## Begum Rokeya University, Rangpur
### Department of Computer Science and Engineering
B.Sc. (Engg.) 4th year 2nd Semester Final Examination, 2016. (Session: 2012-13)

Course Code: **CSE 4204**  
Course Title: **Digital Image Processing**

Time: **3.00 hours**  
Total Marks: **50**

[N B: *Answer any five (5) questions and figures in the right margin indicate full marks]*
[*All parts of each question must answer together]*

1. a) Define the following terms:                                                                 2
      (i)    Image; (ii) Resolution; (iii) Pixel and  (iv) Digital Image.
   b) Depict different steps involved in digitization process of analog image in short.            4
   c) Explain the image formation procedure in human eye.                                          4

2. a) Write down the reasons of low contrast image.                                               2
   b) Why it is necessary to normalize the histogram by its components.                           2
   c) Consider an equation $s=T(r)$, where $T(r)$ is monotonically increasing function. After      3
      reversing the equation like that $r=T(s^{-1})$, what type of problem arise in this case.
   d) Consider the following two filter masks.                                                     3

   | 1 | 1 | 1 |
   |---|---|---|
   | 1 | 1 | 1 |
   | 1 | 1 | 1 |

   (i)

   | 1 | 2 | 1 |
   |---|---|---|
   | 2 | 4 | 2 |
   | 1 | 2 | 1 |

   (ii)

   Discuss the effect of filter mask (ii) compare to (i) in terms of central coefficient. Also
   explain why in filter mask (ii) with increasing distance from central coefficient, the value of
   coefficients decreasing.

3. a) Define brightness, hue and saturation.                                                      2
   b) Explain different type's effect produce by smoothing spatial filter on an image?            2
   c) Write the power law transformation formula and distance about its parameter. What are the    4
      applications of power law transformation?
   d) What do you mean by image negatives? Formulated an expression for image negatives            2
      where M = highest intensity level.

4. a) Describe Butterworth high-pass filters and Gaussian low-pass filter in terms of image        4
      sharpening.
   b) Discuss the model of the image degradation and restoration process.                          4
   c) Note down the differences between arithmetic and geometric mean filter.                       2

5. a) Illustrate Erlang noise and Impulse noise with PDF and histograms.                           5
   b) Explain the application of max and min filters.                                              2
   c) How bandreject filters differ from bandpass filters. Explain with figure.                    3

6. a) What is need of image transform? Define DFT.                                               2+2
   b) Explain the following two properties of 2D- DFT:                                             6
      i)    Convolution ii)   Correlation

7. a) What do you mean by full color image processing?                                             1
   b) What do you mean by Pseudocolor image processing and note down its importance.               3
   c) How gray level can be transformed into Color. Explain.                                       3

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Department of Computer Science and Engineering

B.Sc. (Engg.) 4<sup>th</sup> year 2<sup>nd</sup> Semester Final Examination, 2016. (Session: 2012-13)

Course Code: **CSE 4202**                                               Time: **3.00 hours**
Course Title: **Web Engineering**                                       Total Marks: **50**

[N B: *Answer any five (5) questions and figures in the right margin indicate full marks*]

| | | | |
|---|---|---|---|
| 1. | a) | What is web? Write down the main properties of Web 1.0, Web 2.0 and Web 3.0. | 1+3 |
| | b) | What does a Web Designer do? What are the main differences/similarities between a Web Designer and Web Programmer? | 2+2 |
| | c) | Why do you use the commands *ifconfig* and *ping*? | 2 |
| | | | |
| 2 | a) | What is requirement engineering (RE)? Briefly describe all stakeholders who are involved in Web-based project, and how they contribute in RE? | 1+4 |
| | b) | Requirement adaptation in Web-based development is different than usual development, considering the above statement, how will you adapt requirements in a Web Application development. | 5 |
| | | | |
| 3 | a) | Why do we need to use models in a Web Application development? Argue with your points. | 2 |
| | b) | What is MVC? Write and discuss components of MVC? In what type of development, we should follow and not follow it? | 1+2+2 |
| | c) | What is Linked Data? Describe Linked data publishing principles. | 1+2 |
| | | | |
| 4 | a) | Why defining architecture is important in any development? | 2 |
| | b) | Extensively describe, with proper examples, components of a Generic Web Application Architecture. | 5 |
| | c) | Why layered approach architecture is better than non-layered architecture? Argue with your points. | 2 |
| | d) | Explain benefits of using Proxy server | 1 |
| | | | |
| 5 | a) | How data are managed in a web application development? Differentiate purposes of using HTML, XML and JSON in a Web application development. | 1+3 |
| | b) | What is cross-browser compatibility? How jQuery helps in cross-browser compatibility? | 1+2 |
| | c) | Describe below communication protocols | |
| | | 1. SMTP | |
| | | 2. RTSP | |
| | | 3. HTTP | 3 |
| | | | |
| 6 | a) | What is testing? Mention 4 special testing that are essential for a Web application. | 1+2 |
| | b) | Describe benefit and drawbacks of test automation for a Web Application development. | 2 |
| | c) | What are the challenges need to handle in a launch of a Web Application development? Describe them briefly. | 3 |
| | d) | Why do we need to use Web Analytics? Describe an Analytic technique that can serve in Web security. | 2 |
| | | | |
| 7 | | Write short notes on the followings (any four) | 4x 2.5 |
| | a) | Semantic Web | |
| | b) | HTTPS | |
| | c) | Resource Description Framework | |
| | d) | Web Security | |
| | e) | REST | |

Time: 3 hours                                                                Full Marks: 50

**N.B.**
a) There are **SEVEN** questions in this course. Answer any **FIVE** questions.
b) The figures in the margin indicate full marks.
c) The questions are equal marks.

1.  a) While studying the object "Simulation and Modeling" which one comes first- simulation or modeling? Explain why? — 4
    b) What do you mean by the "System Simulation"? — 2
    c) Discuss the advantages and disadvantages of simulation. How the limitations of simulation can be overcome? — 4

2.  a) What errors may be occurred while generating pseudo random numbers? — 3
    b) Which points should have been considered at the time of designing a pseudo random number generator? Explain why? — 3
    c) Briefly describe the Combined Linear Congruential Generator with example. — 4

3.  a) Why is it necessary to perform randomness tests? What kind of test can be performed? — 3
    b) Based on runs up and runs down, determine whether the following sequence of 40 numbers is such that hypothesis of independence can be rejected where $\alpha = 0.05$ and $Z_{0.025} = 1.96$ — 5
    0.41, 0.68, 0.89, 0.94, 0.74, 0.94, 0.55, 0.62, 0.36, 0.27, 0.19, 0.72, 0.75, 0.08, 0.54, 0.02, 0.01, 0.36, 0.16, 0.28, 0.18, 0.01, 0.95, 0.69, 0.18, 0.47, 0.23, 0.32, 0.82, 0.53, 0.31, 0.42, 0.73, 0.04, 0.83, 0.45, 0.13, 0.57, 0.63, 0.29
    Distinguish between Random number and Pseudo random number. — 2

4.  a) Write down the differences between system verification and validation. Explain the purpose and process of verification of system models. — 7
    b) Define continuous random variable. Note down properties of normal distribution curve. — 3

5.  a) What do you mean by PERT and CPM? — 3
    b) For critical path computation draw the flowchart and discuss the procedure for backward pass. — 4
    c) What are activity network, dummy activity and source node? — 3

6.  a) Describe what is meant by spline curve and why cubic splines are used frequently in computer simulation? — 4
    b) Derive the expression for the Hermit blending functions to generate spline curve. — 5
    c) What is Bezier patch? — 1

7.  a) What is fractal object? What are its characteristics? — 3
    b) Describe different types of fractal objects. — 4
    c) Explain how the dimension of a fractal may be defined? — 3

**Course Title: Pattern Recognition**       **Full Marks: 50**

**Course Code: CSE4208**       **Time: 3 Hours**

### Answer Any FIVE From the Given Questions

**(Note: Numbers in the right margin indicate marks for each question.)**

1. (a) What is Pattern recognition (PR)? What are the sub-problems of PR?   2

    (b) State the Bayes rule and explain how it is applied to pattern classification problems.   4

    (c) Discuss how Naïve Bayesian classifier can be implemented based on the Bayes's theorem. Also specifically mention the assumtions made in the classifier.   4

2. (a) What are the components of a PR system? Illustrate your answer with a figure.   2

    (b) Write short notes on : i) Support Vector Machine(SVM)  ii) Principle component Analysis (PCA)   4

    (c) Suppose we have a two-classes problem $(A, \sim A)$, with a single binaryvalued feature $(x, \sim x)$. Assume the prior probability $P(A) = 0.33$. Given the distribution of the samples as shown in the following table, use Bayes Rule to compute the values of posterior probabilities of classes.   4

| | A | ~A |
|---|---|---|
| x | 248 | 167 |
| ~x | 82 | 503 |

3. (a) In a class, 40% of the students study math and science. 60% of the students study math. What is the probability of a student studying science given he/she is already studying math?   2

    (b) Suppose we train a model to predict whether an email is Spam or Not Spam. After training the model, we apply it to a test set of 500 new emails (also labeled) and the model produces the following contingency table   4

| | | True Class | |
|---|---|---|---|
| | | Spam | Not Spam |
| Predicted | Spam | 70 | 30 |
| Class | Not Spam | 70 | 330 |

    Compute the <u>precision</u> and <u>recall</u> of this model with respect to the Spam class

    (c) Write short noets (any two): i) Deep Learning ii) Reinforcement Learning iii) Eigen value and vectors   4

4. (a) What is the role of pooling layers in a Convulutional Neural Network?   2

    (b) Explain 2 category and multi category case of linear discriminant functions. Also explain linear decision bounding for 2 class problem with the help of suitable diagram.   4

    (c) What is learning rule? Write the differences between unsupervised and supervised learning.   4

5. (a) Which are the two schemes of Hierarchical clustering algorithm?   2

    (b) Use the k-means algorithm and Euclidean distance to cluster the following 8 examples into 3 clusters: A1=(2,10), A2=(2,5), A3=(8,4), A4=(5,8), A5=(7,5), A6=(6,4), A7=(1,2), A8=(4,9).   8

    Suppose that the initial seeds (centers of each cluster) are A1, A4 and A7. Run the k-means algorithm for 1 epoch only. At the end of this epoch show:

    The new clusters (i.e. the examples belonging to each cluster)

    The centers of the new clusters

    Draw a 10 by 10 space with all the 8 points and show the clusters after the first epoch and the new centroids.

    How many more iterations are needed to converge? Draw the result for each epoch.

6. (a) Explain the concept of feature extraction in pattern recognition system with examples   5

    (b) Write HMM Decoding algorithm. With the help of example explain the state sequence decoding of hidden Markov model.   5

7. (a) What is overfitting and why is it a problem?   2