7135

Ph.D. ENTRANCE EXAMINATION, OCTOBER 2015

Section – B & C

Time : 140 Minutes | Max. Marks : 160

Instructions :

(This is to test the candidate's ability of defining concepts through short answers.)

1) *Answer **any twelve** questions from Section **B** and **one** question from Section **C**.*
2) *In Section **B** **each** question carries **10** marks. Section **C** carries **40** marks.*
3) *In Section **B** an answer should not exceed **100** words. In Section **C** an answer should not exceed **500** words.*
4) *Candidates should **clearly** indicate the **Section, Question Number** and **Question Booklet code** in the answer paper.*
5) *The candidates are **permitted** to answer questions **only** from the subject that comes under the **faculty** in which he/she seeks registration as indicated in the **application** form.*

FACULTY OF ENGINEERING AND TECHNOLOGY

1. **Computer Science Engineering**
2. **Electronics and Communication Engineering**

Name of Candidate	
Register Number	
Answer Booklet Code	
Signature of Candidate	
Signature of Invigilator	

7135

FACULTY OF ENGINEERING & TECHNOLOGY

1. Computer Science Engineering

Section – B

1. Calculate the address of X[4, 3] in a two dimensional array X[1...5/...4] stored in the row major order in the main memory. Assume the base address to be 1000 and that each element requires 4 words of storage.
2. Comment on physical representation of the following data items +17, –15, 1.8, 'C', 'g', false, true.
3. Write an algorithm to reverse a linked list.
4. Explain how tape utilization is related to the blocking factor and inter record gap(IBG).
5. Consider the following processes :

Processes	Burst Time	Priority
P_1	10	3
P_2	1	1
P_3	2	3
P_4	1	4
P_5	5	2

The process have all arrived at time 0 in the order P_1, P_2, P_3, P_4, P_5.

Draw the Gantt chart to show the execution of these processes using FCFS, SJF, a non-preemptive, priority and RR scheduling.

6. Consider the following sequence of numbers 92, 37, 52, 12, 11, 25. Use bubblesort to arrange the sequence in ascending order. Give the sequence at the end of each of the first five passes.

7. What is the number of binary trees with 3 nodes which when traversed in postorder give the sequence A, B, C ? Draw all these binary trees.

8. The following is an 8085 assembly language program :

```
    MVI B, OAH
    MVI A, 05H
    LXI H, IC40H
    CALL SUB
    HLT
SUB CMP M
    RZ
    INX H
    DCR B
    JNZ SUB
    RET
```

   a) What does the program do ?

   b) What are the contents of registers A and B initially ?

   c) What are the contents of HL register pair after the execution of the program ?

9. a) An asynchronous serial communication controller that uses a start stop scheme for controlling the serial I/O of a system is programmed for a string of length seven bits, one parity bit (odd parity) and one step bit. The transmission rate is 1200 bits/second.

      i) What is the complete bit stream that is transmitted for the string '0110101' ?

      ii) How many such strings can be transmitted per second ?

   b) Consider a CRT display that has a text mode display format of 80 × 25 characters with an 9 × 12 character cell. What is the size of the video buffer RAM for the display to be used in monochrome (1 bit per pixel) graphics mode ?

10. Illustrate the design of pipelined floating point adder with a diagram.

11. A demand paged virtual memory system uses 16 bit virtual address, page size of 256 bytes and has 1 Kbyte of main memory. LRU page replacement is implemented using list, whose current status (page numbers in decimal) is

↑

LRU page

For each hexadecimal address in the address sequence given below, 00FF, 010D, 10FF, 11B0 indicate, (i) the new status of the list (ii) page faults, if any, and (iii) page replacements, if any.

12. Let G be a context-free grammar where G = ({S, A, B, C}, {a, b, d}, P, S) with the productions in P given below.

S-→ ABAC A

A-→aA | ε

B-→bB / ε

C→d

(ε denoted the null string). Transform the grammar G to an equivalent context free grammar G that has no ε productions and no unit productions. (A unit production is of the form x → y, x and y are non terminals).

13. A bit stream 1101011011 is transmitted using the standard CRC method.

$G(x) = x^4 + x + 1$

Compute checksum.

14. Draw DFA that accepts a string if and only if the string begins and ends with a 1, and every 0 in the string is preceded and followed by at least a single 1.

15. A bit stream of original data is 011011111111111111110010. What is the bit pattern after bit stuffing and after destuffing ?

16. Draw the precedence graph for the program

```
a : = x + y;     /* Statement s1  */
b : = z + 1;     /* Statement s2  */
c : = a – b;     /* Statement s3  */
w : = c + 1;     /* Statement s4  */
d : = a + e;     /* Statement s5  */
w : = w * d;     /* Statement s6  */
```

Section – C

1. Discuss the need for the following in research
   i) Literature review and identifying gaps areas from literature review.
   ii) Data collection.
2. Discuss the following in research :
   a) Data analysis and modelling with Statistical Packages.
   b) Correlation and regression.
3. Discuss the potential research issues in the following areas :
   a) Bigdata Analysis
   b) Social Networks
   c) Formal Verification
   d) Cloud Security.

2. Electronics and Communication Engineering

Section – B

1. Explain cycle stealing method in DMA transfer, and explain burst mode of operation in DMA.
2. Using AC analysis, explain how does differential amplifier reduces noise.
3. Generate a (7, 3) hamming code and check for linearity property of the generated code.
4. In quantum mechanics view point, describe the phenomenon of tunneling. Describe an application of tunnel diode and justify the necessity.
5. Why vestigial side Band transmission is used in Television ? Compare VSB and SSB.
6. A 4 input neuron has weights 1, 2, 3, 4. The transfer function is linear with the constant of proportionality equal to 2. The inputs are 4, 10, 5 and 20. Find the output.
7. Explain admissibility condition for a wavelet.
8. Explain the method of data storage in UV PROM.
9. Is USB or Ethernet a better data acquisition Interface ? Give your explanations.
10. With the help of constellation diagram, explain how error probability is computed in QPSK.

11. A car is travelling towards you at 16 metres/second sounding its hooter with a frequency of 320 Hz. The velocity of sound is 330 metres/second. What is the frequency of the sound you will hear ?

12. Write the radar range equation and explain blind speed.

13. How CDMA differs from FDMA and TDMA ? Cite an example for all the mentioned schemes.

14. Why embedded system is named so ? What is the role of software and hardware in embedded systems ? Cite two examples.

15. Classify the following as true or false. Give brief explanation for your conclusion.
    a) Both IIR and FIR filters are always stable.
    b) FIR filter always have linear phase response.
    c) FIR filter requires fewer computation than IIR filter for the same frequency response.

16. Compare progressive and interlaced scanning. Why HDTVs prefer progressive scanning ?

Section – C

1. Practical significance of Hata-Okumura Model in the designing of a Base station at a particular location. Can we alter the Hata-Okumura model, if so what all factors have to considered ?

2. Why signals are distorted or corrupted in MOSFETs used VLSI ICs, and how this can be reduced through design improvement in VLSI ? Comment on strained silicon technology.

3. Explain recent trend in MEMS and nanotechnology in biomedical engineering.