



**S.Y. B.Sc. (Computer Science) (Semester – I) Examination, 2010**  
**(Paper – II) ELC-212 : PROCESS CONTROL INSTRUMENTATION**  
**(Old)**

Time : 2 Hours

Max. Marks : 40

*Instructions : 1) All questions are compulsory.*  
*2) Figures to **right** indicate **full** marks.*

1. Answer the following : (1×10=10)
- a) Calculate sample time for sampling frequency 2 kHz with 40% duty cycle.
  - b) Define gauge factor of semiconductor strain gauge.
  - c) What is self regulation of a system ?
  - d) Write the equation for output of PI controller.
  - e) “Split commutator helps to rotate the shaft of D.C. motor”. Comment.
  - f) What is acquisition time in Sample and Hold circuit ?
  - g) Write the working principle of LDR.
  - h) Define critical frequency in high pass filter.
  - i) Name any two systems represented by I<sup>st</sup> order differential equation.
  - j) The stepper motor requires 180 pulses per rotation. Calculate step angle.
2. Attempt **any two** of the following. (5×2=10)
- a) Draw the flowchart for acquiring data in a multichannel analog multiplexed DAS.
  - b) For a proportional controller the control variable is a process temperature with a range of 80°C to 100°C and a set point of 90°C. Calculate percent of span error. Under nominal condition the set point is maintained with an output at 50%. Calculate controller output if temperature is 85°C for proportional gain of two % (2.0%).
  - c) A velocity control system has a range of 340 to 580 mm/s. If the set point is 480 mm/s and the measured value is 390 mm/s. Calculate the error as percentage of span.

P.T.O.



3. Attempt **any two** of the following. (5×2=10)

a) Explain in brief, the following signal conditioning techniques :

- i) level shifting
- ii) loading

b) State the important characteristics of a LASER source. Explain how they are used in label inspection.

c) Explain with neat diagram, electrical and ultrasonic level sensors.

4. Attempt **any one** of the following. (10×1=10)

a) i) Write the advantages of circuit simulation software. Derive the transfer function of RC circuit connected to d.c. voltage source. 6

ii) List the elements of process control loop and explain the function of each. 4

b) i) Explain construction, working principle, range, time response and signal conditioning circuit of RTD. 5

ii) Draw the circuit of instrumentation amplifier using 3 op-amps and derive the expression for the output voltage. 5

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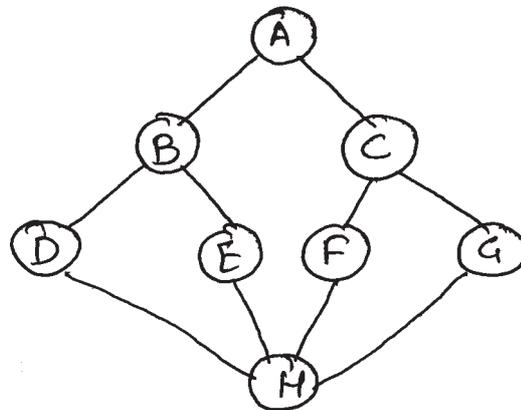
**S.Y. B.Sc. (Computer Science) (Semester – I) Examination, 2010**  
**CS – 211 : DATA STRUCTURES USING ‘C’**  
**(Paper – I) (2008 Pattern)**

Time : 2 Hours

Max. Marks : 40

1. Attempt **all** of the following :**(1×10=10)**

- a) What is ADT ?
- b) What is time complexity of quick sort ?
- c) Given an array `int a [5] [4] [3]` whose base address is 1000. Calculate the address of element `a [3] [2] [2]`.
- d) Represent the following expression as binary tree  $(A + B + D) / ((E + B) * C)$ .
- e) Define : Critical path.
- f) Using DFS technique, list the vertices of the following graph, the way they are visited. (Let starting vertex is ‘A’)



- g) Define : Height Balanced Tree.
- h) Write function to initialize a circular queue.
- i) Define : Strictly binary tree.
- j) Represent generalized linked list for the following expression, diagrammatically  $G = (a (b, c, d), e, f)$ .

P.T.O.

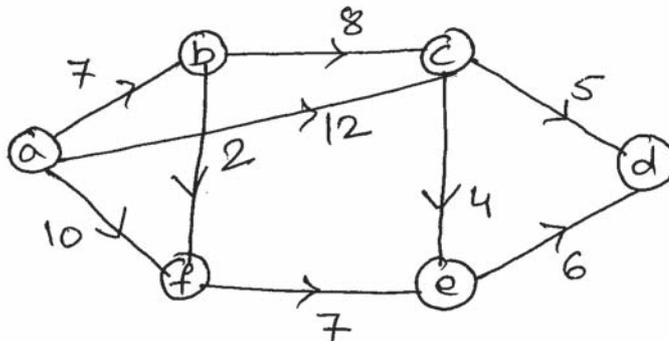


2. Attempt **any two** of the following : (2×5=10)

- a) Write a 'C' function to delete an element which is in between two nodes, from a singly linked list.
- b) Write a 'C' function to push an element to a stack. (Stack is represented dynamically).
- c) Write a function to count number of leaf nodes in a tree.

3. Attempt **any two** of the following : (2×5=10)

- a) Build an AVL tree for the following data.  
Sun, Fri, Mon, Wed, Tue, Thur, Sat
- b) Find the shortest paths using Dijkstra's shortest path algorithm.



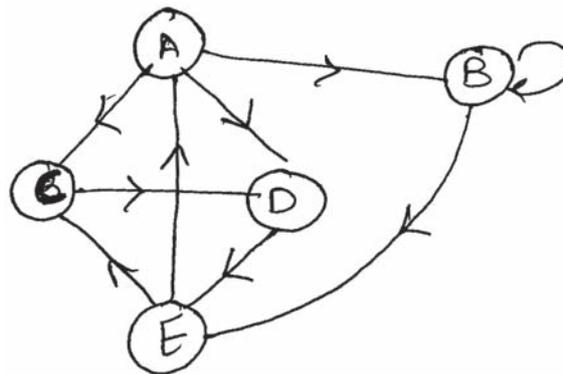
- c) Consider an array of MAXSIZE memory locations. Create 5 queues of different sizes. Insert the elements from this array to the 5 queues one by one, in sequence. If some queue is full, skip it and insert remaining elements in rest of the arrays. Assume MAXSIZE is user defined size. Write functions Add Queue and Queue Full. Write a program to implement above process.

4. Attempt **any one** of the following : (1×10=10)

- a) i) Sort the following data using merge sort, (in ascending order) : 4  
Nasik, Ahmednagar, Pune, Baramati, Loni, Aurangabad, Chandrapur, Malegaon.



- ii) Define the following : 3
  - 1) AOV network
  - 2) Minimum cost spanning tree
  - 3) Complete graph.
- iii) Differentiate between stack and queue. 3
  
- b) i) Convert the following data to prefix and postfix expression. Show the stack contents at each conversion. 4  
$$(((A + B) / C) * D) * A$$
- ii) Compare BFS and DFS. 3
- iii) Give the in degree, out degree and total degree of the following graph. 3



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**S.Y.B.Sc. (Computer Science) (Semester – I) Examination, 2010**  
**MATHEMATICS (Paper – I)**  
**MTC-211 : Linear Algebra**  
**(2008 Pattern)**

Time : 2 Hours

Max. Marks : 40

*Instructions:* 1) *All questions are compulsory.*  
2) *Figures to the right indicate full marks.*

1. Attempt **each** of the following : **10**

- i) What is the condition on the square matrix  $A$  such that the system  $AX = B$  has infinitely many solutions ?
- ii) Let  $(a, 4)$  and  $(3, 5)$  are orthogonal vectors in  $\mathbb{R}^2$ . Find the value of  $a$ .
- iii) Determine whether the matrix  $A = \begin{bmatrix} 0 & -1 \\ -1 & 0 \end{bmatrix}$  is an orthogonal matrix.
- iv) Let  $V = \mathbb{R}^3$  be the vector space of all ordered triples of real numbers. Write the standard basis for  $\mathbb{R}^3$ .
- v) Let a map  $T : M_{2 \times 2} \rightarrow \mathbb{R}$  be defined by  $T\left(\begin{bmatrix} a & b \\ c & d \end{bmatrix}\right) = b + c$ . Determine whether  $T$  is a linear transformation ?
- vi) For what value of  $k$  the vectors  $V_1 = (1, -2)$  and  $V_2 = (-5, k)$  are linearly dependent in  $\mathbb{R}^2$ .
- vii) Let  $A$  be  $6 \times 7$  matrix with rank 4. What is the dimension of the solution space of  $AX = 0$  ?

**P.T.O.**



- viii) Let  $P_3$  be the vector space of all polynomials of degree  $\leq 3$ . Is set  $\{1, x, x^2, x^3, x^3 - 1\}$  linearly independent? Why?

ix) Let  $A = \begin{bmatrix} 1 & 0 & 0 & 2 \\ 0 & 1 & -1 & -1 \\ 0 & 0 & 1 & 3 \end{bmatrix}$

Is A in reduced row echelon form? Why?

x) If  $A = \begin{bmatrix} 0 & 3 \\ 4 & 0 \end{bmatrix}$ . Find all eigen values of  $A^6$ ?

2. Attempt **any two** of the following :

10

- i) Let  $AX = B$  be a linear system where

$$A = \begin{bmatrix} 2 & 8 & 0 \\ 2 & 2 & -3 \\ 1 & 2 & 7 \end{bmatrix}, \quad B = \begin{bmatrix} 18 \\ 3 \\ 12 \end{bmatrix}.$$

Solve the above system using LU-Factorization of A, where

$$L = \begin{bmatrix} 2 & 0 & 0 \\ 2 & -3 & 0 \\ 1 & -1 & 4 \end{bmatrix} \text{ and } U = \begin{bmatrix} 1 & 4 & 0 \\ 0 & 2 & 1 \\ 0 & 0 & 2 \end{bmatrix}$$

- ii) Let  $W_1$  and  $W_2$  be two subspaces of a vector space  $V$  then show that  $W_1 \cup W_2$  is a subspace of  $V$  if and only if either  $W_1 \subseteq W_2$  or  $W_2 \subseteq W_1$ .
- iii) Determine whether the vectors  $P_1 = 1-x$ ,  $P_2 = 5 + 3x - x^2$  and  $P_3 = 1 + 3x - x^2$  are linearly dependent in  $P_2$ .

3. Attempt **any two** of the following :

10

- i) Let  $B = \{(2, -1), (4, 3)\}$  be a basis for vector space  $\mathbb{R}^2$ . Find the co-ordinates of  $(-3, 1)$  relative to B.

ii) Verify Cayley-Hamilton theorem for the matrix  $A = \begin{bmatrix} 5 & 0 & 1 \\ 1 & 1 & 0 \\ -7 & 1 & 0 \end{bmatrix}$ .

- iii) Let  $T: V \rightarrow W$  be a linear transformation. Show that Kernel of T is a subspace of V.



4. Attempt **any one** of the following :

**10**

i) a) Find the basis for column space of A, Where  $A = \begin{bmatrix} 1 & 2 & 0 & 2 & 5 \\ -2 & -5 & 1 & -1 & -8 \\ 0 & -3 & 3 & 4 & 1 \\ 3 & 6 & 0 & -7 & 2 \end{bmatrix}$

Consisting entirely column vectors of A. Hence find the rank of A.

b) Determine whether the given matrix A is diagonalizable. If so find a matrix P

that diagonalizes A. Where  $A = \begin{bmatrix} 1 & 0 \\ 6 & -1 \end{bmatrix}$ .

ii) a) If  $T : \mathbb{R}^3 \rightarrow \mathbb{R}^2$  is a linear transformation given by

$$T(x, y, z) = (x + y - z, x - 2y + z, -2x - 2y + 2z).$$

Find a basis for range space  $R(T)$ . Hence find the rank and nullity of T.

b) Show that the system of equations

$$x + y + 2z = a$$

$$x + z = b$$

$$2x + y + 3z = c$$

is consistent only if  $a + b = c$ .

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**S.Y. B.Sc. (Computer Science) (Semester – I) Examination, 2010**  
**ELECTRONICS (Paper – I)**  
**ELC 211 : Microprocessor Architecture and Programming**  
**(2008 Pattern)**

Time : 2 Hours

Max. Marks : 40

- Instructions:** 1) *All questions are compulsory.*  
2) *Figures to the right indicate full marks.*  
3) *Neat diagram must be drawn whenever necessary.*

1. Answer the following questions in **one** or **two** sentences : **(1×10=10)**
- a) Define cycle time of memory.
  - b) Give any two differences between synchronous and asynchronous serial communication.
  - c) If  $T_c = 100$  ns, Hit Ratio  $h = 0.95$  and  $T_m = 1000$  ns. calculate efficiency of cache memory.
  - d) How much memory is accessed by pentium processor in real and protected mode ?
  - e) What is the function of branch prediction unit of pentium processor ?
  - f) Identify the instruction type as per the classification for the following instructions :
    - i) CMPS
    - ii) JAE MESSEGE.
  - g) How INTR interrupt is masked ?
  - h) Specify the role of assembler for assembly language programs and give one example of assembler.
  - i) Comment “LOD S, MOV S, STO S, SCA S, IN S instructions are not supported by NASM”.

P.T.O.



j) Find the output for the following program :

```
segment . data
msg db " Hello $ "
msg 1 db " Welcome $ "
msg 2 db " To Electronics $ "
segment . text
mov dx, msg 2
mov ah, ogh
int 21h
```

2. Attempt **any two** of the following : (5×2)

- a) Write NASM assembly program to add two numbers accept one number from keyboard and one in program, save the result.
- b) What do you mean by cache mapping ? Explain direct and set -associative mapping technique in details.
- c) When an interrupt is received, discuss the interrupt processing sequence.

3. Attempt **any two** of the following : (5×2)

- a) Draw functional block diagram of pentium processor and explain U-pipe and V-pipe of pentium.
- b) Explain the following assembler directives :
  - i) DW
  - ii) times
  - iii) org
  - iv) equate
  - v) ENDP
- c) Explain with example :
  - i) Register addressing mode
  - ii) Direct addressing mode
  - iii) Based-indexed addressing mode with displacement.



4. Attempt **any one** of the following : **(10×1)**

- a) i) What is the concept of virtual memory ? Explain the segmentation method of virtual address mapping.
- ii) How data is organized in pentium ? Explain concept of byte swapping.

OR

- b) i) Write NASM assembly program to convert the decimal number to its binary number. **5**
- ii) a) For pentium descriptor a base address is of 0006A000H, a limit of 00010H and G = 1. What is the starting and ending locations are addressed by this descriptor ? **3**
- b) Describe the following flags of the pentium flag register :
  - i) Trap Flag (TF)
  - ii) Alignment Check (AC). **2**

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**S.Y.B.Sc. (Computer Science) (Semester – I) Examination, 2010  
(2008 Pattern) (Paper – II)**

**CS-212 : RELATIONAL DATABASE MANAGEMENT SYSTEM (RDBMS)**

Time: 2 Hours

Max. Marks: 40

*N.B. : i) All questions are compulsory.  
ii) Figures to the right indicate full marks.*

1. Attempt **all** of the following : **(1×10=10)**

- a) What are complex types in MySQL ?
- b) Define system throughput.
- c) Define composite primary key.
- d) State the commit point.
- e) What is the output of following ?  
Select CEILING (6.89);
- f) Define an Authorization matrix.
- g) What is Fat server ?
- h) Define a consistent database state.
- i) List two basic mechanisms used to provide security.
- j) Define the cascadeless schedule.

2. Attempt **any two** of the following : **(2×5=10)**

- a) What is cursor ? Explain how to create cursor with suitable example.
- b) Explain what are the actions to be taken to recover the system from deadlock.
- c) Write a note on Roll based access control.

**P.T.O.**



3. Attempt **any two** of the following :

(2×5=10)

a) Consider the following transaction :

<b>T<sub>1</sub> :</b>	<b>T<sub>2</sub> :</b>	<b>T<sub>3</sub> :</b>
READ(X)	READ(X)	READ(Z)
READ(Y)	READ(Z)	READ(Y)
Y = Y – X	X = N+Z	Y = Y + Z
WRITE (Y)	WRITE(X)	WRITE (Z)
WRITE (X)		WRITE (Y)

Give atleast two non-serial schedules that are serializable.

b) Consider following tables

Teacher (t\_no, t\_name, college\_name, dept)

E\_test (e\_no, test\_name)

Teacher and E\_test are related with many to many. relation.

Solve the following queries.

- 1) Give the name of teacher who have passed either SET or NET.
  - 2) Delete all teachers details of “Physics” department.
- c) What is Recovery algorithm ? Explain recovery using deferred update in single user environment.



4. Attempt the following :

(2×5=10)

a) The following is the list of events in an interleaved execution of set of transaction  $T_0, T_1, T_2$  with two phase locking protocol.

Time	Transaction	Code
$t_1$	$T_0$	LOCK (A, X)
$t_2$	$T_1$	LOCK (B, S)
$t_3$	$T_2$	LOCK (A, S)
$t_4$	$T_0$	LOCK (C, X)
$t_5$	$T_1$	LOCK (D, X)
$t_6$	$T_0$	LOCK (D, S)
$t_7$	$T_1$	LOCK (C, S)
$t_8$	$T_2$	LOCK (B, S)

Construct a wait-for graph according to above request. Is there deadlock at any instance ? Justify.

b) Following are log entries at the time of system crash.

- [Start-transaction,  $T_1$ ]
- [Start-transaction,  $T_2$ ]
- [Read-item,  $T_1, A$ ]
- [Write-item,  $T_2, B, 25, 50$ ]
- [Start-transaction,  $T_3$ ]
- [Commit-transaction,  $T_2$ ]
- [Start-transaction,  $T_4$ ]
- [Write-item,  $T_1, C, 100, 115$ ]
- [Commit-transaction,  $T_1$ ]
- [Write-item,  $T_3, D, 50, 60$ ]
- [Read-item,  $T_3, E$ ]
- [Write-item,  $T_4, D, 60, 75$ ]
- [Commit-transaction,  $T_4$ ]
- [Abort-transaction,  $T_3$  ] ← system crash.

If immediate update with checkpoint is used; what will be the recovery procedure ?

OR

b) What are different services provided by server components ? Explain.



**S.Y. B.Sc. (Comp. Science) (Semester – I) Examination, 2010**  
**MATHEMATICS (Paper – II)**  
**(2008 Pattern)**  
**MTC – 212 : Numerical Analysis**

Time : 2 Hours

Max. Marks : 40

- Instructions :** 1) *All questions are compulsory.*  
2) *Figures to the **right** indicate **full** marks.*  
3) *Use of single memory, non-programmable scientific calculator is **allowed**.*

1. Attempt **all** questions : **10**
- i) Round off 0.745250 correct to four significant figures and then find absolute error.
  - ii) Evaluate :  $\Delta^2(2 \cdot (3^x))$ .
  - iii) Write the formula for  $\frac{dy}{dx}$  using Newton's forward interpolation formula.
  - iv) Prove that :  $(\Delta - \nabla) f(x) = \Delta \nabla f(x)$ .
  - v) State **true** or **false** :  
The  $(n + 1)^{\text{th}}$  divided difference of  $f(x)$  of degree  $n$  is zero.
  - vi) Given  $\frac{dy}{dx} = y - \frac{2x}{y}$ ,  $y(0) = 1$ , find  $y(0.1)$  using Euler's method.
  - vii) Write Trapezoidal rule.
  - viii) Compute a root of the equation  $x^2 - 5x + 6 = 0$  using Newton-Raphson method. Take  $x_0 = 5$ . (Perform 2 iterations).
  - ix) Define averaging operator  $\mu$ .
  - x) Write Runge-Kutta formula of second order for ordinary differential equation.



2. Attempt **any two** of the following :

**10**

i) Use Regula-Falsi method to find approximate root of equation  $x^3 - 4x - 9 = 0$  in the interval (2, 3) correct upto 2 decimal places.

ii) Find the missing figures in the following table :

<b>x</b>	1	2	3	4	5	6	7	8
<b>f(x)</b>	1	8	–	64	–	216	343	512

iii) Solve the following system of equations; by Gauss-Seidal Method.

$$3x + 8y + 29z = 71$$

$$83x + 11y - 4z = 95$$

$$7x + 52y + 13z = 104$$

Perform three iterations.

3. Attempt **any two** of the following :

**10**

i) State and prove Newton's backward interpolation formula for equally spaced points.

ii) From the following table, find  $\frac{dy}{dx}$  at  $x = 1.2$ .

<b>x</b>	1	1.2	1.4	1.6	1.8	2.0	2.2
<b>y</b>	2.7183	3.3201	4.0552	4.9530	6.0496	7.3891	9.0250



iii) Use Lagrange’s interpolation formula to find interpolated polynomial of  $f(x)$ , if the values of  $x$  and  $f(x)$  are given as below :

<b>x</b>	1	2	7	8
<b>y</b>	4	5	5	4

Hence find  $f(6)$ .

4. a) Attempt **any one** of the following :

**10**

i) a) State and derive Simpson’s  $\left(\frac{1}{3}\right)^{\text{rd}}$  rule for numerical integration.

b) Evaluate  $\int_0^6 \frac{dx}{(1+x)^2}$  , by using Simpson’s  $\left(\frac{3}{8}\right)^{\text{th}}$  rule. (Take  $h = 1$ ).

ii) a) Solve  $\frac{dy}{dx} = \frac{y-x}{y+x}$  ,  $y(0) = 1$  , by using Runge-Kutta fourth order methods find  $y(1)$  [ $h = 0.5$ ].

b) Determine the value of  $y$  when  $x = 0.1$  by Euler’s modified method.  
Given :  $y(0) = 1$  ,  $y' = x^2 + y$ .





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**S.Y. B.Sc. (Computer Science) (Semester – I) Examination, 2010**  
**ELECTRONICS (Paper – II)**  
**ELC-212 : Communication Principles (2008 Pattern) (New Course)**

Time : 2 Hours

Max. Marks: 40

**Instructions :** 1) *All questions are compulsory.*  
2) *Figures to the right indicate full marks.*  
3) *Neat diagrams must be drawn wherever necessary.*

1. Answer the following in **one** or **two** sentences : **(1×10=10)**
- a) What is full duplex system ? Give one example.
  - b) How many voice channels are multiplexed in a master group ?
  - c) What is GPRS ?
  - d) Draw the waveform of ASK for the data 11101001.
  - e) State any two applications of RFID.
  - f) Define Protocol.
  - g) Comment on “Guard band is essential in multiplexing technique”.
  - h) How many maximum characters can be send through SMS ?
  - i) For an amplitude modulated system, maximum amplitude of the envelop is 5 V and minimum amplitude is 2 V, calculate the modulation index.
  - j) Draw the radiation pattern of isotropic antenna.
2. Attempt **any two** of the following : **(5×2=10)**
- a) Draw the block diagram of electronic communication system and explain function of each block.
  - b) State the conversion principle of delta modulation along with its suitable block diagram. What is the advantage of Delta modulation over PCM with respect to Bandwidth requirement ?
  - c) Explain the frequency reuse concept in mobile communication. Explain the “Handoff” concept.

P.T.O.



3. Attempt **any two** of the following : **(5×2=10)**
- a) Describe the FDM transmitter with its block diagram and state any two applications of FDM.
  - b) Differentiate between Asynchronous and synchronous data transmission.
  - c) Define five parameters of antenna.
4. Attempt **any one** of the following : **(10×1=10)**
- a) i) Draw the block diagram of PAM and explain the principle of PAM with the help of waveform. **5**
  - ii) Describe cellular phone system with a neat block diagram. **5**
  - b) i) What is the role of PN sequence generator in spread spectrum communication system ? Explain the concept of frequency hopped multiple access technique in detail. **5**
  - ii) Classify the basic analog modulation techniques. Which modulation technique is less sensitive to noise ? **2**
  - iii) An antenna has a radiation resistance of  $65\Omega$ , a loss resistance of  $10\Omega$  and a power gain of 22. What is its efficiency and directivity ? **3**
-



**S.Y. B.Sc. (Computer Science) (Sem. – I) Examination, 2010**  
**ENGLISH (2008 Pattern)**

Time : 2 Hours

Max. Marks : 40

1. Answer **any two** of the following : **10**

A) State whether the following situations are formal or informal.

- i) Newsreader on TV
- ii) Friends planning to go for a film
- iii) Principal addressing a Student's Meet
- iv) Passerby asking for directions
- v) Two passengers conversing in a train

B) Identify the message that each of the non-verbal signals convey

- i) placing the index finger on your lips
- ii) opening your eyes wide
- iii) raising your shoulders
- iv) clicking your tongue
- v) wiping your forehead frequently

C) Write down points for a brief talk on 'Global Recession'.

2. A) Use the following words in sentences to bring out their literal and figurative meanings. (Make two sentences using each word) **3**

spectacle, fan, draw.

B) Differentiate between the following pairs of words and use them in sentences. **3**

- i) decent, descent
- ii) caring, careful
- iii) priceless, valueless



- C) Choose the correctly spelt word from the following sets of words. **4**
- i) vacum, vacuum, vaccume
  - ii) tomorrow, tommorrow, tommorow
  - iii) occassion, occasion, ocassion
  - iv) accomodation, accommodation, acomodation.
3. A) Write **four** words each belonging to the following lexical webs. **3**
- i) television
  - ii) exhibition
  - iii) competition
- B) Re-order the letters to make meaningful words using the hints below. **3**
- i) atrmaeu (one who is not a professional)
  - ii) cilnuat (insane)
  - iii) agttoiain (unrest)
- C) Match the following with their opposites **4**
- i) dawn
  - ii) friend
  - iii) giant
  - iv) convict
  - a) dwarf
  - b) acquit
  - c) dusk
  - d) foe
4. Answer **any two** of the following : **10**
- A) Write the phonetic transcription for the following words
- i) floor
  - ii) use
  - iii) nerve
  - iv) run
  - v) quest.
- B) Write appropriate expressions for the following situations.
- i) getting the attention of participants
  - ii) asking for information
  - iii) asking for clarifications
  - iv) encouraging others to participate
  - v) declining invitation
- C) You appeared for an interview for the post of a computer programmer. List out five questions you were asked by the interviewers.