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Roll No. 2K15/CO/025

FIFTH SEMESTER **B.TECH (COE)**

MID SEMESTER EXAMINATION *(SEPTEMBER 2017)*

CO-303 THEORY OF COMPUTATION

Time: 1.5 hours *Max. Marks: 25*

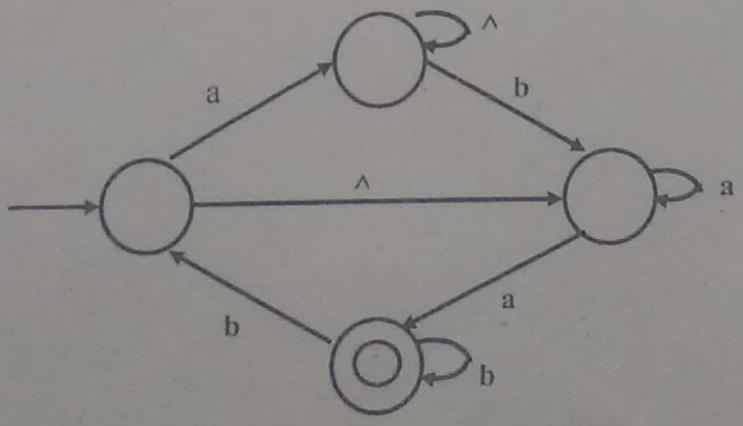
Note: Attempt **all** questions.
Assume suitable missing data, if any.

1. Are the following statements true or false? Justify by giving proof. (2x3 = 6 marks)
   a) Let $L^R = \{w^R | w \in L\}$ *where* w^R is the string obtained by reversing w. If L is regular then L^R is regular.
   b) Let L= $\{0^k \mid$ k is relatively prime to 12 i.e. k and 12 has no common factor greater than 1$\}$ is regular.
   c) Let L1 and L1.L2 are regular. Is L2 also regular.

2. Draw the DFA for L=$\{w:[n_a(w) - n_b(w)] \bmod 3 = 0\}$ where $n_a(w)$ and $n_b(w)$ represents no of a's and no. of b's in the string w. (4 marks)

3. Show $L = \{ww | w \in \{0,1\}^*\}$ is non regular using Pumping Lemma theorem. (4 marks)

4. Convert the following NFA to DFA. (5 marks)



5. Let L1 be the language of all the strings that don't contain substring aa and L2 be all the strings with odd no of letter. Find L1.L2 using Kleen's Theorem. (6 marks)

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FIFTH SEMESTER

B.Tech. (CO)

MID SEMESTER EXAMINATION

September-2017)

CO-301 SOFTWARE ENGINEERING

Time: 1:30 Hours *Max. Marks: 30*

Note: Answer all Questions. Assume missing data if any.

Q1. a) Suggest a suitable life-cycle model for a software project undertaken on behalf of a customer who is unsure of his requirements and is like to change requirements frequently. Give reason behind your answer. [4]

b) Discuss the aspects of the software product you would document in the SRS document. What would be the organization of your SRS document? [3+3]

Q2. a) What do you mean by terms cohesion and coupling in context to software design? How are these concepts useful in arriving at a good design of software? [5]

b) With reference to online admission system of a university, discuss the various functional and non-functional requirements. [5]

Q3. Draw the context diagram, 1-level DFD and use-case diagram of following case study. [2+5+3]

A restaurant owner wants to computerize his order processing, billing and accounting activities. He also expects the computer to generate the statistical reports about the sales of different items. The computer should maintain the prices of all items and also support changing the prices by manager. Whenever any item is sold, the sales clerk would enter the item code and the quantity sold. The computer should generate the bills of items being sold. Whenever ingredients are issued for the preparation of food items, the data is to be entered into the computer. Purchase orders are generated on daily basis, whenever the stock for any ingredient falls below a threshold value. The computer should calculate the threshold value on the basis of average consumption of a particular ingredient in the past three days. Whenever the ordered ingredients arrive, the invoice data regarding the quantity and price is entered. Monthly sales receipts and expenses data should be generated whenever the manager would request to see them.

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Roll No. 2K15/IT/025

FIFTH SEMESTER

B. Tech.

MID SEMESTER EXAMINATION September-2017

IT-307 PATTERN RECOGNITION

Time: 1:30 Hours

Max. Marks: 20

Note: Answer *ALL* questions.
Assume suitable missing data, if any.
Use of scientific calculator is permitted.
USE ONLY OPTIMAL NUMBER OF WORDS FOR YOUR ANSWERS

1. Describe (briefly) major steps in the design of a pattern recognition system with help of neat diagram. [2]
2. A company visiting university for campus placement, wants to classify students in eligible and non-eligible classes. There are following parameters for each student [2]
   i. percentage of marks till last semester
   ii. percentage of theory classes attended
   iii. percentage of practical labs attended
   iv. score factor (S_f) which is calculated as

$$S_f = \frac{(M-\mu)}{N}$$

   where M is percentage marks obtained by students till last semester, μ is mean of marks percentage of all students appearing for placement. N is total number of candidates.
3. Justify that a set of k mutually perpendicular feature vectors will form a bases for k-dimensional feature space. [2]
4. Consider a set $S = \left\{\overline{X} \in R^2 : \left\|\overline{X}\right\|_1 = 2\left\|\overline{X}\right\|_\infty\right\}$ where $\left\|\overline{X}\right\|_1$ is L_1 norm & $\left\|\overline{X}\right\|_\infty$ is L_∞ norm of the vector. Draw set S in two-dimensional plane. Also, find whether it is a subspace of R^2 or not. [2]
5. A class test of IT-307 is conducted with maximum marks 5. Let a random variable X represents marks obtained by students, and it takes only integer values. Probability mass function $p_X(x)$ for X is given in the following table I. Find expectation E[X] and variance σ_X^2. [4]

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Table I

x	$p_X(x)$
0	0
1	0.1
2	0.15
3	0.25
4	0.3
5	0.2

After awarding marks to each student, it was decided that maximum marks should be 10. Thus, marks of students are scaled up. Let new marks are represented by a new random variable Y. Find E[Y] and σ_Y^2 using E[X] and σ_X^2 only.

6. Consider a set of data points $A=\begin{bmatrix}1\\1\end{bmatrix}$, $B=\begin{bmatrix}1.5\\2\end{bmatrix}$, $C=\begin{bmatrix}2\\1.5\end{bmatrix}$, $D=\begin{bmatrix}2.5\\3\end{bmatrix}$, $E=\begin{bmatrix}3\\2.5\end{bmatrix}$. Find coordinates of point A and E in the new bases obtained using principle component analysis (PCA). [4]

Hint: use division by $(n-1)$ for calculating variance, n is number of data points. Eigen values: 1.125 and 0.125, Eigen vectors $[0.707, 0.707]^T$, $[-0.707, 0.707]^T$

7. According to records at a university, the probability of a student graduating in four years of duration is 0.8. The University admits students through a national level examination (say JEE). The students are classified in two classes: A and B. Class A: students graduating in four years, and Class B: students graduating in more than four years. JEE scores of students of class A is normally distributed (Gaussian distribution) with mean 80 and variance 2, and that of class B is also normally distributed with mean 40 and variance 3. Find optimal decision boundary using Bayes decision rule. Discard decision boundary (if any) beyond 100. [4]

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5TH SEMESTER

B.Tech. (CO)

MID SEMESTER EXAMINATION

(September – 2017)

CO 313

Computer Graphics

Time: 1:30 Hours

Max. Marks: 30

Note: Answer all the questions. Assume suitable missing data, if any.

Q1 (a) Differentiate between random and raster scan display. 3

Q1 (b) Discuss the classification of computer graphics. 3

Q2 Derive the expression for DDA line generation algorithm along with diagram. Digitize the points to draw a line from (1,1) to (5,5) using DDA line drawing algorithm. 9

Q3 Explain rotation transformation with mathematical expression and diagram. What are the new co-ordinates of the point A(5,2) after a rotation of 45° about origin. 9

Q5 Write short notes (any two) : (2X3=6)

a) Advantages of Computer Graphics

b) Boundary Fill Algorithm

c) Shear Transformation

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Roll No. 2K15/Co/085

FIFTH SEMESTER

B.Tech. [EP]

MID SEMESTER EXAMINATION *September-2017*

EP-351: PHYSICS OF ENGINEERING MATERIALS

Time: 1.5 Hours *Max. Marks: 25*

Note : Answer any **ALL** questions.
Assume suitable missing data, if any.

1. Write short notes on the following: (4×2=8)

   (a) Miller Indices with one example (b) Covalent bond

   (c) Atomic Packing Factor (d) Frenkel Defect

2. NaCl crystal has *f.c.c.* structure. The density of NaCl is 2.18 gm/cm^3. Calculate the distance between two nearest neighboring atoms. (5)

3. Derive an expression for conductivity of an intrinsic semiconductor. How does it vary with the temperature in intrinsic and extrinsic semiconductor? (6)

4. In intrinsic GaAs, the electron and hole mobilities are 0.85 and 0.04 m^2/V-s, respectively and the corresponding effective masses are 0.068 m_o and 0.5 m_o, respectively where m_o is the rest mass of the electron. Given the energy band gap at 300 K as 1.43 eV, determine the intrinsic carrier concentration and conductivity. (6)

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