaining two Head and two Tails?
   - a) 1/8
   - b) 3/8
   - c) 1/16
   - d) 3/16

3. A fair die is tossed seven times. The toss is called success if a 5 or 6 appears. What is the probability that a 5 or 6 appears exactly one time.
   - a) 0.2
   - b) 0.4
   - c) 0.6
   - d) 0.8

4. Lily has nine different skirts, eight different tops, seven different pairs of shoes, six different necklaces and five different bracelets. In how many ways can Lily dress up?
   - a) 12,096
   - b) 15,120
   - c) 268,800
   - d) 30,240

5. A matching pair of blue gloves, a matching pair of red gloves, and one lone white right-handed glove are in a drawer. Ron blindly pulls two gloves out of the drawer. What is the probability that the two gloves are blue?
   - a) 1/5
   - b) 2/5
   - c) 1/10
   - d) 2/10

6. In a class, 25% of the students like mathematics, 15% like chemistry, and 10% like both. A student is selected randomly from the class. What is the probability that the student likes mathematics, if it is known that the likes chemistry?
   - a) 1/3
   - b) 2/3
   - c) ½
   - d) 3/8

7. A cubical biased die is rolled twice. The numbers from one to five are equally likely to land face up, but number six is twice as likely to land face up as each of the other numbers. What is the probability of getting fives in both rolls?
   - a) 1/25
   - b) 1/36
   - c) 1/49
   - d) 1/64

8. A code consists of two digits chosen from 0 to 9 followed by a letter of the alphabet. What is the probability the code is 90A?
   - a) 1/1000
   - b) 1/260
   - c) 1/2600
   - d) 1/6760

9. A number is chosen at random from the set of two-digit numbers from 00 to 99 inclusive. What is the probability the number contains at least one digit 2?
   - a) 17/90
   - b) 1/5
   - c) 19/100
   - d) 9/50

10. There are 10 counters in a bag: 3 are red, 2 are blue and 5 are green. The contents of the bag are shaken before Ginny randomly chooses one counter from the bag. What is the probability that she doesn't pick a red counter?
    - a) 7/10
    - b) 3/10
    - c) 9/10
    - d) 1/10

## Question Number (2)    (15 Points)

a) A and B are independent events having, $P(A)=1/2$, $P(A \cup B) = 2/3$. Then, Find: **(5 points)**
1. $P(B)$
2. $P(A \cap B)$
3. $P(A|B)$
4. $P(B^c|A)$

b) We have two boxes, namely A and B. Box A contains 10 apples of which 3 are defected. Box B contains 5 oranges of which 2 are defected. Two fruits are drawn randomly from each box. **(5 points)**
1. What is the probability that both fruits are defected?
2. What is the probability that only one fruit is defected?
3. What is the probability that both fruits are not defected?
4. If only one fruit is defected, what is the probability that the apple is defected?
5. If only one fruit is defected, what is the probability that the orange is defected?

c) Let continuous r.v.s X and Y has joint pdf: **(5 points)**

$$f_{X,Y}(x,y) = \frac{1}{8}(6 - x - y), \ 0 \le x \le 2, \ 2 \le y \le 4$$

1. Find $f_X(x)$
2. Find $f_Y(y)$
3. Find $P(2 \le Y \le 3)$
4. Find $P(X \ge 2)$
5. Find $P(X \le 1)$

## Question Number (3)    (20 Points)

a) Let X and Y be discrete r.v.s. The joint pdf of X and Y's is given below. **(5 points)**

| Y \ X | 0 | 1 | 2 |
|---|---|---|---|
| 0 | 1/6 | 1/3 | 1/12 |
| 1 | 1/9 | 1/6 | 1/9 |
| 2 | 1/36 | 1/6 | 0 |

1. Find $P(X = 2, Y = 1)$
2. Find $P(X \le 1)$
3. Find $P(Y \le 1)$
4. Find the conditional distribution of X given Y=1.
5. Find the conditional distribution of Y given X = 0.

b) A weighted coin with $P(H) = 1/3$ is tossed three times. Let $X$ be the random variable denoting the number of heads which occurs. Find: **(5 points)**

1. PMF.
2. Expected value E[X].
3. Variance var(X).
4. S.D. (Standard Deviation).

**(10 points)**

c) Let $f(x)=\begin{cases} x, & 0 \leq x \leq 1 \\ \frac{3-x}{4}, & 1 \leq x \leq 3 \\ 0, & \text{otherwise} \end{cases}$

1. Prove that $f(x)$ is a density function.
2. Find the cumulative distribution function.
3. Find $P(X > 2)$.
4. Find the expectation of the continuous random variable $X$.
5. Find the variance of the continuous random variable $X$.

## Question Number (4)  **(15 Points)**

a) If a r.v. $X$ has an expectation of $E[X] = 5$, and a variance $var(X) = 10$. $Y$ is another r.v. where $Y = 4X + 50$. Find: **(5 points)**

1. $E[Y]$
2. $E[X + Y]$
3. var(Y).
4. $E[XY]$, If $X$ and $Y$ are independent.
5. var$(X + Y)$, If $X$ and $Y$ are independent.

b) Let $X$ be a random variable with standard normal distribution $\Phi(z)$. Find: **(10 points)**

1. $\Phi(1.24)$
2. $\Phi(-0.75)$
3. $P(-0.7 \leq x \leq 0)$
4. $P(-1.35 \leq x \leq 2.01)$
5. $P(|x| \leq 0.5)$

*End of questions*............

*Dr. Basma Effitay*

TABLE 1
Standard normal curve areas



| z | 0.00 | 0.01 | 0.02 | 0.03 | 0.04 | 0.05 | 0.06 | 0.07 | 0.08 | 0.09 |
|---|---|---|---|---|---|---|---|---|---|---|
| 0.0 | 0.5000 | 0.5040 | 0.5080 | 0.5120 | 0.5160 | 0.5199 | 0.5239 | 0.5279 | 0.5319 | 0.5359 |
| 0.1 | 0.5398 | 0.5438 | 0.5478 | 0.5517 | 0.5557 | 0.5596 | 0.5636 | 0.5675 | 0.5714 | 0.5753 |
| 0.2 | 0.5793 | 0.5832 | 0.5871 | 0.5910 | 0.5948 | 0.5987 | 0.6026 | 0.6064 | 0.6103 | 0.6141 |
| 0.3 | 0.6179 | 0.6217 | 0.6255 | 0.6293 | 0.6331 | 0.6368 | 0.6406 | 0.6443 | 0.6480 | 0.6517 |
| 0.4 | 0.6554 | 0.6591 | 0.6628 | 0.6664 | 0.6700 | 0.6736 | 0.6772 | 0.6808 | 0.6844 | 0.6879 |

Tanta University
Course Title: Compilers and Languages
Date: 15/1/2022(Final Exam)

Department: Control and Computers Dept.
(100 Marks)

Faculty of Engineering
Course Code: CCE3113
Model [A]
Allowed Time: 3 hours

## Question 1: (35 Marks) Choose the correct answer:

1. Grammar of the programming is checked at .....phase of compiler.

   (a) Semantic analysis
   (b) Syntax analysis
   (c) Code optimization
   (d) Code generation

2. Consider the following deterministic finite state automaton M. S denotes the set of seven bit in which the 1st ,4th and last bits are 1. The number of strings that are accepted by M is



   (a) 1
   (b) 5
   (c) 7
   (d) 8

3. The set of all strings over $= a,b$ in which all strings having bbbb as substring is.....

   (a) (a+b)* bbbb (a+b)*
   (b) (a+b)* bb (a+b)*bb
   (c) bbb(a+b)*
   (d) bb (a+b)*

4. Which of the following is NOT the set of regular expression R = (ab + abb)* bbab:

   (a) ababbbbab
   (b) abbbbab
   (c) ababbabbbab
   (d) ababbab

5. Which grammar defines Lexical Syntax?

   (a) Regular Grammar
   (b) Lexical Grammar
   (c) Syntactic Grammar
   (d) Context free Grammar

6. A finite automata recognizes......

   (a) Regular Language
   (b) Context Sensitive Language
   (c) Any Language
   (d) Context free grammar

7. Compiler translates the source code to.....

   (a) Executable code
   (b) Machine cod
   (c) Binary code
   (d) Both B and C

8. If a state does not know whether it will make a shift operation or reduction for a terminal is called......

   (a) Shift/reduce conflict
   (b) Reduce /shift conflict
   (c) Reduce /reduce conflict
   (d) Shift conflict

9. A grammar that produces more than one parse tree for some sentence is called as...

   (a) Ambiguous
   (b) Unambiguous
   (c) Regular
   (d) All of these

10. Which regular expression can be described by this language?
    S → E S | ε
    E → A c | A d
    A → a b A | ε

    (a) ((ab)* (c|d))*
    (b) ((abd)* (c|b))*
    (c) ((acbd)* (ca|cb))*

11. Which is the application of NFA?

    (a) A regular language is produced by union of two regular languages
    (b) The concatenation of two regular languages is regular
    (c) The Kleene closure of a regular language is regular
    (d) All of the mentioned

12. Context free grammars for the languages which all strings open and close parentheses, where the parentheses are balanced:

    (a) S → ((S)) | S
    (b) S → (S) | SS | ε
    (c) S → (S)) | ε

13. The string (a)|((b)*(c)) is equivalent to:

    (a) b*c|a
    (b) abcabc
    (c) Empty
    (d) None of the mentioned

14. The language accepted by this DFA is
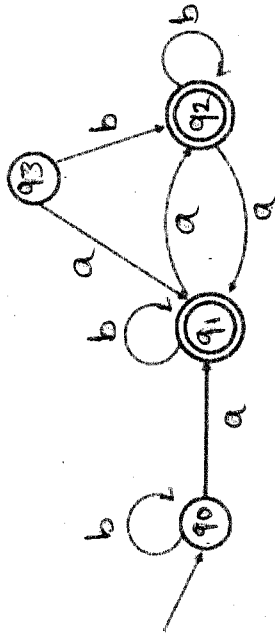


   (a) b*ab*ab*ab*

   (b) (a+b)*

   (c) b*a(a+b)*

   (d) b*ab*ab*

15. Find the pair of regular expressions that are equivalent.

   (a) (0+1)* and (0*+1*)*

   (b) (0+1)* and (0+1*)*

   (c) (0+10)* and (0*+10)*

   (d) All of the mentioned

16. A bottom up parser generates.....

   (a) Right most derivation

   (b) Rightmost derivation in reverse

   (c) Leftmost derivation

   (d) Leftmost derivation in reverse

17. Which of the following is true?

   (a) (01)*0 = 0(10)*

   (b) (0+1)*0(0+1)*1(0+1) = (0+1)*01(0+1)*

   (c) (0+1)*01(0+1)*+1*0* = (0+1)*

   (d) All of the mentioned

18. Regular expressions are closed under

   (a) Union

   (b) Intersection

   (c) Kleene star

   (d) All of the mentioned

19. How many strings of length less than 4 contains the language described by the regular expression (x+y)*y(a+ab)*?

   (a) 11

   (b) 12

   (c) 7

   (d) 10

20. The context free grammar S → SS | 0S1 | 1S0 | ∈ generates.....

   (a) Equal number of 0's and 1's

   (b) Unequal number of 0's and 1's

   (c) Number of 0's followed by any number of 1's

   (d) Non of mentioned

21. Which concept of FA is used in the compiler?

   (a) Lexical analysis

   (b) Parsing

   (c) Code generation

   (d) Code Optimization

22. The grammar G: S → SS | a | b is ambiguous. Check all and only the strings that that have exactly two leftmost derivations in G:

   (a) bbb

   (b) ab

   (c) All of the mentioned

   (d) None of the mentioned

23. The regular expression with all strings of 0s and 1s with at least two consecutive 0s is:

   (a) 1 + (10)*

   (b) 0*1*2*

   (c) (0+1)*011

   (d) (0+1)*00(0+1)*

24. Given the following expression grammar: E → E * F | F+E| F F → F-F | id which of the following is true?

   (a) * has higher precedence than +

   (b) + and — have same precedence

   (c) – has higher precedence than *

   (d) + has higher precedence than *

25. Regular expressions S → SaSb | c | Qq, Q → Qm | ∈ . What are the FOLLOW sets of Q and S?

   (a) The FOLLOW set of Q is {q,m}, the FOLLOW set of S is {a,b}

   (b) The FOLLOW set of Q is {q,m}, the FOLLOW set of S is {a,b,c}

   (c) The FOLLOW set of Q is {m}, the FOLLOW set of S is {a,b}

26. Which one of the following is true at any valid state in shift-reduce parsing?

   (a) At the bottom we find the prefixes

   (b) None of the mentioned

   (c) Stack contains only viable prefixes

   (d) Stack consists of viable prefixes

27. Regular expression a/b denotes the set:

   (a) {a}

   (b) {∈,a,b}

   (c) {a,b}

   (d) {a,b}

28. Shift Reduce parsers are .....

   (a) Bottom up parser

   (b) Top down parser

   (c) Both mentioned

   (d) Not mentioned

35. Which regular expression can be described by this language?

S → E S | ε
E → A c | A d
A → a b A | ε

(a) ((ab)* (c|d))*
(b) ((abd)* (c|b))*.
(c) ((acbd)* (ca|cb))*

## Question 2: (20 Marks) True/False

1. CFG is a language expression.
2. A compiler program written in a high level language is called source program.
3. The string (a)|((b)*(c)) is equivalent to abcabc.
4. The context free grammar S → SS | 0S1 | 1S0 | ε generates equal number of 0's and 1's.
5. A regular language corresponds to set of strings over an alphabet.
6. Parser is a concept grammar which used in the compiler.
7. The following languages over the alphabet 0,1 is described by the regular expression: (0+1)*0(0+1)*0(0+1)* have string with at most two 0's.
8. RE can be used only for values of type string and number.
9. Every language that is defined by regular expression can also be defined by finite automata.
10. To Handle LR parsing we can used in the next step for reduction along with a position in the sentential form where the right hand side of the production may be found.
11. Lexical Analyser's Output is given to Semantic Analysis.
12. The subset construction shows that every NFA accepts a string.
13. In Syntax Analysis the output generates Parse Tree.
14. The pairs of regular expression are equivalent 1(01)* and (10)*1.
15. The RE in which any number of 0s is followed by any number of 1s followed by any number of 2s is 0*1*2*.
16. The RE gives none or many instances of an x or y is (xy)*.
17. For every NFA a deterministic finite automaton DFA can be found that accepts the same language.
18. A regular expression enables a quick test to determine objects and text strings with undependable values.
19. The output of lexical analyzer is a set of RE.
20. The grammar A → AA | (A) | ε is not suitable for predictive parsing because the grammar is right recursive.

---

29. Regular expressions E → E + T | T,
T → T * num | num.

(a) * and + has the same precedence
(b) + has higher precedence than *
(c) * has higher precedence than +

30. Consider the following shift-reduce parse of a string:

S
aSa|a$
aaS|aa$
aaS$|aa$
aab|aa$
aa|baa$
a|abaa$
|aabaa$

Assuming this parse exercises all productions of the grammar, what is the grammar for this shift-reduce parser?

(a) S → a a b S | b
(b) S → a b S a | b
(c) S → a S a | b

31. Can a DFA simulate NDFA?

(a) No
(b) Sometimes
(c) Depends on NDFA
(d) Yes

32. Consider the grammar defined by the following production rules S → T * P, T → U | T * U, P → Q + P
| Q, Q → Id, U → Id. Which one of the following is TRUE?

(a) + is left associative, while is right associative
(b) + is right associative, while is left associative
(c) Both + and are right associative
(d) Both + and are left associative

33. This grammar is : S → c C C,
C → c C | d

(a) LL(1)
(b) SLR(1) but not LL(1)
(c) LR(1) but not LL(1)
(d) Not mentioned

34. ...... is a process of finding a parse tree for a string of tokens.

(a) Analysing
(b) Recognizing
(c) Parsing
(d) Tokenizing

---

## Question 3: (15 Marks)

1. Define Handle? (5 marks)
2. Consider the following grammar: (5 marks)

S → A
A → A+A | B++
B → y

a) Draw the parse tree for the input "y+++y+++y++y++"
b) Show a left most derivation of P → ∨ y+++y+++y++.

3. Consider the following grammar: (5 marks)

X → YaYb | ZbZa

Y → ∈

Z → ∈ a) Using the definition of LL(1), explain why the grammar is or is not

LL(1).

b) Show whether the grammar is or is not SLR(1).

## Question 4: (20 Marks)

1. Consider the following grammar with terminals [, ], a, b, c, +, and -: S → [ S X ] | a

X → ∈| + S Y | Y b

Y → ∈| - S X c

a) Fill in the table below with the First and Follow sets for the non-terminals in this grammar:

|  | First | Follow S |
|---|---|---|
| X |  |  |
| Y |  |  |

b) Create the top-down parsing table

c) Using your table, parse [a+a-ac]

| Stack | Input | Production |
|---|---|---|

## Question 5: (10 Marks)

1. Write down a recursive descent parser (i.e. parsing algorithm) for the following grammar:

E → T | T + E

T → int | int * T | (E)

End of Exam.    with my best wishes

Dr. Tahani Allam

2021-2022

71A

Tanta University

Department: Control and Computers Dept.

Faculty of Engineering

Course Title: Compilers and Languages

(100Marks)

Course Code: CCE3113

Date: 15/1/2022(Final Exam)

Model B

Allowed Time: 3 hours

## Question 1: (35 Marks) Choose the correct answer:

1. Regular expressions $E \rightarrow E + T \mid T$, $T \rightarrow T * num \mid num$.

   (a) * and + has the same precedence
   (b) + has higher precedence than *
   (c) * has higher precedence than +

2. If a state does not know whether it will make a shift operation or reduction for a terminal is called......

   (a) Shift/reduce conflict
   (b) Reduce /shift conflict
   (c) Reduce /reduce conflict
   (d) Shift conflict

3. Can a DFA simulate NDFA?

   (a) No
   (b) Sometimes
   (c) Depends on NDFA
   (d) Yes

4. Which of the following is NOT the set of regular expression R = (ab + abb)* bbab:

   (a) ababbbab
   (b) abbbab
   (c) ababbabbbab
   (d) abababab

5. The context free grammar S → SS | 0S1 | 1S0 | $\epsilon$ generates.....

   (a) Equal number of 0's and 1's
   (b) Unequal number of 0's and 1's
   (c) Number of 0's followed by any number of 1's
   (d) None of the mentioned

6. The set of all strings over = a,b in which all strings having bbbb as substring is......

   (a) (a+b)* bbbb (a+b)*
   (b) (a+b)* bb (a+b)*bb
   (c) bbbb(a+b)*
   (d) bb (a+b)*

7. Grammar of the programming is checked at ......phase of compiler.

   (a) Semantic analysis
   (b) Syntax analysis
   (c) Code optimization
   (d) Code generation

8. The language accepted by this DFA is
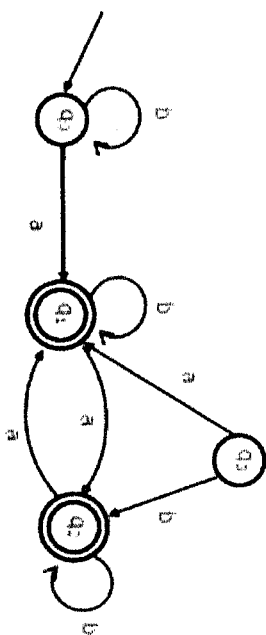


9. Which of the following is true?

   (a) $(01)*0 = 0(10)*$
   (b) $(0+1)*0(0+1)*1(0+1) = (0+1)*01(0+1)*$
   (c) $(0+1)*01(0+1)*+1*0* = (0+1)*$
   (d) All of the mentioned

10. Context free grammars for the languages which all strings open and close parentheses, where the parentheses are balanced:

    (a) S → ((S)) | S
    (b) S → (S) | SS | $\epsilon$
    (c) S → (S)) | $\epsilon$
    (d) Not mentioned

11. Shift Reduce parsers are ......

    (a) Bottom up parser
    (b) Top down parser
    (c) Both mentioned
    (d) Not mentioned

12. Which regular expression can be described by this language?

    S → E S | $\epsilon$
    E → A c | A d
    A → a b A | $\epsilon$

    (a) ((ab)* (c|d))*
    (b) ((abd)* (c|b))*
    (c) ((acbd)* (ca|cb))*

13. Given the following expression grammar: E → E * F | F+E | F-F | id which of the following is true?

    (a) * has higher precedence than +
    (b) + and — have same precedence
    (c) * has higher precedence than *

    (d) + has higher precedence than *

14. Compiler translates the source code to......

    (a)  Executable code

    (b)  Machine cod

    (c)  Binary code

    (d)  Both B and C

15. ...... is a process of finding a parse tree for a string of tokens.

    (a)  Analysing

    (b)  Recognizing

    (c)  Parsing

    (d)  Tokenizing

16. Which one of the following is true at any valid state in shift-reduce parsing?

    (a)  At the bottom we find the prefixes

    (b)  None of the mentioned

    (c)  Stack contains only viable prefixes

    (d)  Stack consists of viable prefixes

17. Consider the following shift-reduce parse of a string:

|aabaa\$
a|abaa\$
aa|baa\$
aab|aa\$
aaS|aa\$
aaSa|a\$
aS|a\$
aSa|\$
S

Assuming this parse exercises all productions of the grammar, what is the grammar for this shift-reduce parser?

    (a)  $S \rightarrow a\ a\ b\ S \mid b$

    (b)  $S \rightarrow a\ b\ S\ a \mid b$

    (c)  $S \rightarrow a\ S\ a \mid b$

18. Which is the application of NFA?

    (a)  A regular language is produced by union of two regular languages

    (b)  The concatenation of two regular languages is regular

    (c)  The Kleene closure of a regular language is regular
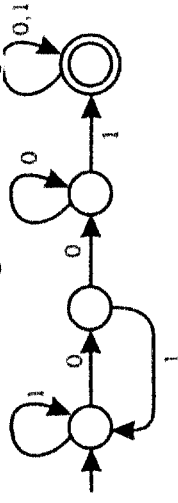
    (d)  All of the mentioned

19. How many strings of length less than 4 contains the language described by the regular expression $(x+y)^*y(a+ab)^*$?

    (a)  11

    (b)  12

    (c)  7

    (d)  10

20. Consider the grammar defined by the following production rules $S \rightarrow T * P$, $T \rightarrow U \mid T * U \mid T * U$, $P \rightarrow Q$ $\mid Q$, $Q \rightarrow Id$, $U \rightarrow Id$. Which one of the following is TRUE?

    (a)  + is left associative, while is right associative

    (b)  + is right associative, while is left associative

    (c)  Both + and are right associative

    (d)  Both + and are left associative

21. Consider the following deterministic finite state automaton M. S denotes the set of seven bit in which the 1st ,4th and last bits are 1. The number of strings that are accepted by M is



    (a)  1

    (b)  5

    (c)  7

    (d)  8

22. Regular expressions are closed under

    (a)  Union

    (b)  Intersection

    (c)  Kleene star

    (d)  All of the mentioned

23. Which regular expression can be described by this language?

$S \rightarrow E\ S \mid \epsilon$

$E \rightarrow A\ c \mid A\ d$

$A \rightarrow a\ b\ A \mid \epsilon$

    (a)  $((ab)^* (c|d))^*$

    (b)  $((abd)^* (c|b))^*$

    (c)  $((acbd)^* (ca|cb))^*$

24. Regular expressions $S \rightarrow SaSb \mid c \mid Qq$, $Q \rightarrow Qm \mid \epsilon$. What are the FOLLOW sets of Q and S?

    (a)  The FOLLOW set of Q is {q,m}, the FOLLOW set of S is {a,b}

    (b)  The FOLLOW set of Q is {q,m}, the FOLLOW set of S is {a,b,c}

    (c)  The FOLLOW set of Q is {m}, the FOLLOW set of S is {a,b}

25. This grammar is : $S \rightarrow C\ C$,

$C \rightarrow c\ C \mid d$

    (a)  LL(1)

    (b)  SLR(1) but not LL(1)

    (c)  LR(1) but not LL(1)

    (d)  Not mentioned

26. The string $(a)|((b)^*(c))$ is equivalent to:

    (a)  b*c|a

    (b)  abcabc

    (c)  Empty

    (d) Non of mentioned

28. Which concept of FA is used in the compiler?

   (a) Lexical analysis

   (b) Parsing

   (c) Code generation

   (d) Code Optimization

29. The grammar G: S → SS | a | b is ambiguous. Check all and only the strings that have exactly two leftmost derivations in G:

   (a) bbb

   (b) ab

   (c) All of the mentioned

   (d) None of the mentioned

30. A grammar that produces more than one parse tree for some sentence is called as...

   (a) Ambiguous

   (b) Unambiguous

   (c) Regular

   (d) All of the mentioned

31. A bottom up parser generates.....

   (a) Right most derivation

   (b) Rightmost derivation in reverse

   (c) Leftmost derivation

   (d) Leftmost derivation in reverse

32. The regular expression with all strings of 0s and 1s with at least two consecutive 0s is:

   (a) 1 + (10)*

   (b) 0*1*2*

   (c) (0+1)*011

   (d) (0+1)*00(0+1)*

33. Find the pair of regular expressions that are equivalent.

   (a) (0+1)* and (0*+1*)*

   (b) (0+1)* and (0+1*)*

   (c) (0+10)* and (0*+10)*

   (d) All of the mentioned

34. Regular expression a/b denotes the set:

   (a) {a}

   (b) {ε,a,b}

   (c) {a,b}

   (d) {a, b}

35. Which grammar defines Lexical Syntax?

   (a) Regular Grammar

   (b) Lexical Grammar

   (c) Syntactic Grammar

   (d) Context free Grammar

## Question 2: (20 Marks) True/False

1. Every language that is defined by regular expression can also be defined by finite automata.

2. RE can be used only for values of type string and number.

3. In Syntax Analysis the output generates Parse Tree.

4. Lexical Analyser's Output is given to Semantic Analysis.

5. The output of lexical analyzer is a set of RE.

6. The subset construction shows that every NFA accepts a string.

7. The grammar A → AA | (A) | ε is not suitable for predictive parsing because the grammar is right recursive.

8. A compiler program written in a high level language is called source program.

9. The RE in which any number of 0s is followed by any number of 1s followed by any number of 2s is 0*1*2*.

10. To Handle LR parsing we can used in the next step for reduction along with a position in the sentential form where the right hand side of the production may be found.

11. The string (a)|((b)*(c)) is equivalent to abcabc.

12. The pairs of regular expression are equivalent 1(01)* and (10)*1.

13. The RE gives none or many instances of an x or y is (xy)*.

14. A regular expression enables a quick test to determine objects and text strings with undependable values.

15. For every NFA a deterministic finite automaton DFA can be found that accepts the same language.

16. The following languages over the alphabet 0,1 is described by the regular expression: (0+1)*0(0+1)*0(0+1)* have string with at most two 0's.

17. CFG is a language expression.

18. A regular language corresponds to set of strings over an alphabet.

19. The context free grammar S → SS | 0S1 | 1S0 | ε generates equal number of 0's and 1's.

20. Parser is a concept grammar which used in the compiler.

## Question 3: (15 Marks)

1. Define Handler? (5 marks)

2. Consider the following grammar: (5 marks)

   S → A

   A → A + A | B ++

   B → y

   a) Draw the parse tree for the input "y + + + y + + y + +"

   b) Show a left most derivation of y + + + y + + .

3. Consider the following grammar: (5 marks)

X → YaYb | ZbZa

Y → ∈

Z → ∈

LL(1).

a) Using the definition of LL(1), explain why the grammar is or is not

b) Show whether the grammar is or is not SLR(1).

## Question 4: (20 Marks)

1. Consider the following grammar with terminals [, ], a, b, c, +, and -: S → [ S X ] | a

X → ∈| + S Y | Y b

Y → ∈| - S X c

a) Fill in the table below with the First and Follow sets for the non-terminals in this grammar:

| | First | Follow S | |
|---|---|---|---|
| X | | | |
| Y | | | |

b) Create the top-down parsing table

c) Using your table, parse [a+a-ac]

| Stack | Input | Production |
|---|---|---|

## Question 5: (10 Marks)

1. Write down a recursive descent parser (i.e. parsing algorithm) for the following grammar:

E → T |T + E

T → int | int * T | (E)

End of Exam.    with my best wishes

Dr. Tahani Allam

2021-2022