Total No. of Questions : 8]

SEAT No. :

PE-2596

[Total No. of Pages : 4

[6583]-127

T.E. (Information Technology)

THEORY OF COMPUTATION

(2019 Pattern) (Semester - V) (314441)

Time : 2½ Hours] *[Max. Marks : 70*

Instructions to the candidates :

1) ***Attempt Q.1 or Q.2, Q.3. or Q.4, Q.5 or Q.6, and Q.7 or Q.8.***
2) ***Neat diagrams must be drawn wherever necessary.***
3) ***Figures to the right side indicate full marks.***
4) ***Assume suitable data if necessary.***

Q1) a) Write a formal definition of a Regular Grammar? Explain Chomsky Hierarchy of Grammar. **[6]**

b) Convert the following Left Linear Regular Grammar (LRG) into Right Linear Regular Grammar (RLG) : **[6]**

G = {V, T, S, P} where V = {S, A, B, C}, T = {0, 1}, S = {S} and P are given as

S -> B1 | A0 | C0

B -> B1 | 1

A -> A1 | B1 | C0 | 0

C -> A0

c) Derive the leftmost and rightmost derivation for the string “ibtibtaea” using following Context Free Grammar (CFG). **[6]**

S -> iCtS | iCtSeS | a

C -> b

OR

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Q2) a) Simplify the following CFG (Context Free Grammar) **[6]**

S -> aSa | bSb | ε | A

A -> aA | ε

D -> b | bD | ε

b) Convert the CFG (Context Free Grammar) with productions **[6]**

S -> bA | aB

A -> bAA | aS | a

B -> aBB | bS | b

to Chomsky Normal Form (CNF).

c) Write a short note on the Pumping Lemma for Context Free Language. **[6]**

Q3) a) Construct a Push Down Automata (PDA) for accepting language containing odd length palindrome over $\Sigma = \{0, 1\}$. **[6]**

b) Give the Context Free Grammar (CFG) generating the language accepted by the following Pushdown Automata (PDA) **[6]**

M = ({p, q}, {0, 1}, {Z_0, X}, δ, q, Z_0, ϕ) when δ is given by

$\delta(q, 1, Z_0) \rightarrow (q, XZ_0)$

$\delta(q, 1, X) \rightarrow (q, XX)$

$\delta(q, 0, X) \rightarrow (p, X)$

$\delta(q, \in, X) \rightarrow (q, \in)$

$\delta(p, 1, X) \rightarrow (p, \in)$

$\delta(p, 0, Z_0) \rightarrow (q, Z_0)$

c) Define the following terms with example. **[6]**

i) Pushdown Automata

ii) Post Machine

OR

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Q4) a) Construct a Push Down Automata (PDA) that accepts the following language. L ={ $a^n b^n$ | n > = 0 } **[6]**

b) Design a Post Machine which accepts the string with an equal number of a's and b's. **[6]**

c) Construct a Push Down Automata (PDA) for a language L = {$a^n b^{2n}$ | n > = 0} **[6]**

Q5) a) Construct a Turing Machine (TM) for checking if a set of parenthesis are well formed. **[6]**

b) Write a short note on : **[6]**

i) Church-Turing thesis

ii) Multi-tape TM

c) Explain the power of Turing Machine over Push Down Automata. **[5]**

OR

Q6) a) Design a TM to compute proper subtraction of two unary numbers. The proper subtraction function f is defined as follows. **[6]**

f(m,n) = m - n if m > n

= 0 otherwise

b) Construct a Turing Machine to accept a language L = {$a^{n+1} b^n$ | n > = 0} **[6]**

c) Write a short note on Universal Turing Machine. **[5]**

Q7) a) Write Short note on : **[6]**

i) Un-decidable Problem

ii) Measuring Complexity

b) Let HALT TM ={where M is a TM and M halts on input w}. Prove that HALT TM is undecidable. **[6]**

c) Define the following. **[5]**

i) NP Hard Problem

ii) NP Complete Problem

OR

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Q8) a) Prove that A_{DFA} is a decidable language. **[6]**

A_{DFA} ={ | B is a DFA that accepts input string w}.

b) Write a short note on Normal Forms of Boolean Expressions. **[6]**

c) Write a short note on NP Completeness of SAT Problem. **[5]**

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SEAT No. :

PE-2590

[Total No. of Pages : 2

[6583]-121

T.E. (Information Technology)

DATA SCIENCE AND BIG DATA ANALYTICS

(2019 Pattern) (Semseter - VI) (314452)

Time : 2½ Hours] *[Max. Marks : 70*

Instructions to the candidates:

1) ***Answer Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6, Q.7 or Q.8.***
2) ***Neat diagrams must be drawn wherever necessary.***
2) ***Figures to the right indicate full marks.***
3) ***Assume suitable data, if necessary.***

Q1) a) i) Draw architecture of Google File system and explain its advantages. **[5]**

ii) Describe with example the types of classes to handle big data. **[5]**

b) Draw architecture of Hadoop distributed file system and explain. **[8]**

OR

Q2) a) i) Write 5 Hadoop Shell commands **[5]**

ii) Explain Role Job tracker and Task Tracker in Hadoop Architecture. **[5]**

b) Explain Read operations in HDFS with suitable diagram. **[8]**

Q3) a) Explain different types of Big Data Analysis. How it will perform analysis. **[8]**

b) i) Explain Different Data Transformation techniques with its applications. **[3]**

ii) What is dataset? Explain with python syntax of 2 different types of dataset used in Big data. **[6]**

OR

Q4) a) i) Explain Mean, Mode and variance with suitable example. **[6]**

ii) Explain Data Standardization and its necessity. **[4]**

b) Draw and explain Architecture of HIVE.. **[7]**

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Q5) a) i) How data visualization help Big data Analytics. Explain **[4]**

ii) List the conventional Data visualization tools. Explain any Two **[6]**

b) Explain data visualization with the help of example? What are the advantages of data visualization? **[8]**

OR

Q6) a) Explain any 4 Types of data visualization with example. **[8]**

b) i) List challanges in data visualization with example. **[6]**

ii) Explain Data Visualization with Tableau **[4]**

Q7) a) Explain Text mining with example. **[8]**

b) Explain Big Data Analytics Challenges in brief. **[9]**

OR

Q8) a) Explain four Big Data use cases with example. **[8]**

b) Explain types of Mobile Analytics with real time example. **[9]**

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Total No. of Questions : 8]

SEAT No. :

PE-2599

[Total No. of Pages : 2

[6583]-130

T.E. (Information Technology)

HUMAN COMPUTER INTERACTION

(2019 Pattern) (Semester - V) (314444)

Time : 2½ Hours] *[Max. Marks : 70*

Instructions to the candidates :

1) ***Answers Q1 or Q2, Q3 or Q4, Q5 or Q6, Q7 or Q8.***
2) ***Neat diagrams must be drawn wherever necessary.***
3) ***Figures to the right side indicate full marks.***
4) ***Assume suitable data if necessary***

Q1) a) What is KLM (Keystroke Level Model)? Discuss the steps involved in estimating task execution time using KLM. **[8]**

b) Create a GOMS description of the task of photocopying a. paper from a Journal. Discuss the issue of closure in terms of your GOMS description. **[9]**

OR

Q2) a) What is a Dialogue? Why do we need separate dialogue notation? Explain with example? **[9]**

b) Differentiate User Profiles with respect to Interface design with example **[8]**

Q3) a) What is the. definition of usability as per ISO 9241 standard? Describe any four usability goals of Internet Explorer? **[9]**

b) What is design? What is the golden rule of design? Illustrate the process of Interaction design? **[9]**

OR

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Q4) a) Write short notes on: **[9]**

1) Learnabillity

2) Flexibility

3) Robustness

b) What is User Centric Design? Why design teams involve user throughout the design process Justify your answer with proper example? **[9]**

Q5) a) List & Explain Neilsen's ten heuristics? **[8]**

b) Explain user interface management system (UIMS) with its architecture? **[9]**

OR

Q6) a) What is Usability Testing? Explain why usability testing is important with proper example? **[8]**

b) Complete the cognitive Walk-through example for the video remote control design? **[9]**

Q7) a) What is Ubiquitous Computing? How Ubiquitous Computing is used in Application Justify with Suitable example? **[10]**

b) Explain five stages of design thinking process with suitable example? **[8]**

OR

Q8) a) Differentiate Augmented and Virtual Reality. Also explain both with real life examples. **[8]**

b) In today's world finding things on the web has become easy Discuss how multimodal interaction has enriched the experience. **[10]**

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SEAT No. :

PE2601

[Total No. of Pages : 2

[6583]-132
T.E. (IT)
INTERNET OF THINGS
(2019 Pattern) (Semester - V) (314445 D) (Elective - I)

Time : 2½ Hours] *[Max. Marks : 70*

Instructions to the candidates:

1) ***Answer Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6, Q.7 or Q.8.***
2) ***Neat diagrams must be drawn wherever necessary.***
3) ***Figures to the right indicate full marks.***
4) ***Assume suitable data, if necessary.***

Q1) a) Why 6LoWPAN plays important role in IOT. Explain in detail 6LoWPAN. **[8]**

b) What are advantages of Zigbee? Explain in detail Zigbee protocol stack. **[9]**

OR

Q2) a) Explain in detail IEEE 802.15.4. **[8]**

b) What is Bluetooth? Explain in detail Bluetooth Technology. **[9]**

Q3) a) Explain Arduino. What are the things need to be considered for developing on the Arduino? Which is the official Arduino Boards? **[9]**

b) Compare Arduino Uno and Raspberry Pi Model. **[9]**

OR

Q4) a) Draw and explain interfacing of input device (LED) using Arduino Uno with program. **[9]**

b) What is an IOT Device? List different IOT Devices. Explain any 2 devices. **[9]**

Q5) a) Explain Cloud storage models (SaaS, Paas, IaaS) and Communication APIs Web server in details. **[8]**

b) Explain Python Web Application Framework in detail. Explain How different Amazon web services can be used for IOT? **[9]**

OR

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Q6) a) What is the Vulnerability of IOT? Explain in details. **[8]**

b) What is threat analysis in IOT? Explain threat analysis in detail. **[9]**

Q7) a) Explain smart city architecture with diagram also state security and privacy challenges in smart transportation in smart city. **[9]**

b) Explain in detail How IOT can be used in home automation? **[9]**

OR

Q8) a) Explain how you will design a smart water management system for agriculture using IOT. **[9]**

b) Explain in detail any two application of health monitoring using IOT. **[9]**

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SEAT No. :

PE-2598

[Total No. of Pages : 2

[6583]-129

T.E. (IT)

MACHINE LEARNING

(2019 Pattern) (Semester - V)(314443)

Time : 2½ Hours] *[Max. Marks : 70*

Instructions to the candidates:

1) ***Answer Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6 and Q.7 or Q.8.***
2) ***Neat diagrams must be drawn wherever necessary.***
3) ***Figures to the right side indicate full marks.***
4) ***Assume suitable data, if necessary.***

Q1) a) What do you understand by overfitting data? Gives any two methods to avoid overfitting. **[6]**

b) Given the set of values X = (3, 9, 11, 5, 2)T and Y=(1, 8, 11, 4, 3)T. Evaluate the regression coefficients. **[5]**

c) Compare the linear regression model and the logistic regression model. **[6]**

OR

Q2) a) What are the metrics used to validate the result of the regression and explain each? **[6]**

b) Distinguish between overfitting and underfitting. How it can affect model generalization. **[5]**

c) Discuss linear regression with examples. Explain the role of the hypothesis function in ML. **[6]**

Q3) a) What is Gini impurity? Briefly explain the properties of Gini Impurity. **[8]**

b) [CO4, L_1] How does the decision tree handle missing attribute Values? **[4]**

c) [CO4, L_2] What do you understand by Information gain? Explain the mathematical formula associated with it. **[6]**

OR

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Q4) a) Write short notes on **[12]**

i) Conditional probability

ii) Tree Pruning

iii) Bayesian Network

b) What do the root node, leaf node, and parent node represent in a decision tree model? Represent them pictorially. **[6]**

Q5) a) What is the difference between the Manhattan distance and Euclidean distance? **[4]**

b) Explain in detail Apriori Algorithm. **[8]**

c) Define the following terms concerning K - Nearest Neighbor Learning **[6]**

i) Regression

ii) Residual

iii) Kernel Function

OR

Q6) a) What is the difference between k-Means and K-Medians and when would you use one over another? **[6]**

b) What is hierarchical clustering? Explain the issue of connectivity constraints. **[8]**

c) What are support and confidence measures in data mining? **[4]**

Q7) a) With suitable equations, explain any two types of activation functions used in a neural network. **[8]**

b) Explain why the initialization process of weight and bias is important for neural networks. **[6]**

c) Write short notes on Mean square Error. **[3]**

OR

Q8) a) Explain with a neat diagram how neural networks are modeled. **[6]**

b) Write short notes on **[6]**

i) Sigmoidal Neuron

ii) McCulloch Pitts Neuron

c) Explain the working of a Perceptron with a neat diagram. **[5]**

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SEAT No. :

PE-2597

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T.E. (Information Technology)
OPERATING SYSTEM
(2019 Pattern) (Semester - V) (314442)

Time : 2½ Hours] *[Max. Marks : 70*

Instructions to the candidates :

1) ***Answer Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6, Q.7 or Q.8.***
2) ***Neat diagrams must be drawn wherever necessary.***
3) ***Figures to the right side indicate full marks.***
4) ***Assume suitable data, if necessary.***

Q1) a) What is critical section? Write parameters to control access to critical section and explain the requirements to be satisfied for its solution. **[9]**

b) What is deadlock? What are the necessary conditions for deadlock? How deadlock is detected in a system having single instance of each type? **[9]**

OR

Q2) a) Explain any two approaches for Recovery from deadlock. **[6]**

b) Write bankers safety algorithm. **[12]**

Consider the following system snapshot

Process	MAX				Allocation				Available			
	A	B	C	D	A	B	C	D	A	B	C	D
P0	0	3	2	2	0	2	1	2	2	5	3	2
P1	2	7	5	2	1	1	0	2				
P2	2	3	7	6	2	2	5	4				
P3	1	6	4	2	0	3	1	2				
P4	3	6	5	8	2	4	1	4				

Answer the following questions

i) What is the content of need matrix?

ii) Is the system in a safe state?

iii) If the request from process p1 arrives for (0,2,2,0), can it be granted immediately?

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Q3) a) Given references to the following pages by a program **[9]**

0,1,4,2,0,2,6,5,1,2,3,2,1,2,6,2,1,3,6,2.

Compute number of page faults if the system has 3 page frames for the following policies

i) FIFO

ii) LRU

iii) Optimal Page replacement

b) Explain paged memory management in detail. **[8]**

OR

Q4) a) What is Belady's anomaly? Explain with suitable example. **[6]**

b) Consider the following segment table : **[5]**

Segment	Base	Length
0	330	124
1	876	211
2	111	99
3	498	302

What are the physical addresses for the following logical addresses? If the address generates a segment fault indicate so.

i) 0,99 ii) 2,78

iii) 1,265 iv) 3,222

v) 0,111

c) Explain memory partition selection algorithms **[6]**

Q5) a) A disk drive has 1000 cylinders, numberd 0-999. The drive is currently serving the request at track no. 345 and head is moving towards track 0. The queue of pending requests in FIFO order is 123,874, 692,475,105,376. Starting from the current head position what is the total distance that disk arm moves to satisfy all the pending requests for the following disk scheduling algorithms. **[12]**

i) FCFS ii) SCAN

iii) LOOK iv) SSTF

b) Explain Record blocking with the help of neat diagrams. **[6]**

OR

Q6) a) Write different file system free space management techniques. **[9]**

b) Explain different file allocation methods. **[9]**

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Q7) a) Define the following terms : **[3]**

i) Macro processor

ii) Interpreter

iii) Linker

b) Differentiate between a system software and application software. **[6]**

c) Explain Pass 1of assembler with flowchart. **[8]**

OR

Q8) a) Explain the phase structure of a compiler with neat diagram. **[9]**

b) Explain the following **[8]**

i) Compile and Go Loader

ii) Absolute Loader

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SEAT No. :

PE-2591

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T.E. (Information Technology)

WEB APPLICATION DEVELOPMENT

(2019 Pattern) (Semester - VI) (314453)

Time : 2½ Hours] *[Max. Marks : 70*

Instructions to the candidates:

1) ***Answer Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6, Q.7 or Q.8.***
2) ***Neat diagrams must be drawn wherever necessary.***
3) ***Figures to the right side indicate full marks.***
4) ***Assume suitable data, if necessary.***

Q1) a) What is MVC? Explain MVC architecture in detail. **[6]**

b) How would you use the term typescript? Give the advantages and disadvantages of using it? **[6]**

c) List and explain different types of structural directives in Angular. **[5]**

OR

Q2) a) Explain variables and constant in TypeScript and how they differ from traditional JavaScript. **[6]**

b) Explain the basic hooks in ReactJS with simple demo applications. **[6]**

c) What is Pipe? Explain with example. **[5]**

Q3) a) List and explain the features of any three popular web frameworks. **[6]**

b) What is socket? Write a client server communication in node JS using socket programming. **[6]**

c) What is API? Explain REST HTTP API's in detail. **[5]**

OR

Q4) a) Write a code using ExpressJS to illustrate the concept of routes. **[6]**

b) What is CRUD? Explain CRUD operations in node.JS **[6]**

c) What is NoSQL? Explain different features of MongoDB. **[5]**

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Q5) a) List and Explain any 3 widgets in JQuery Mobile. **[6]**

b) Explain concept of 'role' in jQuery mobile? List and explain any 4 role. **[6]**

c) What is navigation? Write code to navigate from one page to another in jQuery Mobile. **[6]**

OR

Q6) a) List any five widgets in jQuery mobile. **[6]**

b) What is page? Write a code to create a page in jQuery mobile. **[6]**

c) What way would you design a code to make slide up transition in jQuery mobile? **[6]**

Q7) a) What is cloud computing, benefits of cloud computing & types of cloud computing. **[6]**

b) List steps to deploy the application on elastic beanstalk. **[6]**

c) What are the different components of VPC? **[6]**

OR

Q8) a) List steps to deploy website in EC2. **[6]**

b) How to convert EC2 Instance with PuTTY. **[6]**

c) What is S3 bucket and how to create a bucket? **[6]**

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