SPACE FOR ROUGH WORK / रफ कार्य के लिए जगह

10

Optional Paper

Computer Science

Paper – II

Time : 3 Hours | Maximum Marks : 200

IMPORTANT NOTES / महत्वपूर्ण निर्देश

Please fill up the OMR Sheet of this Question Answer Booklet properly before answering. Please also see the directions printed on the obverse before filling it.
प्रश्नोत्तर पुस्तिका में प्रश्न हल करने से पूर्व उसके संलग्न ओ.एम.आर. पत्रक को भली प्रकार भर लें । उसे भरने हेतु उसके पृष्ठ भाग पर मुद्रित निर्देशों का अध्ययन कर लें ।

The question paper has been divided into three Parts - A, B and C. The number of questions to be attempted and their marks are indicated in each part.
प्रश्न-पत्र अ, ब और स तीन भागों में विभाजित है । प्रत्येक भाग में से किये जाने वाले प्रश्नों की संख्या और उनके अंक उस भाग में अंकित किये गये हैं ।

Attempt answers in English.
उत्तर अंग्रेजी भाषा में दीजिये।

Answers to all the questions of each part should be written continuously in the script and should not be mixed with those of other parts. In the event of candidate writing answers to a question in a part different to the one to which the question belongs, the question will not be assessed by the examiner.
उत्तर पुस्तिका में प्रत्येक भाग के समस्त प्रश्नों के उत्तर क्रमवार देने चाहिये तथा एक भाग में दूसरे भाग के उत्तर नहीं मिलाने चाहिये । एक भाग में दूसरे भाग के प्रश्न के उत्तर लिखे जाने पर ऐसे प्रश्न को जाँचा नहीं जा सकता है ।

The candidates should not write the answers beyond the limit of words prescribed in parts A, B and C failing this the marks can be deducted.
अभ्यर्थियों को भाग अ, ब और स में अपने उत्तर निर्धारित शब्दों की सीमा से अधिक नहीं लिखने चाहिये। इसका उल्लंघन करने पर अंक काटे जा सकते हैं ।

In case the candidate makes any identification mark i.e. Roll No./Name/Telephone No./Mobile No. or any other marking either outside or inside the answer book, it would be treated as resorting to using unfair means. In such a case his candidature shall be rejected for the entire examination by the Commission.
अभ्यर्थी द्वारा उत्तर पुस्तिका के अंदर अथवा बाहर पहचान चिन्ह यथा -- रोल नम्बर / नाम / मोबाईल नम्बर / टेलीफोन नम्बर लिखे जाने या अन्य कोई निशान इत्यादि अंकित किये जाने को अनुचित साधन मान जायेगा। आयोग द्वारा ऐसा पाये जाने पर अभ्यर्थी की सम्पूर्ण परीक्षा में अभ्यर्थिता रद्द कर दी जावेगी ।

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PART – A

Marks : 40

Note : Attempt all the **twenty** questions. Each question carries **2** marks. Answer should not exceed 15 words.

1 List four things, which an instruction set needs to specify either explicitly or implicitly.

2 How many fields the instruction format will contain in a 3 address machine. Also give the instruction format.

3 How many 500 MB tapes will be required to backup a 120 GB hard disk? How long will the backup process require if one tape can be filled in 5 minutes.

4 Define the instruction cycle time. How many machine cycle are there in one instruction cycle of 8085.

5 List the maskable and non-maskable interrupts in 8085.

6 Define the flag register and various flags available in 8085.

7 An OS uses simple paging system with a page table containing 64 entries of 11 bits (including invalid/valid bit) each, and a page size of 512 bytes, how many bits in the logical address will specify the page number? Explain.

8 Define vector processing and enumerate two of its advantages over scalar processing.

9 Instruction pipelining is used to increase the processor performance. However, there are a number of factors that limits the ability of pipelining to execute instructions at its peak rate - termed as instruction pipeline hazards. List various instruction pipeline hazards.

10 Give the business goals of a typical business application.

11 What is an index in indexed-file organization?

12 Identify and give the master data for a financial accounting application.

13 Differentiate between the terms database schema and database instance.

14 State functional dependencies in relational database design.

15 What is data model? Give the list of data models used in DBMS.

16 Consider the following relational schema :

Student (roll-no, name, address, programme)

Grade (roll-no, course-no, grade)

Give a relational algebra expression for finding the details of students who have scored "A+" grade in course-no "CP-201".

17 Find a real root of the equation $x^3 - x-1=0$.

18 If four squares are chosen at random on a chess-board, find the probability that they should be in a diagonal line.

19 If X is a random Poisson variate such that P (x=1) = P (x=2); find P (x=4).

20 The incidence of occupational disease in any industry is such that the workers have a 20% chance of suffering from it. What is the probability that out of 6 workers, 4 or more will catch the disease?

PART – B

Marks : 60

Note : Attempt all the twelve questions. Each question carries 5 marks. Answer should not exceed 50 words.

21 Explain following addressing modes with examples :
(a) Immediate
(b) Relative
(c) Indexed

22 List the steps involved in the general structure of a nested interrupt handler.

[Contd...

23 Explain the function of ALE in 8085 microprocessor.

24 Explain how can we generate four separate signals to read or write the memory and I/O devices in microprocessor 8085.

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25 A certain memory system has a 32 MB main memory, and a 64 KB cache. Blocks are 16 bytes in size. Show the fields in a memory address if the cache is :

(a) Associative

(b) Direct-mapped

(c) 8-way set-associative.

26 Define Asynchronous and synchronous data communication and their uses scenario.

27 Suggest advantages and disadvantages for an organization in devising and implementing a business strategy.

28 Why and when would you choose a database system instead of operating system files for storing business data of a typical business application ?

29 List the major goals of DBMS to provide an environment that is both convenient and efficient to use in storing and retrieving data.

30 Consider the following relations :

$r(A,B,C)$ and $s(A,D,E)$

Write SQL queries equivalent to the following expressions :

(a) $\sigma_{B>10}(r \infty s)$

(b) $\pi_{A,E}(\sigma_{C=D} \wedge E<100(r \times s))$

31 Using Newton's formula, find the following sum :

$S_n = 1^3 + 2^3 + 3^3 + \ldots\ldots + n^3$

32 For the following data find the regression line of y on x.

x	1	2	3	4	5	8	10
y	9	8	10	12	14	16	15

PART – C

Marks : 100

Note : Attempt any 5 questions. Each question carries 20 marks. Answer should not exceed 200 words.

33 (a) Draw the timing diagram for memory read and memory write operations and explain each in detail along with necessary control signals.

(b) A computer system with an 8-bit address bus and an 8-bit data bus uses isolated I/O. It has 64 bytes of EEPROM starting at address 00H constructed using 64×4 chips; 128 bytes of RAM starting at address 40H constructed using 32×8 chips; an input device with a READY signal at address 40H; and an output device with no READY signal at address 80H. Show the design for the system. Include all enable and load logic.

34 A system is designed using microprocessor 8085 to count from 0 to 9 with a 0.5 second delay between each count. At the count 9, the counter should reset itself to Zero and repeat the sequence continuously. Use register pair HL to set up the delay and display each count at the output port 05H. Assume the clock frequency of the microprocessor is 2 MHz. Give the flow chart and delay calculation along with program.

35 (a) There are two ways to design a control unit - hardwired or microprogrammed. Compare the two techniques and draw the block diagram for hardwired control unit.

(b) With the help of neat diagrams explain the organization and operation of a microprogrammed control unit and generation of next microinstruction address.

36 Describe file structures along with explanations that permit each of the following types of access :

(a) Sequential access only

(b) Direct or random access only

(c) Indexed-sequential access.

37 Draw an E-R diagram for the following :

A company needs to store information about employees (e-no, name, contact and salary as attributes), departments (d-no, name, budget as attributes) and projects (p-no, duration as attributes). Each employee works in a department but can be engaged in more than one projects; each department is managed by an employee; there may be more than one employees working on the same project. Also identify all keys, constraints and assumptions you make use. Also give a scheme which maps this E-R diagram into relations or tables of the relational model.

38 Evaluate $\int_0^1 e^{-x^2} dx$ by dividing the range of integration into 4 equal parts, using :

(a) The trapezoidal rule, and
(b) Simpson's rule

39 Using Runge-Kutta method, find y for x = 0.1, 0.2, 0.3 given that

$\frac{dy}{dx} = xy + y^2,\ y(0) = 1.$