Bihar Engineering University, Patna
End Semester Examination - 2022

Course: B.Tech. | *Semester: V* | *Time: 03 Hours*
Code: 105504 | *Subject: Software Engineering* | *Full Marks: 70*

Instructions:-

(i) The marks are indicated in the right-hand margin.
(ii) There are NINE questions in this paper.
(iii) Attempt FIVE questions in all.
(iv) Question No. 1 is compulsory.

Q.1 *Choose the correct answer of the following (Any seven question only):* **[2 x 7 = 14]**

(a) The spiral model was originally proposed by
(i) IBM (ii) Barry Boehm
(iii) Pressman (iv) Royce

(b) Measure of reliability is given by
(i) mean time between success (ii) MTBF
(iii) mean reliable (iv) MTTR

(c) Which of the following is not a use of a CASE tool?
(i) It supports structured analysis and design (SA/SD)
(ii) It maintains the data dictionary
(iii) It checks whether DFDs are balanced or not
(iv) It compiles with the available system.

(d) Name of an evaluation technique to assess the quality of test cases is
(i) mutation analysis
(ii) validation
(iii) verification
(iv) performance analysis

(e) What is the most popular model for student program?
(i) Waterfall model
(ii) Built – and – fix model
(iii) Spiral model
(iv) Rational unified model

(f) Which of the following is not a part of bug report?
(i) Test case (ii) Output
(iii) Software version (iv) LOC

(g) Independent modules are easier to maintain and test because of
(i) code modification is limited (ii) reusable modules are possible
(iii) error propagation is reduced (iv) All of the above

(h) In size-oriented metrics, metrics are developed based on the
(i) number of functions
(ii) number of user inputs
(iii) number of lines of code
(iv) amount of memory usage

(i) Classes communicate with one another via
(i) processed information (ii) interfaces (iii) messages (iv) coupling

(j) Software is not considered to be collection of executable programming code, associated libraries and documentations.
(i) Statement is true (ii) Software is only data structures with algorithms
(iii) Statement is false (iv) Statement underestimates software

P.T.O.

Q.2 Explain in detail the classical waterfall model with help of a neat and labelled diagram. [14]

Q.3 (a) What is prototyping model? Explain the problems and advantages of prototyping in detail. [7]

(b) Develop a test case for any testing technique for 'student admission system'. [7]

Q.4 (a) Define cohesion and coupling. Explain various types of each of them. [7]

(b) What are CASE tools? With a suitable diagram, explain the categories of CASE tools. [7]

Q.5 What are the different COCOMO models? Explain the phases involved in the detailed COCOMO model. [14]

Q.6 (a) What are the types of user-interface design? [7]

(b) Explain the stages of object-oriented design process. [7]

Q.7 Write short notes on the following: [5+5+4=14]

(a) Unified modelling language

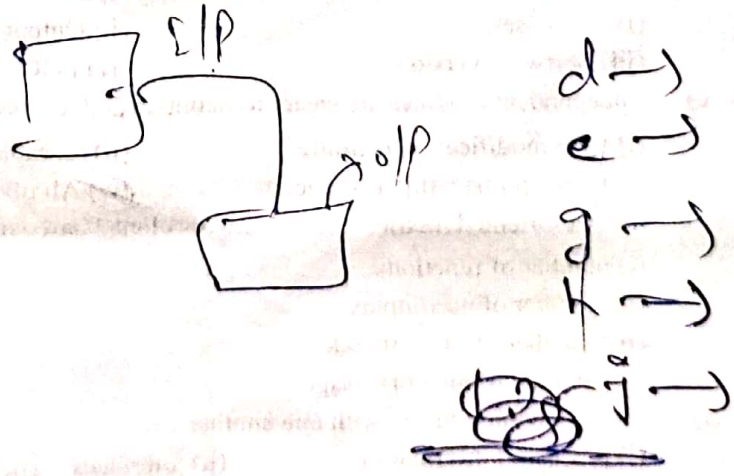
(b) Object-oriented analysis modelling

(c) Object-oriented design concepts and methods

Q.8 Explain coding standards, coding guidelines and code review techniques in detail. [14]

Q.9 (a) What is software quality? Discuss software quality attributes. [7]

(b) Discuss the differences between object-oriented and function-oriented designs. [7]



Bihar Engineering University, Patna
End Semester Examination - 2022

Course: B.Tech. | *Semester: V* | *Time: 03 Hours*
Code: 105503 | *Subject: Formal language & automata theory* | *Full Marks: 70*

Instructions:-
(i) The marks are indicated in the right-hand margin.
(ii) There are NINE questions in this paper.
(iii) Attempt FIVE questions in all.
(iv) Question No. 1 is compulsory.

Q.1 ***Choose the correct option of the following (Any seven question only):*** **[2 x 7 = 14]**

(a) The language $\{ a^m b^n c^{m+n} / m, n \geq 1\}$
(i) regular (ii) context-free but not regular
(iii) Context-sensitive but not context free (iv) type-0 but not context sensitive

(b) Which of the following pairs have DIFFERENT expressive powers?
(i) Deterministic finite automata (DFA) and non-deterministic finite automata (NDFA)
(ii) Deterministic push-down automata (DPDA) and non-deterministic push-down automata (NDPDA)
(iii) Deterministic single-tape Turing machine and non-deterministic single-tape Turing machine
(iv) Single-tape Turing machine and multi-tape Turing machine

(c) The logic of pumping lemma is a good example of
(i) pigeon-hole principle (ii) divide-and-conquer technique
(iii) recursion (iv) iteration

(d) If $L1$ and $L2$ are context free languages, $L1 - L2$ is_____ context-free.
(i) always (ii) sometimes (iii) never (iv) None of these

(e) ____ is the acylic graphical representation of a grammer
(i) Binary tree (ii) Octtree (iii) Parse tree (iv) None of the above

(f) Which of the following pairs of regular expressions are equivalent?
(i) $x^* \text{ and } x^*x$ (ii) $1(01)^* \text{ and } (10)^*1$
(iii) $x(xx)^* \text{ and } (xx)^*x$ (iv) All of the above

(g) The maximum number of states of a DFA converted from an NFA with n states is
(i) n (ii) $n2$ (iii) 2 (iv) None of these

(h) Definition of a language L with alphabet {a} is given as L= $\{a^{nk} / k > 0$, and n is a positive integer constant}. What is the minimum number of states needed in a DFA to recognize L?
(i) $k + 1$ (ii) $n + 1$ (iii) $2n + 1$ (iv) $2k + 1$

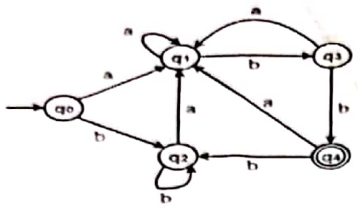
(i) A _____ is context free grammar with atmost one non-terminal in the right handside of the production.
(i) linear grammar (ii) linear bounded grammar
(iii) regular grammar (iv) None of the above

(j) Let N be an NFA with n states and let M be the minimized DFA with m states recognizing the same language. Which of the following is necessarily true?
(i) $m \leq 2^n$ (ii) $n \leq m$ (iii) M has one accept state (iv) $m = 2^n$

Q.2 (a) Tabulate Chomsky hierarchy of grammars with an example for each. **[7]**
(b) Construct the regular grammar accepting the following language: **[7]**
$L = \{w \in \{a,b\}^* / w$ is a string over $\{a,b\}$ such that the number of b's is 3 mod 4$\}$

P.T.O.

Q.3 (a) Minimize the DFA [7]



(b) Define recursively enumerable languages. Let L_1 be recursive and L_2 recursively enumerable. Show that $L_2 - L_1$ is necessarily recursively enumerable. [7]

Q.4 Begin with the grammar : S → ASB/∈ [14]
A → aAS/a
B → SbS/A/bb

(i) Eliminate ∈ –productions.
(ii) Eliminate unit productions in the resulting grammar.
(iii) Eliminate any useless symbol in the resulting grammar.
(iv) Put the resulting grammar into CNF.

Q.5 (a) Design a pushdown automata to accept the following language by empty stack: [7]
$\{0^n 1^n / n \geq 1\}$.

(b) Define deterministic pushdown automata. Explain with an example. [7]

Q.6 (a) Prove using pumping lemna for regular languages that the language $\{0^n / n$ is a perfect square$\}$ is not regular. [7]

(b) Convert the following DFA to regular expression using the state elimination technique. [7]

State/ input	0	1
→*p	s	p
q	p	s
r	r	q
s	q	r

Q.7 (a) Convert the following NFA to DFA and informally describe the language it accepts. [7]

State/ input	0	1
→ p	{p, q}	{p}
q	{r, s}	{t}
r	{p, r}	{t}
* s	∅	∅
* t	∅	∅

(b) When a CFG is called ambiguous? Show that S→ as/aSbS/∈ is ambiguous. [7]

Q.8 (a) Define Turing machine. Design a Turing machine M to recognize the language [7]
$\{1^n 2^n 3^n / n \geq 1\}$.

(b) Construct DFA equivalent to the regular expression: – [7]
$(0+1)^* (00+11) (0+1)^*$

Q.9 Write short notes on any two of the following: [7x2=14]

(i) Pumping lemma for CFL
(ii) GNF
(iii) Multistack Turing Machine
(iv) NP-hard problem

Bihar Engineering University, Patna
End Semester Examination - 2022

Course: B.Tech. | *Semester: V* | *Time: 03 Hours*
Code: 105502 | *Subject: Database Management System* | *Full Marks: 70*

Instructions:-

(i) The marks are indicated in the right-hand margin.
(ii) There are NINE questions in this paper.
(iii) Attempt FIVE questions in all.
(iv) Question No. 1 is compulsory.

Q.1 ***Choose the correct answer of the following (Any seven question only):*** **[2 x 7 = 14]**

(a) Four DML commands are :
(i) create, update, delete, select
(ii) insert, update, drop, select
(iii) create, alter, delete, select
(iv) insert, modify, delete, select

(b) View is a :
(i) temporary table
(ii) virtual table
(iii) dynamic table
(iv) permanent table

(c) The different levels of data abstraction are:
(i) Physical level
(ii) Logical level
(iii) View level
(iv) all of the above

(d) Which of the following is true?
(i) a super-key is always a candidate key.
(ii) every 3NF schema is also a BCNF.
(iii) generalization is bottom-up approach.
(iv) none of these.

(e) What is the purpose of project operation:
(i) It selects certain columns.
(ii) It selects certain rows.
(iii) It selects certain strings.
(iv) It selects certain integers.

(f) The weak entity set does not have sufficient attributes to from.
(i) Primary key (ii) Candidate key (iii) Both (i) and (ii) (iv) Super key

(g) Which normal form is considered adequate for normal relational database design?
(i) 2 NF (ii) 5 NF (iii) 4 NF (iv) 3 NF

(h) Which of the following is not a super key in R(V, W, X, Y, Z) with primary key VY?
(i) VXYZ (ii) VWXZ (iii) VWXY (iv) VWXYZ

(i) Consider R (A, B, C, D, E) with following FDs:-
A → B, A →C, CD → E, B → D, E →A which of the following FDs is not implied by above set?
(i) CD → AC (ii) BD → CD (iii) BC → CD (iv) AC → BC

(j) Which of the following is a concurrency control protocol.
(i) Strict 2-phase locking protocol
(ii) Timestap based protocol
(iii) Graph based protocol
(iv) All of the above

Q.2 (a) What is attribute closure X^+ of a set of attributes X with respect to a set of FDs F? Give the algorithm for commuting X^+ for X. **[7]**

(b) Relation *R (ABCDEFGH)* contains only atomic values for all of its attributes. F = *{CH → G, A → BC, B → CFH, E → A, F → EG}* is a set of functional dependencies (FDs) so that F is exactly the set of FDs that hold for R. **[7]**
(i) Find all the candidate keys the relation R have?
(ii) Find the highest normal form with justification in which R exist?

P.T.O.

Q.3 (a) Briefly explain the ACID properties of the transactions to ensure integrity of the data. [7]

(b) Consider the transactions T1, T2 and T3 and schedules S1 and S2 given below: [7]

T1 : r1 (X); r1(Z); w1 (X); w1 (Z)
T2 : r2 (Y); r2 (Z); w2 (Z)
T3 : r3 (Y); r3 (X); w3 (Y)
S1 : r1 (X); r3(Y); r3(X); r2 (Y); r2(Z); w3(Y); w2 (Z); r1 (Z); w1(X), w1 (Z).
S2 : r1 (X); r3 (Y); r2(Y); r3(X); r1(Z); r2(Z); w3 (Y); w1 (X); w2(Z), w1 (Z).
Determine which of the above schedules are conflict – serializable.

Q.4 (a) Explain the reasons for the update, insertion and deletion anomalies. [7]

(b) With example discuss candidate key, super key, primary key and foreign key. [7]

Q.5 (a) What are the typical phases of query processing? With a sketch, discuss these phases in high level query processing. [7]

(b) When is the decomposition of relation schema *R* into two relation schemes *X* and *Y*, said to be a loss-less-join decomposition? Why is this property so important? Explain with example. [7]

Q.6 (a) Explain the terms 'partial functional dependency' and 'transitive dependency'. Define 2NF and 3 NF in relation with these terms. [7]

(b) Discuss the concept of generalization, specialization and aggregation. [7]

Q.7 (a) Consider the following employee database, primary keys are underlined. [14]

Employee (ename, street, city)
Works (ename, cname, salary)
Company (cname, city)
Manages (cname, manager-name)

Write SQL queries to

(i) Find the names of all the employees who work for XYZ.
(ii) Find all employees who live in the same city as the company for which they work.
(iii) Find all employees who live in the same cities and on the same streets as do their managers.
(iv) Find all employees who earn more than the average salary of all employees of their company.

Q.8 (a) Discuss the advantages and disadvantages of using DBMS as compared to a conventional file system. [7]

(b) What is weak entity set? Explain with suitable example. How weak entities are represented as relational schemas. [7]

Q.9 Write short notes on any two of the following: [7 x 2 =14]

(a) SQL Injection
(b) Two-phase locking protocol
(c) Object Oriented DBMS
(d) Armstrong's Axioms

Bihar Engineering University, Patna
End Semester Examination - 2022

Course: B.Tech. | *Semester: V* | *Time: 03 Hours*
Code: 105501 | *Subject: Artificial Intelligence* | *Full Marks: 70*

Instructions:-

(i) The marks are indicated in the right-hand margin.
*(ii) There are **NINE** questions in this paper.*
*(iii) Attempt **FIVE** questions in all.*
(iv) Question No. 1 is compulsory.

Q.1 ***Choose the correct answer of the following (Any seven question only):*** **[2 x 7 = 14]**

(a) In LISP, the function returns the list that result after the first element is removed (the rest of the list), is
(i) car (ii) last
(iii) cons (iv) cdr

(b) What is artificial intelligence?
(i) Putting your intelligence into computer
(ii) Programming with your own intelligence
(iii) Making a machine intelligent
(iv) Playing a game

(c) Which is the best way to go for game playing problem?
(i) Linear approach (ii) Heuristic approach (some knowledge is stored)
(iii) Random approach (iv) An optimal approach

(d) Face Recognition system is based on which type of approach?
(i) Weak AI approach
(ii) Applied AI approach
(iii) Cognitive AI approach
(iv) Strong AI approach

(e) Which is not the commonly used programming language for AI?
(i) Prolog
(ii) Java
(iii) LISP
(iv) Perl

(f) What are not represented by using propositional logic?
(i) Objects (ii) Relations
(iii) Both objects and relations (iv) None of the above

(g) Inference algorithm is completed only if
(i) it can derive any sentence
(ii) it can derive any sentence that is an entailed version
(iii) it is truth preserving
(iv) it can derive any sentence that is an entailed version and it is truth preserving

(h) Which search strategy is also called as blind search?
(i) Uniformed search (ii) Informed search
(iii) Simple reflex search (iv) All of the mentioned

(i) Which is used for utility functions in game playing algorithm?
(i) Linear polynomial (ii) Weighted polynomial
(iii) Polynomial (iv) Linear weighted polynomial

(j) Graph used to represent semantic network is
(i) undirected graph (ii) directed graph
(iii) directed acyclic graph (DAG) (iv) directed complete graph

P.T.O.

Q.2 (a) Define Artificial Intelligence (AI). Discuss the applications area of AI. [7]

(b) Explain AO* algorithm with an example. [7]

Q.3 (a) Explain with diagram the organization of a natural language understanding system. [7]

(b) Describe all the levels of language understanding in natural language processing system. [7]

Q.4 (a) What do you mean by learning? Explain briefly the learning methods. Discuss the advantages and disadvantages of rule-based system. [7]

(b) Explain the human preferences in encoding uncertainty during parsing. [7]

Q.5 (a) Explain hill climbing algorithm. Explain plateau, ridge, and local maxima. [7]

(b) Explain knowledge acquisition techniques. [7]

Q.6 (a) What is fuzzy set? What is the difference between fuzzy set and crisp set? Explain different fuzzy set operations using examples. [7]

(b) Write a Prolog program that verified whether an input list is a palindrome. [7]

Hint: Goal : Palindrome ([r, a, c, e, c, a, r])
Output : Yes
Goal : Palindrome ([a, b, c])
Output : No

Q.7 (a) Consider the Water Jug problem as stated here. "You are given two jugs, a 4-gallon one and a 3-gallon one. Neither has any measuring marker on it. There is a pump that can be used to fill the jugs with water. How can you get exactly 2 gallons of water into the 4-gallon jug?" Represent this as a problem in State Space Search and state its Production Rules. Show at least one solution to this problem. [7]

(b) Explain the basic component of an expert system. [7]

Q.8 (a) Why is Natural Language Processing (NLP) used? Is NLP difficult to learn? Explain. [7]

(b) Write a function in LISP that computes prime number between 1 and 25 (inclusive). [7]

Q.9 (a) Describe logistic regression with suitable examples. [7]

(b) Define prior probability and conditional probability. State Bayes's theorem. How is it useful for decision making under uncertainty. [7]

Bihar Engineering University, Patna
End Semester Examination - 2022

Course: B.Tech. | *Semester: V* | *Time: 03 Hours*
Code: 100508 | *Subject: Professional skill development* | *Full Marks: 70*

Instructions:-

(i) The marks are indicated in the right-hand margin.
*(ii) There are **NINE** questions in this paper.*
*(iii) Attempt **FIVE** questions in all.*
*(iv) Question No. **1** is compulsory.*

Q.1 ***Answer any seven of the following*** **[2 x 7 = 14]**

(a) Define group.
(b) What is a schedule?
(c) Explain what is a resume?
(d) What is walk-in-interview?
(e) What do you understand by ethics?
(f) What is occullesics?
(g) What is Jargon?
(h) What does group discussion evaluates?
(i) Which is the purpose of communication?
(j) Why power point is used?

Q.2 What is the role of body language in communication? **[14]**

Q.3 What is the significance of group formation? Explain the stage of group formation. **[14]**

Q.4 Define stress. Explain any four methods of stress management. **[14]**

Q.5 What is the importance of emotional intelligence in professional life? **[14]**

Q.6 What business etiquettes should be observed by a salesman? Explain. **[14]**

Q.7 Discuss irrational intelligence in detail. **[14]**

Q.8 What are the types of interview? Explain them. **[14]**

Q.9 Write an essay on "Impacts of Digitalization in India". **[14]**