2015

M.Sc.

3rd SEMESTER EXAMINATION

COMPUTER SCIENCE

PAPER—COS-303

Full Marks : 50

Time : 2 Hours

The figures in the margin indicate full marks.

Candidates are required to give their answers in their own words as far as practicable.

Illustrate the answers wherever necessary.

(*Image Processing*)

Answer any *four* questions : 4×10

1. What do you mean by Normalized histogram? Why histogram eualization is used in image enhancement? Give one example in which image can be enhanced using histogram equalization. 2+2+6

2. Write the name of 3 basic gray level transformation functions. Explain each of them with diagram. What is gamma correction? 2+6+2

3. What is the function of smoothing spatial filter? Write the gradient Operator and Laplacian operator which are used in image filtering? Explain High-boost filtering process in spatial domain. 2+4+4

4. Explain Butterworth low pass filter and Gaussian high pass filter in frequency domain. Write the homomorphic filtering approach for image enhancement in frequency domain. 3+3+4

5. Write any three common edge detectors masks. What is the laplacian of Gaussian (*or* Mexican hat) ? 6+4

6. Write short notes on (any *four*) : $4 \times 2\frac{1}{2}$

   (a) Contrast streatching ;

   (b) Erosion and Dilation ;

   (c) Lossy Decomposition ;

   (d) Thresholding ;

   (e) Bit plane slicing ;

   (f) Discrete Fourier frameform.

7. Explain the basic concept of sampling and quantization with neat sketch. State and explain convolution theorem. 10+5

[*Internal Assessment — 10 Marks*]

(*Cloud Computing*)

Answer *Q. No. 1* and any *three* from the rest.

1. Answer any *five* : 5×2

   (a) What is Cloud Computing ?

(b) Define the two fundamental operations provided by Hadoop for data processing.

(c) What is Utility Computing ?

(d) What does the aeronym Xaas stand for ?

(e) Mention the role played by VM Pool manager in Infrastructure / Hardware as a Service ?

(f) What is Virtualization ? What are its major components ?

(g) What is Community cloud ?

2. (a) Briefly summarize the cloud computing reference model.

(b) Provide a brief characterization of a Distributed System. 5+5

3. (a) Discuss machine reference model of execution virtualization.

(b) Describe the three theorems that define the properties that hardware instructions need to satisfy in order to efficiently support virtualization. 5+5

4. (a) Discuss the taxonomy of Virtualization at different levels.

(b) Briefly describe the different types of hardware virtualization techniques. 5+5

5. Write short notes on (any *four*) : $4 \times 2\frac{1}{2}$

(a) Hypervisor ;

(b) Microsoft Azure ;

(c) Hybrid cloud ;

(d) Manjrasoft Aneka ;

(e) Google App Engine.

6. (a) How does cloud computing provides on-demand functionality ?

(b) What is the difference between scalability and elasticity ?

(c) What resources are provided by IaaS ?

(d) Describe the major concepts introduced by Service-oriented Computing for cloud computing.

$4 \times 2\frac{1}{2}$

[*Internal Assessment — 10 Marks*]

(*Real-Time System*)

Answer any *four* questions.

1. (a) What do you mean by 'Real-Time System' ?

(b) Write down the difference between 'Real-Time System' and 'Traditional System'.

(c) Explain SCADA with example.

3+3+4

2. (a) Describe the basic model of a 'Real-Time System'.

(b) Explain Real Time Embedded systems.

(c) What is BIST ?

5+3+2

3. (a) Explain Hard-Real time, Soft-Real time, and Firm-real time systems.

(b) Identify and represent the timing constraints in the following air-defence system by means of an extended State machine diagram. Classify each constraint into either performance or behavioural constraint.

Every incoming missile must be detected within 0·2 sec. of its entering the radar coverage area. The intercept missile should be engaged within 5 sec. of detection of the target missile. The intercept missile should be fired after 0·1 sec. of its engagement but not less than 1 sec.

2+2+2+4

4. (a) What do you mean by Scheduling point of a task scheduling algorithm ?

(b) Consider the following set of periodic real time tasks to be schedule by a Cyclic scheduler :

$T_1 = (e_1 = 1, P_1 = 4)$, $T_2 = (e_2 = 2, P_2 = 5)$,

$T_3 = (e_3 = 5, P_3 = 20)$.

Determine a suitable frame size for the task set.

(c) Explain EDF Scheduling algorithm.

(d) Consider the following three periodic real time tasks to be scheduled using EDF on a uniprocessor.
$T_1 = (e_1 = 10, P_1 = 20)$, $T_2 = (e_2 = 5, P_2 = 50)$,

$T_3 = (e_3 = 10, P_3 = 35)$.

Determine whether the task set is scheduled.

2+3+4+1

5. (a) What is TMR in RTS ? How decision is taken in a TMR based Real Time System ?

   (b) Describe technique to achieve software fault tolerance in Real Time System. (2+3)+5

6. (a) Describe Rate Monitoring Algorithm (RMA).

   (b) What are sufficient and necessary conditions of RMA.

   (c) Check whether the following set of periodic real time tasks is schedulable under RMA on uniprocessor :

   $T_1 = (e_1 = 20, p_1 = 100)$, $T_2 = (e_2 = 30, p_2 = 150)$, $T_3 = (e_3 = 60, P_3 = 200)$. 3+3+4

[*Internal Assessment — 10 Marks*]

(*Natural Language Processing*)

Answer any *four* questions.

1. What is Semi-supervised Learning? Briefly describe Bootstrapping. In which scenarios using Bootstrapping based SSL is risky? And why? 10

2. Define Precision, Recall and F-Measure. Discuss the impact of Precision and Recall on the accuracy of a system in details. 10

3. Write short note on any *two* of the given topics : 2×5

   (a) Morphology ;

   (b) Active Learning ;

   (c) Text Classification ;

(d) Source of Noisy Text ;

(e) Sentiment Analysis.

4. (a) Draw the parse structure of the following sentence : Abraham Lincoln was born in Kentucky in 1809.

(b) Draw the parse structure of the following sentence : The top run scorer in the 2011 Cricket World Cup was Tillakaratne Dilshan.

5+5

5. (a) Draw the parse structure of the following sentence :

Sachin Tendulkar retired from International Cricket after playing his 200th Test Match, against the West Indies in Mumbai's Wankhede Stadium in 2013.

(b) Named Entity Recognition. An elementary task of Information Extraction. (Justify the comments).

5+5

[*Internal Assessment — 10 Marks*]

(*Pattern Recognition*)

Answer *Q. No. 1* and any *three* questions from the rest.

1. (a) What do you mean by supervised learning? 1

(b) Write the applications of ANN. 2

(c) Write the importance of speech recognition system. 2

2. (a) Write the components of speech recognition system. 3

(b) Describe the functions of a speech recognition system. 7

(c) Describe Dialog management. 5

3. (a) Describe Lazy Learning method with the help of an example. 6

(b) How does Lazy Learning apply in classification ? 4

(c) How does K-NN method apply in classification ? 5

4. (a) What is good clustering ? Write its applications. 2+3

(b) How do you measure the quality of clustering ? 5

(c) Describe nearest neighbour rule. 5

5. Write short notes (any *three*) : 3×5

(a) LDA ;

(b) Back propagation ;

(c) Statistical Pattern Recognition ;

(d) Feature selection / extraction ;

(e) Syntax Parsing.

6. (a) Describe the applications of syntactic pattern recognition. 5

(b) Write the applications of feature reduction. 4

(c) What is good projection ? 2

(d) Describe the functions of Syntactic Pattern Recognition. 4

[Internal Assessment — 10 Marks]

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