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**T.E. (Information Technology) (Sem. – II) Examination, 2009
(Course 2003)**

HUMAN COMPUTER INTERFACE

Time : 3 Hours

Max. Marks : 100

- Note :** 1) Answer Question 1 or 2, 3 or 4, and 5 or 6 from Section – I and Question 7 or 8, 9 or 10 and 11 or 12 from Section – II.
2) Answers to the **two** Sections should be written in **separate** books.
3) **Neat** diagrams must be drawn **wherever** necessary.
4) Figures to the **right** indicate **full** marks.
5) Assume suitable data, **if** necessary.

SECTION – I

1. a) Discuss human factors related metrics to evaluate any interface. **8**
b) Explain the difference between slips and mistakes with the help of suitable example. **8**

OR

2. a) What is reasoning ? Explain different types of reasoning with examples. **8**
b) Compare life critical system against commercial computer systems with reference to goals of user interface design. **8**

3. a) Explain stages of action model. Define gulf of evaluation and gulf of execution. **10**
b) Explain task objects and task actions as well as interface objects and interface actions to build computer interface for any one of the following systems :
• Library Management System
• Hospital Management System. **8**

OR

4. a) Explain GOMS and keystroke level model. **10**
b) Evaluate Microsoft Word interface using the “Eight golden rules of interface design”. **8**

P.T.O.



5. a) Explain three Pillars of Interface Design. 8
- b) Explain how scenarios help in the design process of interactive system. 8

OR

6. Write short note on : 16
- Ethnographic observation
 - LUCID.

SECTION – II

7. a) Explain different dialog design notations. 8
- b) What are different issues while designing multiple window interfaces for an application ? 8

OR

8. a) Explain advantages and disadvantages of direct manipulation with the help of example. 8
- b) Explain different menu styles. 8
9. a) Explain how following CSCW systems are useful for co-operative working : 8
- 1) Meeting Rooms
 - 2) Shared Drawing Surfaces.

- b) Discuss important issues involved in designing a web page. 8

OR

10. a) Explain an importance of hypertext over linear paper document. List important considerations for creating a good hypertext document. 8
- b) Explain the guidelines for developing good error messages. 8



11. a) Some of the favorite techniques of web pages these days include automatic scrolling text boxes, moving marquees, and constantly running animations (e.g. for icons). Discuss these features in terms of web design guidelines. **10**
- b) Give four benefits and three problems of touch screens and voice recognition input. **8**

OR

12. Write short notes on : **18**
- Shared Editors
 - Information visualization
 - Role of HCI in animation industry.



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T.E. (Information Technology) (Semester – II) Examination, 2009
COMPUTER NETWORK TECHNOLOGY (2003 Course)

Time : 3 Hours

Max. Marks : 100

- Instructions :** 1) Answer 3 questions from Section I and 3 questions from Section II.
2) Answers to the **two** Sections should be written in **separate** books.
3) Neat diagrams must be drawn **wherever** necessary.
4) Assume suitable data, if **necessary**.

SECTION – I

1. A) Differentiate between distance vector routing and link state routing. 8
B) What is NAT ? Explain its operation. 8
OR
2. A) Explain how packet switching is more band width efficient than circuit switching. 8
B) For a given class B network 144.155.0.0 with default subnet mask, how can you divide it into 8 equal subnets ? How many hosts can be accommodated in each sub-network ? 8
3. A) Explain how TCP provides a flow control mechanism. 8
B) What is silly-window syndrome ? Explain at-least two methods to overcome it. 8
OR
4. A) What is a socket ? Where do we use it ? Explain important primitives used in socket programming. 8
B) List and discuss performance issues of transport layer. 8
5. A) Compare and contrast FTP and TFTP. 6
B) Explain atleast 8 commands of FTP in brief. 4
C) Explain how DNS service works. 8
OR
6. A) Where and why do we use MIME ? 8
B) List the similarities and differences between POP3 and IMAP. Which protocol is better and why ? 10

P.T.O.



SECTION – II

7. A) Explain RSVP. Why this protocol is needed ? 8
B) Explain what is MIB along with its structure. 8

OR

8. A) Differentiate between SIP and H.323. 8
B) What is the purpose of SMI and MIB in relation to SNMP ? 8
9. A) Explain BOOTP and DHCP in detail. 8
B) How SNMP messages are used to monitor and to control the network elements ? 8

OR

10. A) List and explain the principal components of network management architecture. 8
B) List the 5 areas of network management and explain the necessity of each. 8

11. Write short notes on **any three** : 18

- i) 802.11 architecture
- ii) B-ISDN
- iii) SMDS
- iv) X.25

OR

12. Write short notes on **any three** : 18

- i) WLAN architecture
- ii) Bluetooth
- iii) ATM
- iv) Frame Relay.



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T.E. (Information Technology) (Semester – II) Examination, 2009
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- i) WLAN architecture
- ii) Bluetooth
- iii) ATM
- iv) Frame Relay.



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T.E. (I.T.) (Semester – II) Examination, 2009
SYSTEM SOFTWARE
(2003 Course)

Time : 3 Hours

Max. Marks : 100

- Instructions:** 1) Answer **any three** questions from **each** Sections.
2) Answers to the **two** Sections should be written in **separate** answer books.
3) Neat diagrams must be drawn **wherever** necessary.
4) Figures to the **right** indicate **full** marks.
5) Assume suitable data, if **necessary**.

SECTION – I

1. a) Define the term language processor and explain various language processing activities. 8
b) Explain the following language processor tools. 6
 i) LEX ii) YACC
c) Write the significance of debug monitor. 4
 OR
2. a) With the help of a neat block diagram explain the structure of screen editor. 8
b) Define the terms 6
 i) Language processor ii) Linker
 iii) Macro iv) Interpreter.
c) Compare the following : 4
 i) Compiler and an Interpreter
 ii) System program and application program.
3. a) Explain with suitable example the use of intermediate code in two pass assembler. 8
b) In an assembly language program, certain action is required at 'n' places in the program. Under what condition would you code this action as macro or subroutine ? 8

OR

P.T.O.



4. a) For the following input source, show the contents of Macro definition table and macro name table.

	START	
	SR	2, 2
	L	1, DATA 1
	MACRO	
	ADD_MAIN	&ARG1
	L	1, &ARG1
	A	1, =F' 10'
	SR	3, 3
	ST	1, & ARG1
	MEND	
	AR	2, 2
	MACRO	
	ADD_SECOND	&A1, &A2, &A3
	ADD_MAIN	&A1
	ADD_MAIN	&A2
	ADD_MAIN	&A3
	MEND	
	ADD_MAIN	DATA 1
	ADD_SECOND	X1,X2, X3
	ADD_SECOND	X2, X1, X3
DATA 1	DC	F'20'
X1	DC	F'25'
X2	DC	F'30'
X1	DC	F'35'
	END	

10

- b) What are the different ways in which we can specify the arguments to a macro call ? Briefly explain with the help of suitable examples.

6



5. a) With the help of a suitable example explain the problem of left factoring in TOP-Down Parser. 6
- b) What is Lexical analysis ? Enlist the various databases/data structures used in lexical analyzer. Give the format of each of these. 10

OR

6. a) State **true** or **false**
- i) A recursive descent parser is a bottom up parser.
 - ii) Backtracking is needed in recursive descent parser.
 - iii) Top down parser is also called as shift reduce parser.
 - iv) Right most reduction is used in top down parser.
 - v) Bottom-up parser is more efficient than top down parser.
 - vi) Top down parser is much easier to implement as compared to bottom-up parser. 6
- b) Consider the following grammar :
- $A \rightarrow aB$
 $B \rightarrow Ab$
 $B \rightarrow b$
- Show stepwise procedure for recognizing the input string “aabb” using bottom up parsing technique. 6
- c) What are the basic tasks of scanner ? 4

SECTION – II

7. a) For the statement given below generate intermediate code in the format
- i) Quadruple ii) Triple
 - iii) Parse Tree iv) Postfix Notation
- $A = - P * (-Q + R)$ 8
- b) Differentiate between machine dependent and machine independent optimization techniques in compiler. 4
- c) What is the need for generating intermediate code ? Explain. 4
- d) With respect to the phases of compiler, state True or False.
- i) Memory allocation for an identifier is done by lexical analysis phase
 - ii) Code generation phase can update identifier table entries. 2

OR



8. a) Explain in brief machine independent optimization techniques. **4**
b) Comment on the statement : “Use of minimum number of registers is machine independent task”. **2**
c) Explain the term activation record and explain its use in storage allocation. **8**
d) Write the Triple form for the following. **4**
 $X = ++Y * Z$
9. a) What is loader ? Enlist the basic functions of a loader. **6**
b) Explain “Compile and Go loader” scheme. What are the advantages and disadvantages of this scheme ? **8**
c) Comment on the statement “In compile and Go Loader, linking and loading is done by the loader itself”. **2**
- OR
10. a) What information must be supplied by an assembler to direct linking loader ? Explain the significance of this information with respect to the design of direct linking loader. **8**
b) Draw a flowchart for PASS-I of direct linking loader. **8**
11. a) Compare DDE and COM. **4**
b) Explain the use of Call Back Function in DLL. **4**
c) Explain the term Dynamic Data Exchange. **8**
- OR
12. Write short note on : **16**
i) Different methods of specifying link
ii) Class Libraries
iii) Dynamic Link Libraries.
-



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T.E. (IT) (Sem. – I) Examination, 2009
DATA COMMUNICATION AND NETWORKING
(2003 Course)

Time : 3 Hours

Max. Marks : 100

- Instructions :** 1) Answer 3 questions from Section – I and 3 questions from Section – II.
2) Answer to the **two** Sections should be written in **separate** books.
3) **Neat** diagrams must be drawn **wherever necessary**.
4) Assume suitable data, **if necessary**.

SECTION – I

1. A) Explain CRC generation method with suitable example. 8
B) Explain the shift keying techniques with suitable diagram and constellation pattern for the following.
1) PSK 2) FSK 3) ASK 4) QAM 10
OR
2. A) Discuss the hamming code technique. Calculate hamming code if data to be sent is 1001101. 8
B) State and explain Shannon's capacity theorem. 6
C) What is bandwidth ? Explain the relationship between spectrum and bandwidth of signal. 4
3. A) Explain FDM and statistical TDM. 8
B) Explain cable modem technology with suitable diagram. 8
OR
4. A) Explain DMT, ADSL and HDSL. 8
B) Describe T1 frame structure. Also comment on T2/E2, T3/E3 and T4/E4 lines. 8

P.T.O.



5. A) Explain why the uplink frequency is higher than the downlink frequency in satellite communication. 4
- B) Explain the principle of light propagation in optical fibers. 4
- C) Explain the main components of satellite communication. 8

OR

6. A) Compare i) Single mode and multimode fiber. 8
- ii) Step index and graded index fiber. 8
- B) Explain the losses in the fiber in detail. 8

SECTION – II

7. A) Explain the TCP/IP Protocol stack. 8
- B) Explain EIA - 232 interface with respect to its physical, electrical, functional specifications. 8

OR

8. A) Describe OSI model in detail. 8
- B) Explain the merits and demerits of star, bus, ring and mesh topologies. 8
9. A) Explain ALOHA, Slotted ALOHA and CSMA/CD. Also comment on efficiency of each. 10
- B) Explain PPP in brief. 4
- C) What is gateway ? Explain its function. 4

OR

10. A) Explain Go-Back-n ARQ, Stop & Wait ARQ and selective repeat ARQ in detail. 10
- B) Explain the working of switch and router. 4
- C) Write a short note on HDLC. 4

11. A) Explain FDDI and DQDB in detail. 8
- B) Explain how token ring works. 8

OR

12. A) Discuss the working of VLAN. Also state its advantage. 8
- B) Explain 100 Base Tx ethernet specification. 8



T.E. (IT) (Semester – I) Examination, 2009
MULTIMEDIA SYSTEMS
(2003 Course)

Time : 3 Hours

Max. Marks : 100

- Instructions** : 1) Answer 3 questions from Section I and 3 questions from Section II. (Q. 1 or Q. 2, Q. 3 or Q. 4, Q. 5 or Q. 6) (Q. 7 or Q. 8, Q. 9 or Q. 10, Q. 11 or Q. 12)
- 2) Answers to the two sections should be written in **separate** books.
- 3) **Neat** diagrams must be drawn **wherever** necessary.
- 4) Black figures to the **right** indicate **full** marks.

SECTION – I

1. a) Name the various types of authoring tools that exist for multimedia. Explain any one in details. 10
- b) With the help of suitable example explain the Bresenham's circle drawing algorithm. 8

OR

2. a) Explain the steps involved in Flood fill and boundary fill algorithms. 8
- b) What is shading ? List the salient features of different types of shading methods. 10
3. a) What is a homogeneous coordinate system ? What do you mean by composite coordinates ? 8
- b) Consider a triangle with vertices A (0, 0), B (3, 0) and C (0, 4). This triangle is to be tilted in clockwise direction by an angle of 30 degrees and then translated horizontally by 5 units and vertically by 4 units. Calculate the resultant vertices after the transformations are done. 8

OR

P.T.O.



4. a) What is clipping ? Explain the steps in the Sutherland Hodgman polygon clipping algorithm. **8**
- b) Consider a line with end points as P (60, 250), Q (240, 180). This line is to be clipped against the polygon ABCD with the vertices A (100, 100), B (200, 100), C (200, 300), and D (100, 300) respectively. Find the resultant end points of the line after the clipping using Cohen-Sutherland line clipping algorithm. **8**
5. a) What is aliasing and antialiasing ? Explain with a suitable example. **10**
- b) What are the various storage media for multimedia ? **6**

OR

6. Write short notes on the following :
- a) Vector scan raster scan display. **4**
- b) 3 D Rotation about Y-axis. **6**
- c) Scan line seed fill algorithm. **6**

SECTION – II

7. a) What is MIDI file and explain commands of MIDI file ? **8**
- b) Explain characteristics of sound. **8**

OR

8. a) Describe audio file format supported by windows OS. **8**
- b) What are the compression techniques in audio ? Explain PCM in detail. **8**
9. a) What are the steps in designing an animation sequence ? **6**
- b) What are different types of animation techniques ? Explain in brief. **6**
- c) Explain color model used for CRT display. **6**

OR



10. a) Explain the salient points of color models RGB, YUV, CMY. **9**
b) What is computer controlled animation ? What is segmentation in animation ? **9**
11. a) Explain different types of loss less data compression techniques. **8**
b) Explain MPEG compression. **8**

OR

12. Write short notes on :
- a) BMP file format. **6**
b) LZW encoder. **4**
c) Quantization in JPEG. **6**



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T.E. (Information Technology) (Semester – I) Examination, 2009
OPERATING SYSTEMS
(2003 Course)

Time : 3 Hours

Max. Marks : 100

- Instructions :** 1) Answer *all* questions from *each* Section.
2) Answers to the *two* Sections should be written in *separate* books.
3) Figures to the *right* indicate *full* marks.
4) *Neat* diagrams must be drawn *wherever* necessary.
5) *Assume* suitable data, *if* necessary.

SECTION – I

1. a) Describe with the help of a neat diagram the interaction of operating system with the hardware architecture. 8
b) Draw and explain the architecture of Windows 2000. 8

OR

1. a) State in brief the four key features of each of the following types of OS : 8
i) Real-time, ii) Distributed,
iii) Multiprogramming, iv) Time-sharing
b) Discuss the advantages of Multiprocessor System. What are different types of Multiprocessor systems ? 8
2. a) Explain in detail the steps involved in UNIX process creation. 6
b) With the help of neat diagram explain the concept of Context Switching. 4
c) Explain Message Passing system for IPC and Synchronization. 8

OR

P.T.O.



2. a) Consider following snapshot of system at time T_0

12

	Allocation				Max				Available			
	A	B	C	D	A	B	C	D	A	B	C	D
P0	0	0	1	2	0	0	1	2	2	1	0	0
P1	2	0	0	0	2	7	5	0				
P2	0	0	3	4	6	6	5	6				
P3	2	3	5	4	4	3	5	6				
P4	0	3	3	2	0	6	5	2				

i) Calculate the need matrix.

ii) State whether system is safe ? If yes, give safe sequence.

iii) For the system snapshot at time T_0 , If a request from P2 arrives for (0,1,0,0).
Can the request be safely granted ?

iv) For the system Snapshot at time T_0 , If a request from P3 arrives for (1,0,0,0).
Can the request be safely granted ?

b) Explain the implementation of the Dining Philosopher problem using semaphore.

6

3. a) Compare FCFS, Round Robin, Shortest Job First (Preemptive), Shortest Job First (Non-Preemptive) on the basis of following characteristics :

8

i) Selection Function

ii) Decision Mode

iii) Response Time

iv) Effect on Processes

b) Explain scheduling algorithms in real time system.

8

OR



3. a) State four approaches for multiprocessor thread scheduling and processor assignment. **8**
- b) State and explain the scheduling criteria for uniprocessor scheduling. **4**
- c) Describe in detail the difference between the short-term, medium term and long term schedulers with the help of a neat diagram. **4**

SECTION – II

4. a) Describe the following memory allocation strategies : **8**
Best fit, First fit, Next fit, Worst fit
- b) Explain with neat diagram address translation in Single-level paging system and Two-level paging system. **8**

OR

4. a) A process references pages in the following order : **8**
1, 2, 3, 4, 5, 3, 4, 1, 6, 7, 8, 7, 8, 9, 5, 4, 2, 4, 9
Use the FIFO, Optimal and LRU page replacement algorithms to find out the number of page faults for this reference string using 3 page frames.
- b) Discuss various data structures involved in UNIX memory management. **8**
5. a) Discuss the evolution of the I/O Function in detail. **6**
- b) Explain key features of Windows File System. **6**
- c) Describe methods of record blocking with the help of neat diagrams. **6**

OR

5. a) Explain with example and neat diagram following disk scheduling algorithms : **10**
i) SCAN ii) C-SCAN iii) SSTF iv) FIFO
- b) Explain different file organization techniques. **8**



6. a) State and explain different methods for user authentication for security. **8**
- b) Write a shell script to accept the username as command line argument and check whether the same exist in/etc/password file. **4**
- c) Write a shell script that takes as command line argument a number n and a word. It then prints the word n times, one word per line. **4**

OR

6. a) How is security implemented in Windows 2000 ? **8**
- b) Describe System and Network threats. **8**



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DATA COMMUNICATION AND NETWORKING
(2003 Course)

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OR

12. A) Discuss the working of VLAN. Also state its advantage. 8
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T.E. (IT) (Semester – II) Examination, 2009
SOFTWARE ENGINEERING
(2003 Course)

Time : 3 Hours

Max. Marks : 100

Instructions : 1) Answer 3 questions from Section – I and 3 questions from Section – II.

- 2) Answers to the **two** Sections should be written in **separate** books.
- 3) **Neat** diagrams must be drawn **wherever** necessary.
- 4) **Black** figures to the **right** indicate **full** marks.

SECTION – 1

- 1. A) Explain in brief CMMI process Model and its levels. 6
- B) List software Myths of Customer, Management and Practitioners. 6
- C) What is the purpose of process assessment ? Why has SPICE been developed as a standard for Process Assessment ? 6

OR

- 2. A) Explain software process models with the help of diagrams applicable for following scenarios. 9
 - 1) Large scalable modular projects having time constraints on it, where High Performance is not an issue ?
 - 2) Application in which detailed software requirements are not clear and just the general objective of the software are defined by the customer ?
 - 3) Large scale and high risk software systems.
- B) Explain phases of Unified Proess with the help of diagram. 6
- C) Explain failure curve for software with the help of a diagram. 3



3. A) Select any large system or product with which you are familiar ? Define the set of domains that describe the World view of the system or product. Describe the set of elements that make up one or two domains. For one element, identify the technical components that must be engineered. 8
- B) Business Process Engineering strives to define data and application architecture as well as technology infrastructure. Describe what each of these terms means and provide an example ? 8

OR

4. A) State the seven core principles that focus on Software Engineering Practice as a whole. Explain any one principle in brief. 8
- B) State the three actions that encompass the deployment activity. State the key principles of testing. 8
5. A) State and explain in brief requirement engineering tasks. 12
- B) Draw and explain the traceability table for requirement management. 4

OR

6. A) Draw and explain level 0, level 1 and level 2 Data Flow diagram for "ATM System". 10
- B) State with example three types of requirements in Quality Function Deployment. 6

SECTION – 2

7. A) Explain User Interface Design Process. How is User Interface design evaluation performed ? 8
- B) List Design Concepts and explain "Modularity" in detail. 8

OR

8. A) Explain different Software Measurements. Explain Defect Removal Efficiency the metrics for software Quality. 8
- B) What is a metrics baseline and what benefit does it provide to software engineers? How Software metrics collection process is carried out ? 8



9. A) What are the different categories of software engineering resources ? What is software estimation decomposition ? Explain any three software estimation decomposition techniques. 8

B) What is the significance of COCOMOII model ? How component based project effort estimate is derived using COCOMOII ? What is outsourcing ? 8

OR

10. A) Draw and explain decision tree to support the make/buy decision with an example. 8

B) Explain Usecase based estimation Techniques with an example. Explain the concept of reconciling estimates. 8

11. A) Explain the concept of base lined SCIs. Draw and explain modification path for baselined SCIs in project database. 9

B) Draw and explain Business Process Reengineering model. What is document restructuring ? 9

OR

12. A) Draw and explain the change control Process with an example. What is version control ? 9

B) Explain following terms in details

i) Software Re-engineering

ii) Reverse engineering

What is the difference between forward engineering and reverse engineering ?

9

T.E. (Information Technology) (Sem. – II) Examination, 2009
MANAGEMENT INFORMATION SYSTEM
(2003 Course)

Time : 3 Hours

Max. Marks : 100

- Instructions :** 1) Answers to the **two** Sections should be written in **separate** sheet.
- 2) Use of logarithmic tables, slide rules and electronic pocket calculator is **allowed**.
- 3) **Neat** diagrams must be drawn **wherever** necessary.
- 4) Black figures to the **right** indicates **full** marks.
- 5) Assume suitable data, **if necessary**.

SECTION – I

1. a) What is information system ? In what major ways the role of information system applications in business expanded during the last 40 years ? 6
- b) Define management. Give various management functions at various levels of management . 6
- c) Explain F.W. Taylor's four principles of scientific management. 6

OR

2. a) Classify Information systems. Why are there so many conceptual classification of information system ? 6
- b) Explain the basic model of organizational structure. Comment on its span of control. 6
- c) Illustrate with suitable diagram, how manager integrates Information Technology with the business environment ? 6



3. a) What are the major tasks performed by Personal Management System ? What are the various subsystems a Personal Management System uses to perform those tasks ? 8
- b) How do a MIS affect sales person's productivity in Marketing Management ? What specific information systems he/she uses for his daily business work ? 8

OR

4. a) What is service ? How MIS helps in banking services ? 8
- b) What is cross-functional information system ? Explain online transaction processing as a type of cross-functional information system that plays a strategic role in electronic commerce. 8
5. a) Explain tangible and intangible benefits of using an ERP system for an organization. Give suitable example. 8
- b) What is information technology architecture ? Explain examples of different architectures. 8

OR

6. a) Explain tangible and intangible benefits of using an ERP system for an organization. Give suitable example. 8
- b) What do you mean by Outsourcing ? What are the challenges faced by BPO industry today ? 8

SECTION – II

7. a) What is electronic commerce ? "Most business should engage in electronic commerce on the Internet." Do you agree or disagree with this statement ? Explain your opinion. 8
- b) What is CRM ? Explain important application components of CRM. 8

OR

8. a) Explain how do organization implement the change required using IT to transform organization and create new structure. 8
- b) Write short note on : 8
- i) Implementation change
 - ii) Implementation strategy.



9. a) Discuss the relevance and role of MIS in various phases in decision making. 6
- b) What is the need of EIS ? Explain how EIS helps in decision making process. 6
- c) What are some of the limitations or dangers you see in use of AI techniques such as Expert Systems, Virtual Reality and Intelligent Agent in business ? 6

OR

10. a) Explain major activities of GIS with respect to decision making process. 6
- b) Differentiate between MIS and DSS. 6
- c) What are some of the limitations or dangers you see in use of AI techniques such as Expert Systems, Virtual Reality and Intelligent Agent ? 6
11. a) Describe the 'privacy issue' of information system management in global sharing of information. 8
- b) Write short note on : 8
- i) Global business strategies
- ii) Fault tolerant system.

OR

12. a) Explain the measures required to be taken against common threats such as fire, flood and electric short circuits. 6
- b) Write short note on : 10
- i) Global IT strategies
- ii) Contingency plan.
-



T.E. (I.T.) (Sem. – I) Examination, 2009
THEORY OF COMPUTATION
(2003 Course)

Time : 3 Hours

Max. Marks : 100

- Instructions :** 1) Answer *any three* questions from *each* Sections.
2) Answers to the *two* Sections should be written in *separate* answer books.
3) *Neat* diagrams must be drawn *wherever* necessary.
4) Figures to the *right* indicate *full* marks.
5) Assume suitable data, if *necessary*.

SECTION – I

1. a) Define the following with suitable example for each :
- i) Symbol
 - ii) Alphabet
 - iii) Proper prefix of a string
 - iv) Suffix of a string. 6
- b) Find the transitive closure and symmetric closure of a relation (1, 2), (2, 3), (3, 4), (5, 4). 4
- c) Design a FA that reads strings defined over $\Sigma = \{a, b\}$ and accept only those strings which end up in either “aa” or “bb”. 8

OR

2. a) What is the basic machine ? Enlist the important features of basic machine. 4
- b) Define NFA and DFA in the tuple format. 4
- c) Construct a NFA that accepts the set of all strings over $\{a, b\}$ ending in aba. Use this NFA to construct DFA accepting the same set of strings. 8
- d) What is the basic difference between NFA and DFA ? 2



3. a) Describe in English the language represented by following regular expressions :

i) $(a + ab)^*$

ii) $(a + b)^* a (a + b)^*$

iii) $(a^* ab^* ab^*) + b^*$

iv) $a^+ b^* c^+$

4

b) Construct DFA equivalent to the following regular expression :

$(01/10)^* 00(01/10)^*$

12

OR

4. a) Write a regular expression for the following :

i) $\Sigma = \{a, b\}$ such that each of string do not have aa or bb as a substring in it.

ii) $\Sigma = \{0, 1\}$ with even number of 0's.

iii) $\Sigma = \{a, b\}$ such that ab is not a substring of any strings.

6

b) Prove that the language defined by $\{a^n b^{n+1} \mid n > 0\}$ is non-regular using pumping lemma.

6

c) Give the applications of pumping lemma.

4

5. a) Is the following grammar ambiguous ?

$P = \{S \rightarrow iCtS$

$S \rightarrow iCtSeS$

$C \rightarrow b$

$S \rightarrow a \}$

4

b) Write an equivalent right recursive grammar for the given left recursive grammar :

$S \rightarrow S10/0.$

6

c) Write a CFG to recognize the language L,

where $L = \{x/x \text{ containing equal number of } a\text{'s and } b\text{'s}\}$

6

OR



6. a) Simplify the following grammar :

$S \rightarrow Ab$

$A \rightarrow a$

$B \rightarrow C/b$

$C \rightarrow D$

$D \rightarrow E$

$E \rightarrow a$

6

b) Find Chomsky Normal form equivalent to :

$S \rightarrow aAbB$

$A \rightarrow aA/a$

$B \rightarrow bB/b$

6

c) Find the CFG to generate the language defined by the following regular expressions :

i) ab^*

ii) a^*b^* .

4

SECTION – II

7. a) Define PDA.

2

b) Construct a PDA accepting $\{a^n b^m a^n \mid m, n \geq 1\}$ by null store. Give the equivalent CFG for this PDA.

10

c) With the help of PDA, show that Context Free Languages are closed under union and concatenation.

6

OR

8. a) Construct a PDA equivalent to the following CFG :

$S \rightarrow OBB, B \rightarrow OS/1S/0.$

8

b) Enlist the differences between PDM and FSM.

4

c) Construct a post machine accepting the language $\{a^n b^n \mid m, n \geq 0\}$.

6



9. a) Design a Turing machine to recognize the words of the form $a^n b^n$. Show the Stepwise working of the machine for the string "aabb". 10
- b) State **True** or **False** :
- i) FSM is a special case of the TM.
 - ii) TM can be deterministic.
 - iii) TM has an external memory which can remember arbitrary long sequences of inputs.
 - iv) Basis of TM is divide the process into Primitive operations. 4
- c) Give a formal definition of T.M. 2

OR

10. a) Why do we not define ϵ transitions for a Turing machine ? 4
- b) Explain the Halting problem of Turing Machine. 4
- c) Construct a TM that can accept the strings over $\{0, 1\}$ containing even number of 1's. 8
11. a) Explain in brief application of CFG in compilers. 4
- b) Enlist various applications of regular expressions and explain any one of them. 6
- c) Write a short note on power of TM. 6

OR

12. a) Arrange the following functions by growth value
 $N, \sqrt{N}, N^2, N \log_2 N, N \log^2 2N, 2/N, 2^N, N^{500}$ 6
- b) Write a note on :
- i) Application of PDA in expression conversion.
 - ii) Limitation of TM and its effect on computing. 10