[5037]-102

M.Sc-I (Computer Science)
CS - 102:ADVANCED NETWORKING
(2011 Pattern) (Semester-I) (New Course)

Time : 3 Hours]   *[Max. Marks : 80*
Instructions to the candidates:
1) *All questions are compulsory.*
2) *Neat diagrams must be drawn whenever necessary.*
3) *Figures to the right indicates full marks.*

Q1) Attempt any EIGHT of the following.   **[8×2=16]**

a) State any four features of IPV6.

b) Define ferwarding. State the types of forwarding based on IP.

c) What is connection release? State the types of connection release?

d) What is RTP? Where it is placed in a protocol stack?

e) Define cryptography & cryptanalysis.

f) What are OCSP & SCVP?

g) What are stream cipher & block cipher?

h) State the phases of SSL handshake protocol.

i) Define firewall. State its types.

j) What is passwords? State the problems with clear Text passwords.

Q2) Attempt any four of the following.   **[4×4=16]**

a) Explain the access method used by traditional ethernet.

b) Explain how crash recovery is handled in the transport layer.

c) Define SSL.Explain it in terms of its subprotocols.

d) A packet has arrived in which the offset value is 100, the value of HLEN is 10 and the value of total length field is 200. What is the number of the first byte & the last byte?

e) Create & populate matrix using playfair encryption scheme for the keyword <u>ADVANCED NETWORKING</u>.

P.T.O.

Q3) Attempt any <u>FOUR</u> of the following. **[4×4=16]**

a) Explain various approaches used in streaming stored audio/ video

b) Find the topology of the network if the routing table for router R_1 is given:

Mask	NetworkAddress	Next-HopAddress	Interface
/26	140.12.6.60	180.16.2.4	mo
/24	130.8.4.0	190.18.10.6	m2
/16	110.90.0.0	-	m1
/16	180.16.0.0	-	mo
/16	190.18.0.0	-	m2
Default	Default	110.90.12.5	m1

c) By applying RSA algarithm. create public & private keys, if prime numbers are P=11 & Q = 23.

d) How does SET protect payment information from the merchant?

e) Explain error reporting messages in ICMPV6.

Q4) Attempt any <u>FOUR</u> of the following. **[4×4=16]**

a) Explain UDP.

b) Discuss types of links used in OSPF.

c) Explain chief principles of security.

d) Explain various certificate types.

e) What is VPN? Explain its architecture with figure.

Q5) Attempt any <u>FOUR</u> of the following. **[4×4=16]**

a) What is congestion? How congestion control is performed in TCP.

b) What is RIP? Explain RIP timers.

c) Discuss broad level schemes for carring out the security handshake.

d) What is PGP? Explain its working.

e) Define an algorithm mode. Explain various algorithm modes.

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[5037]-201

M.Sc.

COMPUTER SCIENCE

CS - 201(New): Digital Image Processing

(2011 Pattern) (Semester - II)

Time : 3 Hours]   *[Max. Marks :80*

Instructions to the candidates:

 1)   *Question No.1 is compulsory.*

 2)   *Attempt any four from the remaining.*

 3)   *Neat diagrams must be drawn wherever necessary.*

 4)   *Figures to the right indicate full marks.*

Q1) Attempt all: **[8×2=16]**

 a)   Mention any two principal energy sources for images with one application of each.

 b)   Define 'm-adjacency' for two pixels 'p' and 'q'.

 c)   Plot intensity transformation function for thresholding.

 d)   How many frequency components will be present in a DFT of digital image which has spatial resolution of 512×512 ?

 e)   List any two applications of 'Low Pass Filter' in digital image processing.

 f)   Mention any two probability distribution functions which characterize uncorrelated nois in an image.

 g)   Define reflection and translation of a set 'B' with the help of expressions.

 h)   What will happen if size of image smoothing mask is increased?

Q2) a)   Explain fundamental steps in digital image processing with the help of a block diagram.   **[8]**

 b)   What are the three principal sensor arrangements used to acquire an image? Explain any one in brief and mention its application.   **[4]**

 c)   Explain what are 'city-block distance' and 'chess board distance' with diagrams.   **[4]**

Q3) a) What is sampling and quantization? Explain their significance in forming a digital image. **[8]**

b) Explain the power-law transformation with its application. **[4]**

c) What is aliasing in an image? State the important theorem related to it.**[4]**

Q4) a) Explain the various steps in processing an image in frequency domain.**[8]**

b) State any two important properties of 2-D discrete fourier transform(DFT). **[4]**

c) Find the 1st and 2nd order devivatives of the 1-dimensional image data given below- **[4]**

5	5	4	3	2	1	0	0	0	6	0	0	0	0	1	3	1	0	0	0

Q5) a) For the following image data, apply the 'Histogram Equalization' technique and hence find the transfer function T(r) which relates input image intensity level 'r_k' to output image intensity level 's_k'.

Given : intensity distribution for a 3-bit image of size 64×64 **[8]**

Intensity Level	Number of pixels
$r_0 = 0$	790
$r_1 = 1$	1000
$r_2 = 2$	873
$r_3 = 3$	656
$r_4 = 4$	300
$r_5 = 5$	274
$r_6 = 6$	122
$r_7 = 7$	81

b) Why do we get ringing effect when an image is blurred with ideal low pass filter? Which filter eliminates this effect? **[4]**

c) Explain in brief the model of image degradation and restoration. **[4]**

Q6) a) Define erosion and dilation of an image and explain what is the role of structuring element in the same with the help of suitable diagrams. **[8]**

b) Give the basic region growing algorithm based on 8-connectivity. **[4]**

c) Explain the three edge models and sketch second derivative for any one of them. **[4]**

Q7) a) What is a 'Hit-or-Miss' transformation? Illustrate its use with neat diagrams and expressions. **[8]**

b) Give examples of different fields that use digital image processing. **[4]**

c) What is the use of unsharp masking in image enhancement? **[4]**

Q8) a) What do you mean by representation of an image? Illustrate the use of 'chain codes' in image representation by taking a suitable example. **[8]**

b) Give the correspondance between filtering in spatial and frequency domains. **[4]**

c) What do you mean by pixel wise operations in image enhancement? Give one application each of three arithmatic operations used for image enhancement. **[4]**

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[5037]-202

M.Sc.

(COMPUTER SCIENCE)

CS-202 : Advanced Operating System

(2011 Pattern) (Semester - II) (New)

Time : 3 Hours]

[Max. Marks :80

Instructions to the candidates:

1) *Neat diagrams must be drawn wherever necessary.*
2) *All questions carry equal marks.*
3) *All questions are compulsory.*
4) *Assume suitable data, if necessary.*
5) *Figures to the right indicate full marks.*

Q1) Attempt ALL of the following:

[8 × 2 = 16]

a) What is processor execution level? What is its use?

b) What is table of contents?

c) What is the use of last parameter in open ( )?

d) Write pseudocode for context switch.

e) Differentiate Malloc ( ) and alloca ( ).

f) What is Reentrant function?

g) Which data structure are associated with processes and threads in windows?

h) Which two CPU numbers are associated with thread in windows?

Q2) State whether the following statements are true or false. Justify (any Eight)

[8 × 2 = 16]

a) The kernel must always prevent the occurrence of interrupts during critical activity.

P.T.O.

b) The i.node is never locked across system calls.

c) An j node is on the free list if and only if it is unlocked.

d) No process can preempt another process executing in the kernel.

e) Kernel allows context switch only when process is about to goto sleep.

f) It is not possible for a process in Linux to check whether page is in physical memory or not.

g) Signal system call is used to send signal to a process.

h) Kernel checks for receipt of signals whenever process is about to goto sleep.

i) PsJdle Process is a Kernel Variable in windows.

j) Internally windows uses 32 priority levels.

Q3) Attempt any four of the following: **[4 × 4 = 16]**

a) Differentiate Interrupts Vs. exceptions.

b) Explain opportunistic allocation in Linux.

c) Discuss various anomalies in the treatment of signals.

d) Explain main stages of process creation in windows with the help of suitable diagram.

e) Explain structure of executive thread block and Kernel thread block.

Q4) Attempt any four of the following: **[4 × 4 = 16]**

a) Explain the behaviour of the following program.

   # include <fcntl.h>

   main (arge, argv)

      int argc;

   char * arg v[ ];

```
        {
                int fd, skval;
                char c;
                if (argc ! = 2)
                        exit ( );
                Fd = open (arg v[1], O-RDONLY);
                if (Fd = = –1)
                        exit ( );
                while (( SKVal = read (Fd, φc, 1)) = = 1
                {
                        print F("char % c\n," C);
                        skval = 1seck(fd, 1023L, l);
                        Print F("new seek Val % d\n," skval);
                }
        }
```

b) Explain the behaviour of the following program.

```
    # include < Fcntl.h>
    main ( )
    {
    int i, j;
    char buf₁[512], buf₂ [512];
    i = open ("/etc/passwd", O-RDONLY);
    J = dup (j);
    read (j, buf₁, size of(buf₁));
    read (J buf₂ size of (buf₂));
    Close (i);
    read (j, buf₂, size of (buf₂));
    }
```

c) Explain the behaviour of the following program.

```
#include <signal . h>

main ( )

{
        register int i;
        setpgrp ( );
        For (j = 0; i < 10; i + +)
            {
                if (Fork ( ) = = 0)
                    {
                        if (j α ⊥)
                            setpgrp ( );
                        print F("pid = % dpgrp = % d/n," getpid ( ),
                            getpgrp ( ) );
                        Pause ( );
                    }
                }
                Kill (O, SIGINT);
            }
```

d) Explain the behaviour of the following progam.

```
# include <signal. h>

main (arg c, arg v)

{
        char buf [256];
        if (argc! = 1)
        signal (SIGCLD, SIG - IGN);
```

```
                While (read (0, buf, 256));
                    if (for k( ) = = 0).
                    {
                            exit (0);
                    }
                }
```

e)   Explain the behaviour of the following program.

```
# include <signal.h>

    sigcatcher ( )
    {
            print f('PID % dcaught one/n," qetpidc);
            signal (SIGINT, sigcatcher);
    }
    Main ( )
    {
            int ppid;
            signal (SIGINT, sigcatcher);
            if (Fork( ) = = 0)
    {
            Sleep (S);
            ppid = getppid ( );
            For (; ; )
            if (Kill (ppid, SIGINT) = = –1)
                exit ( ) ;
    }
            nice (10);
            For (; ;)
    }
```

f) Explain the behaviour of the following program

```
# include < signal .h>

main ( )

{

    extern catcher ( );

    signal (SIGCLD, catcher);

        if (For k( ) = = 0)

            exit( );

            pause ( );

}

catcher ( )

    {

        print f("purent caught sig\ n");

        signal (SIGCLD, catcher ( ) );

    }
```

Q5) Attempt any four of the following: **[4 × 4 = 16]**

a) Write a C program to obtain statastics related to the memory allocation system in Linux using mallinfo ( ) function.

b) Write a C program to demonstrate communication between two processes using named pipe.

c) Write a C program to create hole in a file supplied as command line argyments.

d) Write a C program which create 5 child processes and wait for termination of all children.

e) Write a C program where parent and child share file access.

f) Write a C program to protect critical region of code from a specific signal.

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[5037]-203

M.Sc.

COMPUTER SCIENCE

CS-203: Data Mining & Data Warehousing

(2011 Pattern) (New Course) (Semester - II)

Time :3 Hours]   *[Max. Marks :80*

Instructions to the candidates:

1) *All questions are compulsory.*

2) *All questions carry equal marks.*

3) *Figures to the right indicate full marks.*

Q1) Attempt <u>any eight</u> of the following: **[8×2=16]**

a) Give any 2 major issues in Data Mining.

b) Define: Online Analytical Processing (OLAP) systems.

c) What do you understand by frequent set?

d) Mention any two tasks in Data preprocessing.

e) Define: Bootstrap.

f) Give any 2 applications of data mining.

g) What is cluster Analysis?

h) What are the different types of web mining?

i) How are data warehouse modelled?

j) What do you mean by CART?

Q2) Attempt <u>any four</u> of the following: [4×4=16]

a) Write a note on the architecture of Data Warehouse.

b) Explain the decision - tree based algorithm.

c) How can data cleaning be used as a method for handling missing values?

d) Explain: Sampling Algorithm.

e) Explain: Cross validation.

f) Discuss the issues to be considered during data integration.

Q3) Attempt <u>any two</u> of the following: [2×8=16]

a) Suppose that a data warehouse consists of the four dimensions, date, spectator, location, and game, and the two measures, count and charge, where charge is the fare that a spectator pays when watching a game on a given date. Spectators may be students, adults or seniors, with each category having its own charge rate.

   i) Draw a star schema diagram for the data warehouse.

   ii) Starting with the base cuboids (date, spectator, location, game), what specific OLAP operations should one perform in order to list the total charge paid by student operators at GM-place in 2004.

b) For the transaction table given below, answer the questions that follow:

Transaction Id	Items Bought
10	A, B, D, E, H
20	A, B, C, D
30	B, C, E, G, H
40	C, E, G, H
50	A, B, C, E, F
60	C, E, F
70	A, B, C

   i) What is the support of association rule $A \Rightarrow B$.

ii) Which rule amongst AB $\Rightarrow$ C and AB $\Rightarrow$ D is having higher confidence?

iii) Are G and H corelated? What about F and H?

iv) If (a, b), (b, c), (b, d), (a, c), (e, a) and (e, c) form the set of frequent 2- itemsets, how many frequent 3-item set are possible.

c) Suppose that the data mining task is to cluster points (with (x, y) representing location) into three clusters, where the points are

$A_1(2, 10), A_2(2, 5), A_3(8,4), B_1(5, 8), B_2(7, 5), B_3(6,4), C_1(1, 2), C_2(4, 9)$.

The distance function is Euclidean function. Suppose initially we assign A_1, B_1 and C_1 as the center of each cluster, respectively. Use the k-means algorithm to show only

i) the three cluster centers after the first round of execution.

ii) the final three clusters.

Q4) Attempt <u>any four</u> of the following: [4×4=16]

a) Write a note on: Confusion matrix in accuracy measures.

b) Write a note on: Hierarchical clustering.

c) How is web usage mining different from web structure mining and web content mining.

d) Explain the techniques of text mining.

e) Give details on data mining versus knowledge discovery in databases.

f) Explain Data Cube as a multidimensional data model.

Q5) Attempt <u>any four</u> of the following: [4×4=16]

a) Explain: Precision in Accuracy Measures of data mining.

b) Give examples for different clustering attributes.

c) Which frequent item-set mining is suitable for text mining?

d) How do you extract structures from unstructured text data? What features are extracted in this process?

e) A database has five transactions. Let Min_sup = 60% and Min_conf = 80%.

TID	items_bought
T_{100}	{M, O, N, K, E, Y}
T_{200}	{D, O, N, K, E ,Y}
T_{300}	{M, A, K, E}
T_{400}	{M, U, C, K, Y}
T_{500}	{C, O, O, K, I, E}

Find all frequent item-sets using Apriori and FP_ growth, respectively.

f) Suppose a company wants to design a data warehouse to facilitate the analysis of moving vehicles in an online analytical processing manner. The company registers huge amount of auto movement data in the format of (Auto_ID, location, speed, time). Each Auto_Id represents a vehicle associated with information (e.g, vehicle_category, driver_category), and each location may be associated with a street and a city. Assume that a street_map is available for the city.

Design such a data warehouse to facilitate effective online analytical processing in multidimensional space.

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[5037]-301

M.Sc.

COMPUTER SCIENCE

CS - 301: Software Metrics and Project Management

(2011 Pattern) (Semester-III)

Time : 3 Hours]   *[Max. Marks : 80*

Instructions to the candidates:

   1)   *All questions are compulsory.*

   2)   *All questions carry equal marks.*

   3)   *Figures to the right indicate full marks.*

Q1) Attempt Each of the following: **[8×2=16]**

   a)   State any four advantages of a good project management.

   b)   State major stake holders of a project.

   c)   State pillars of project management.

   d)   State major frames of work operative in an organization.

   e)   "Integration management is considered as heart of the project management". - Justify.

   f)   State any four activities involved in software measurement.

   g)   Distinguish clearly between quality and Reliability.

   h)   State major processes involved in human resource management.

Q2) Attempt any Four of the following:-   **[4×4=16]**

   a)   What is a project? Discuss important attributes of a project.

   b)   Write a short note on triple constraint.

   c)   Explain the terns: 'Phase Exit" and "Management Review". State importance of phase Exit.

   d)   Discuss the role of project manager in managing a software project.

   e)   Write a short note on change control board.

Q3) Attempt any Four of the following:-   [4×4=16]

    a)   Explain major processes involved in project integration management.

    b)   Draw a sample work breakdown structure(WBS) for library management system of a college.

    c)   Write a short note on scope creep.

    d)   Discuss major reasons for delay in completion of a software project.

    e)   Discuss major problems faced in estimation of cost of I.T. Project.

Q4) Attempt any Four of the following:-   [4×4=16]

    a)   What is project life cycle? Discuss its major phases.

    b)   What do you mean by quality Assurance? Also, discuss 80-20 rule and user Acceptance testing as tools of controlling quality.

    c)   Write a short note on communication management plan.

    d)   Discuss major processes involved in project risk management.

    e)   Explain GQM paradigm.

Q5) Attempt any Four of the following:-   [4×4=16]

    a)   What is software metrics? Discuss its crucial role in successful I.T. project management.

    b)   Explain main features of data which must be considered while collecting data as part of software measurement plan.

    c)   Write a short note on CMM.

    d)   Discuss internal attributes of a software product.

    e)   Comment upon the statement: "I.T. Project is an open, real-life system."

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Total No. of Questions : 5]

P3275

SEAT No. :

[Total No. of Pages : 2

[5037]-302

M.Sc.

COMPUTER SCIENCE

CS - 302 : Mobile Computing

(2011 Pattern) (Semester-III)

Time : 3 Hours]   *[Max. Marks : 80*

Instructions to the candidates:

1) *All questions are compulsory.*
2) *All questions carry equal marks.*
3) *Figures to the right indicates full marks.*

Q1) Attempt all of the following: **[8×2=16]**

a)   Why physical layer performs encryption in wireless network?

b)   Give any two differences in between FHSS over DSSS.

c)   List any two disadvantages of shooping TCP.

d)   Write the features of Android.

e)   What is the use of guard spaces?

f)   What is RTT problem in GSM? How it is resolved?

g)   List any two functions of node B in UMTS.

h)   Give eg.Of the following communication devices:

   i)   Mobile & wired

   ii)   Mobile & wireless

Q2) Attempt any FOUR of the following.   **[4×4=16]**

a)   Explain wireless Application Environment (WAE).

b)   What are the main problems of signal propogation. Why is reflection both useful & harmful?

c)   Draw & explain the architecture of GPRS.

d)   What is reverse tunneling? What are the problems with reverse tunneling?

e)   Name the entities used in GSM along with their functionalities.

P.T.O.

Q3) Attempt any FOUR of the following. [4×4=16]

    a)   Explain the location services logical reference model.

    b)   What happens in the case of hidden & exposed terminals if Aloha, slotted Aloha, reservation Aloha or MACA is used?

    c)   How can DHCD be used for mobility & support of mobile IP?

    d)   How I-TCP isolate problems on the wireless link? Give advantages of this.

    e)   Discuss about Android service lifecycle.

Q4) Attempt any FOUR of the following: [4×4=16]

    a)   Explain the features of WSP/ Badapted to web browsing.

    b)   Discuss J2ME architecture.

    c)   Give the significance of COA. What are different possibilities for the location of the COA.

    d)   What is the reaction of standard TCP in case of packet loss? Why is it quite often problematic in the case of wireless network & mobility?

    e)   What are the different types of handovers supported in UMTS.

Q5) Attempt any FOUR of the following: [4×4=16]

    a)   What are benefits of reservation schemes? How are collisions avoided during data transmission.

    b)   What is IP micro mobility? Discuss Hawaii protocol with its advantages & disadvantages.

    c)   Explain the basic logical channels used in GSM.

    d)   How intra MSc handover is handled by GSM.

    e)   Explain the three classes of transaction service used in WTP.

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[5037]-303

M.Sc.

COMPUTER SCIENCE

CS - 303 : Soft Computing

(2011 Pattern) (Semester - III)

Time : 3 Hours]   *[Max. Marks :80*

Instructions to the candidates:

1)   *All questions are compulsory.*

2)   *Neat diagrams must be drawn wherever necessary.*

3)   *Figures to the right indicate full marks.*

4)   *All questions carry equal marks.*

5)   *Use of electronic pocket calculator is allowed.*

Q1) Attempt all   [8 ×2 = 16]

a)   Comment. Crossover operator creates better offsprings.

b)   Define core of a membership function.

c)   What is fuzzy concentration?

d)   When are two patterns χ_i and χ_j, said to be linearly separable?

e)   Find $\overline{A \cup B}$ for the following two fuzzy sets A and B

$$A = \left\{ \frac{0}{0.64} + \frac{0.75}{0.645} + \frac{1}{0.65} + \frac{0.5}{0.655} + \frac{0}{0.66} \right\}$$

$$B = \left\{ \frac{0}{0.64} + \frac{0.25}{0.645} + \frac{0.75}{0.65} + \frac{1}{0.655} + \frac{0.5}{0.66} \right\}$$

f)   State any two stopping conditions for GA flow.

g)   What is pattern mode training?

h)   Define linear error.

Q2) Attempt any four: [4 × 4 = 16]

a) Explain the McCulloh-Pitts neuronal model. How is this model used to classify linearly separable pattern classes?

b) Write a short note on aggregation of fuzzy rules.

c) With the help of proper diagrams, discuss briefly the various architectures of a neural network.

d) Define Fuzzy relation- $\underset{\sim}{R}$ (X, Y) defined on the universe X and Y. Explain the concept of domain and range of a binary fuzzy relation $\underset{\sim}{R}$ (X, Y).

e) Explain the selection operator in GA. Briefly describe any one method of selection. What is the importance of selection procedure in GA?

Q3) Attempt any four: [4 × 4 = 16]

a) Using the inference approach obtain the membership values for the triangular shapes $\left(\underset{\sim}{I} \text{ and } \underset{\sim}{T}\right)$ for a triangle with angles 10º, 60º and 110º

b) Consider the following two fuzzy sets

$$\underset{\sim}{A} = \left\{ \frac{0.7}{a10} + \frac{0.6}{b52} + \frac{0.8}{c130} + \frac{0.9}{f2} + \frac{0}{f9} \right\}$$

$$\underset{\sim}{B} = \left\{ \frac{0.1}{a10} + \frac{0.2}{b52} + \frac{0.8}{c130} + \frac{0.7}{f2} + \frac{0}{f9} \right\}$$

Using Zadeh's notation, express the fuzzy sets into λ-cut sets for $\lambda = 0.4$ and $\lambda = 0.7$ for the following operations:

$\underset{\sim}{\bar{A}} \cup \underset{\sim}{\bar{B}}, \underset{\sim}{A} \cap \underset{\sim}{B}, \underset{\sim}{\bar{A}} \cap \underset{\sim}{\bar{B}}, \underset{\sim}{\bar{B}}$

c) Consider the following two fuzzy sets defined on the universe U1 = U2 = {4, 5, 6, 7, 8}.

$$\underset{\sim}{8} = \left\{ \frac{0.2}{4} + \frac{0.4}{5} + \frac{0.7}{6} + \frac{0.9}{7} + \frac{1}{8} \right\}$$

$$\underset{\sim}{5} = \left\{ \frac{0.7}{4} + \frac{1}{5} + \frac{0.8}{6} + \frac{0.4}{7} + \frac{0.1}{8} \right\}$$

Using Zadeh's extension principle determine the membership values for the algebraic product.

d) Consider the following fuzzy sets.

$$\underset{\sim}{P} = \left\{ \frac{0.9}{PE} + \frac{0.7}{ZE} + \frac{0.8}{NE} \right\}$$

$$\underset{\sim}{Q} = \left\{ \frac{0.5}{20} + \frac{0.6}{30} + \frac{0.9}{40} + \frac{1}{50} \right\}$$

$$\underset{\sim}{T} = \left\{ \frac{0.2}{HE} + \frac{0.5}{LE} + \frac{0.9}{ME} \right\}$$

Perform the operations - $\underset{\sim}{R} = \underset{\sim}{P} \times \underset{\sim}{Q}$, $\underset{\sim}{S} = \underset{\sim}{Q} \times \underset{\sim}{T}$ and $\underset{\sim}{I} = \underset{\sim}{R} \bullet \underset{\sim}{S}$ on the fuzzy sets.

e) Given the following two fuzzy sets:

$$\underset{\sim}{Small} = \left\{ \frac{1}{1} + \frac{0.8}{2} + \frac{0.6}{3} + \frac{0.4}{4} + \frac{0.2}{5} \right\}$$

$$\underset{\sim}{Large} = \left\{ \frac{0.2}{1} + \frac{0.4}{2} + \frac{0.6}{3} + \frac{0.8}{4} + \frac{1}{5} \right\}$$

Find membership functions for:

i) Large or not very small.

ii) Not small and minus very large

Q4) Attempt any two: [2 × 8 = 16]

a) Differentiate between supervised and unsupervised learning.

b) Explain the binary threshold signal function and the linear threshold signal function with the help of proper diagrams.

c) Differentiate between crisp sets and fuzzy sets.

Q5) Attempt any two: [2 × 8 = 16]

a) For the following inputs, find the weights required to perform the classification using perceptron training algorithm upto two epochs only. Assume learning rate : $\eta = 1$ and initial weights $= 0$.

Inputs					
x_1	x_2	x_3	x_4	bias	t (target)
1	1	1	1	1	1
−1	1	−1	−1	1	1
1	1	1	−1	1	−1
1	−1	−1	1	1	−1

Use the following activation function.

$$\delta_j(x_j) = \begin{cases} 1 & \text{if} & x_j > 0.2 \\ 0 & \text{if} & -0.2 \le x_j \le 0.2 \\ -1 & \text{if} & x_j < -0.2 \end{cases}$$

b) Let $X = \{4, 5, 6, 7, 8\}$ and $Y = \{p, q, r, s, t\}$ be the universe of discourse. Consider the following three fuzzy sets defined on the above universe. Fuzzy set $\underset{\sim}{A}$ defined on universe X and fuzzy sets - $\underset{\sim}{B}$, $\underset{\sim}{C}$ on the universe Y.

$$A = \left\{ \frac{1}{4} + \frac{1}{5} + \frac{0.8}{6} + \frac{0.5}{7} + \frac{0.2}{8} \right\}.$$

$$B = \left\{ \frac{0.5}{p} + \frac{1}{q} + \frac{0.4}{r} \right\}$$

$$C = \left\{ \frac{1}{p} + \frac{.5}{q} + \frac{.3}{r} \right\}$$

Determine the implication relations:

i) if x is in A then y is in B

ii) if x is in A then y is in B else y is in C.

c) Maximize the following function where x is permitted to vary between 0 and 31 with initial population randomly selected is (11, 29, 8, 17). Show one crossover operation and one mutation operation. Use the Roulette wheel selection method to select individuals that will participate in the crossover.

Function : f(x) = x + 2.

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