

(2 ½ Hours)

[Total Marks: 60]

- N.B:**
- (1) **All questions are compulsory.**
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Q.1 Attempt **any two** of the following :

(12)

- a) Consider a variant of the RR scheduling algorithm in which the entries in the ready queue are pointers to the PCBs. 6
  - i) What would be the effect of putting two pointers to the same process in the ready queue?
  - ii) What would be two major advantages and two disadvantages of this scheme?
  - iii) How would you modify the basic RR algorithm to achieve the same effect without the duplicate pointers?
- b) Discuss how the following pairs of scheduling criteria conflict in certain settings. 6
  - i) CPU utilization and response time
  - ii) Average turnaround time and maximum waiting time
  - iii) I/O device utilization and CPU utilization
- c) Discuss in detail features of GRUB. 6
- d) Explain high-level stages of a typical Linux boot process. 6

Q.2 Attempt **any two** of the following :

(12)

- a) Discuss segmentation hardware in detail. 6
- b) Compare the memory organization schemes of contiguous memory allocation, pure segmentation, and pure paging with respect to the following issues: 6
  - i) External fragmentation
  - ii) Internal fragmentation
  - iii) Ability to share code across processes
- c) Why are page sizes always powers of 2? Consider a logical address space of 64 pages of 1,024 words each, mapped onto a physical memory of 32 frames. 6
  1. How many bits are there in the logical address?
  2. How many bits are there in the physical address?
- d) Consider the following page-replacement algorithms. Rank these algorithms on a five-point scale from “bad” to “perfect” according to their page-fault rate. Separate those algorithms that suffer from Belady’s anomaly from those that do not. Explain your answer. 6
  1. LRU replacement
  2. FIFO replacement
  3. Optimal replacement
  4. Second-chance replacement

- Q.3 Attempt **any two** of the following : (12)
- a) Make a list of six security concerns for a bank's computer system. For each item on your list, state whether this concern relates to physical, human, or operating-system security. 6
  - b) Consider a file system that uses inodes to represent files. Disk blocks are 8 KB in size, and a pointer to a disk block requires 4 bytes. This file system has 12 direct disk blocks, as well as single, double, and triple indirect disk blocks. What is the maximum size of a file that can be stored in this file system? 6
  - c) Consider a system that supports the strategies of contiguous, linked, and indexed allocation. What criteria should be used in deciding which strategy is best utilized for a particular file? 6
  - d) State three advantages of placing functionality in a device controller, rather than in the kernel. State three disadvantages. 6

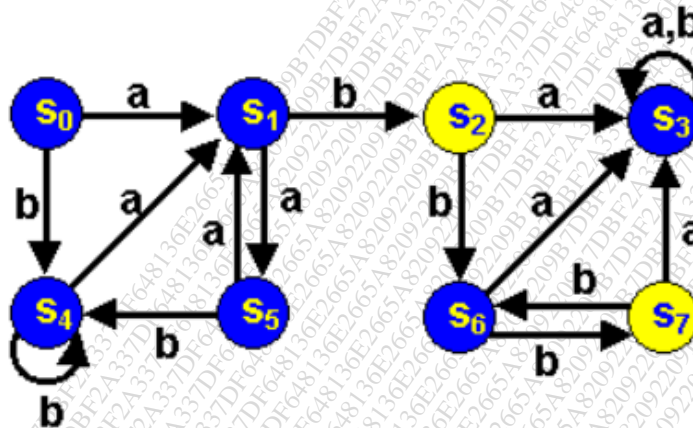
- Q.4 Attempt **any two** of the following : (12)
- a) What are default restrictions of using SQLite database in Android? How more than one applications can share same SQLite database in same device? Explain your answer. 6
  - b) What are uses of content provider? Give example. 6
  - c) How SMS client app can be developed in Android? 6
  - d) Explain in detail Android Software Stack. 6

- Q.5 Attempt **any two** of the following (12)
- a) Given five memory partitions of 100 KB, 500 KB, 200 KB, 300 KB, and 600 KB (in that order), how would the first-fit, best-fit, and worst-fit algorithms place processes of 212 KB, 417 KB, 112 KB, and 426 KB (in that order)? Which algorithm makes the most efficient use of memory? 6
  - b) Explain Android activity Life Cycle in detail. 6
  - c) Why might a system use interrupt-driven I/O to manage a single serial port and polling I/O to manage a front-end processor, such as a terminal concentrator? 6
  - d) The list of all passwords is kept within the operating system. Thus, if a user manages to read this list, password protection is no longer provided. Suggest a scheme that will avoid this problem. 6

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Q.1 Attempt **any two** of the following (12)

- a) Explain what do you mean by DFA and NFA. Provide suitable examples for the same. 6
- b) 6



Minimize DFA where s0 is start state and s2 and s7 are final states. Also explain algorithm in brief.

- c) Define the following terms with suitable examples: 6
  - 1) Regular Expression
  - 2) Bottom up parsing.
- d) Develop Predictive Parsing Table for the following grammar and Parse the string "ababb". 6

$S \rightarrow AB$   
 $S \rightarrow \epsilon$   
 $A \rightarrow aAB$   
 $A \rightarrow \epsilon$   
 $B \rightarrow bA$

Q.2 Attempt **any two** of the following (12)

- a) Consider the following production rules: 6
 

$S \rightarrow S \text{ or } A$   
 $S \rightarrow A$   
 $A \rightarrow A \text{ and } B$   
 $A \rightarrow B$   
 $B \rightarrow t$   
 $B \rightarrow f$

Compute LR(0) item sets.

b) Write a short note on LR(1) parsing. 6

c)

STATE	ACTION				GOTO		
	a	b	c	\$	S	A	B
0	S2		S3		1		
1				R1 acc			
2	S2	S6	S3		8	4	
3	R3	R3	R3	R3			
4	S2		S3		5		
5	R2	R2	R2	R2			
6	S7						
7	R4	R4	R4	R4			
8	S2	S10	S3		12		9
9	R5	R5	R5	R5			
10	S2	S6	S3		8	11	
11	R6	R6	R6	R6			
12	R7	R7	R7	R7			

1. S' → S
2. S → aAS
3. S → c
4. A → ba
5. A → SB
6. B → bA
7. B → S

Consider grammar and parsing table. Show LR(0) parsing moves for the string accbbac.

d) Consider the following Production Rules and compute LR(0) item sets for the same. 6

- S → aABe  
 A → Abc | b  
 B → d

Q.3 Attempt **any two** of the following (12)

a) Define following terms with suitable example. 6

- i) Triple (ii) Quadruple (iii) three address code

b) Write a short note on syntax directed translation by giving suitable examples. 6

c) What are the type checking declarations? Explain them in brief. 6

d) Explain activation records with respect to tiger compiler. 6

Q.4 Attempt **any two** of the following (12)

a) Discuss various techniques of machine independent code optimization techniques. 6

b) State the procedure of constructing a flow graph. Give one example. 6

c) Define dominators and mention properties of the same. 6

d) What is a data flow analysis? State different types of data flow analysis problems. 6

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Q.5 Attempt any two of the following (12)

a) Compute Follow() for the following production rules. 6

1)

 $S \rightarrow aAS$  $S \rightarrow b$  $A \rightarrow bSA|a$ 

2)

 $S \rightarrow aB | bA$  $A \rightarrow bAA | aS | a$  $B \rightarrow aBB | bS|b$ 

b) State the drawbacks of top down parsing with backtracking by giving suitable example. 6

c) Write syntax direct translations for the following Grammar. The Production Rules are as follows: 6

 $S \rightarrow E\$$  $E \rightarrow E+E$  $E \rightarrow E * E$  $E \rightarrow I$  $I \rightarrow I \text{ digit}$  $I \rightarrow \text{digit}$ 

d) Define the following terms or process: 6

1) Reaching definition

2) Busy expression

3) Available expression



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Q.1 Attempt **any two** of the following (12)

- a) Write a simple SOAP Web service that return a list of books. 6
- b) Why web Services is preferred way of communication between cross platform? 6
- c) Discuss important features of JAX-WS. 6
- d) What is use of WSDL? Explain the different patterns of web service operations supported by WSDL. 6

Q.2 Attempt **any two** of the following (12)

- a) Explain the various methods in SOAP and Logical handlers. 6
- b) Explain the various options for SOAP attachments. 6
- c) Write a simple SOAP request Message and SOAP response message for a web service operation GetWeatherDetails() that sends a parameter CityName and returns the current weather of that city. 6
- d) Explain the SOAP Message Architecture with neat diagram. 6

Q.3 Attempt **any two** of the following (12)

- a) What is JAX-RS? Discuss various annotations used in JAX-RS for developing REST service. 6
- b) Explain the different HTTP verbs and status codes and meaning associated with it. 6
- c) Explain the concept of Wire-Level Security. 6
- d) Why REST is architectural style for developing web services. 6

Q.4 Attempt **any two** of the following (12)

- a) Discuss various applications of Amazon Virtual Private Cloud. 6
- b) Write a short note on Elastic Block Storage. 6
- c) Explain the concept of IaaS, PaaS and SaaS. 6
- d) Write a short note on Data Workflow Orchestration service used in AWS. 6

Q.5 Attempt **any two** of the following (12)

- a) Explain the concept of user authentication and authorization. 6
- b) Explain the major elements of a Soap Envelope. 6
- c) Explain different message transport used in a Web services along with their usage. 6
- d) Explain the concepts of Code First and Contract First approach of SOAP web service design. Why these two approaches are required? 6

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**Q.1 Attempt any two of the following (12)**

- a) State and explain the four system security threats.
- b) Explain the various techniques of separation of database in order to achieve multilevel security.
- c) Explain the different types of Computer Criminals
- d) Explain the following techniques of Memory and Address Protection
  - i. Fixed Fence
  - ii. Base/Bound Registers

**Q.2 Attempt any two of the following (12)**

- a) What are the various services offered by PKI?
- b) Explain the following techniques of Reconnaissance:
  - i. Port Scanning
  - ii. Pinging
- c) Write a short note on WEP.
- d) Discuss Kerberos – as a technique for strong authentication.

**Q.3 Attempt any two of the following (12)**

- a) Discuss the characteristics of Cloud Security Design Principles.
- b) Write a short note on Hypervisor Risks.
- c) How is Access Control Management achieved in SaaS/PaaS?
- d) State and explain the techniques for VM-Specific Security.

**Q.4 Attempt any two of the following (12)**

- a) Explain the GSM Security Mechanisms.
- b) Write a short note on Zigbee Encryption.
- c) Discuss the various VoIP security issues.
- d) Write a short note on Cellular Jamming Attacks.

**Q.5 Attempt any two of the following (12)**

- a) Explain the following giving proper examples:
  - i. Hardware Vulnerabilities
  - ii. Software Vulnerabilities
  - iii. Data Vulnerabilities
- b) Explain the different types of IDS's.
- c) Discuss the cloud security controls.
- d) Explain the two operational security modes defined to satisfy the varying security needs of zigbee devices.

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 (3) Illustrations, in-depth answers and diagrams will be appreciated.  
 (4) Mixing of sub-questions is not allowed.

**Q1. Attempt the following (any Two) (12)**

- (A) What is Business Intelligence? State use and benefits of business Intelligence.  
 (B) What is KDD? Explain how it is different from data mining.  
 (C) State and explain in brief different tasks performed in data pre-processing?  
 (D) Explain data normalization. State and explain different methods of data normalization.

**Q2. Attempt the following (any Two) (12)**

- (A) Explain following in brief:  
 1. Data warehouse and Knowledge management  
 2. Data warehouse and CRM  
 (B) Why metadata plays important role? State different types of metadata.  
 (C) What is data marts? Is data marts are better option than data warehouse? Justify the answer.  
 (D) State and explain different methods of data extractions of data warehouse.

**Q3. Attempt the following (any Two) (12)**

- (A) Describe Information package diagram with suitable example.  
 (B) What is Fact table? List and explain Fact table characteristics.  
 (C) What is the benefit of using aggregate fact table? Explain with suitable example.  
 (D) Explain following:  
 1. Drill down and Role up  
 2. Slice and dice or rotation

**Q4. Attempt the following (any Two)**

**(12)**

- (A) Define data mining. Briefly explain process of data mining.
- (B) Define Association rule. Describe the importance of association rules.
- (C) State the formula to calculate conviction. Calculate conviction for any suitable example. Explain what does it indicate?
- (D) What is FP Tree? Generate the FP tree for the given data.

ID	Items
1	L, M, N
2	M, N, Q, H
3	H, P, M, N
4	M, Q, O, H
5	N, Q, L, M
6	M, N, L, P

**Q5. Attempt the following (any Two)**

**(12)**

- (A) What is equal depth binning method? Describe equal depth binning method using suitable example.
- (B) State and explain different data loading techniques. Compare Data refresh with data update.
- (C) What OLAP stands for? State and explain the need and importance of OLAP.
- (D) Explain Apriori Algorithm in brief with example.

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Q1. **Attempt the following (any Two) (12)**

- (A) What is the need of estimating a function 'f' to connect input-output relation in statistical learning? Briefly explain.
- (B) Differentiate between parametric methods and non-parametric methods.
- (C) Briefly explain following concepts:  
(i) Forward selection (ii) Backward selection (iii) Mixed selection
- (D) Compare performance of logistic regression and Linear Discriminant Analysis (LDA) as classification techniques.

Q2. **Attempt the following (any Two) (12)**

- (A) Discuss validation set approach of resampling.
- (B) Explain how bias- variance trade off is addressed by k-fold validation.
- (C) What is forward stepwise selection? Briefly explain.
- (D) What do you mean by ridge regression? Explain.

Q3. **Attempt the following (any Two) (12)**

- (A) What are regression splines? Briefly explain.
- (B) How does Generalised Additive Models (GAM) work? Explain with an example.
- (C) What is recursive binary splitting? What are its characteristics? Briefly explain.



- (D) Define:
  - (i) Gini index
  - (ii) Cross entropy.

What is their significance? Briefly explain.

**Q4. Attempt the following (any Two) (12)**

- (A) What is a maximal margin hyper plane? How can it be used as a classifier? Briefly explain.
- (B) Briefly explain following with proper differences:
  - (i) Support vectors
  - (ii) Support vector classifiers
  - (iii) Support vector Machines
- (C) What are principal components? Why are they important? Briefly explain.
- (D) What is a linkage in clustering? Briefly discuss different types of linkages.

**Q5. Attempt the following (any Two) (12)**

- (A) What is the significance of 'variance-bias trade-off'.
- (B) Write a note on Lasso.
- (C) How does random forest work? Briefly explain.
- (D) Distinguish between one-versus-one classification and one-versus-all classification in a SVM.