Test Booklet No.
प्रश्नपत्रिका क्र.

M

Paper-III
COMPUTER SCIENCE AND APPLICATIONS

Signature and Name of Invigilator

1. (Signature) .....

(Name) .....

2. (Signature) .....

(Name) .....

Seat No. | | | | | | |

(In figures as in Admit Card)

Seat No. .....

(In words)

OMR Sheet No. | | | | | | |

(To be filled by the Candidate)

DEC - 37313

Time Allowed : 2½ Hours] **[Maximum Marks : 150**

Number of Pages in this Booklet : **36**

Number of Questions in this Booklet : **75**

Instructions for the Candidates

1. Write your Seat No. and OMR Sheet No. in the space provided on the top of this page.
2. This paper consists of **75** objective type questions. Each question will carry *two* marks. *All* questions of Paper-III will be compulsory, covering entire syllabus (including all electives, without options).
3. At the commencement of examination, the question booklet will be given to the student. In the first 5 minutes, you are requested to open the booklet and compulsorily examine it as follows :
   (*i*) To have access to the Question Booklet, tear off the paper seal on the edge of this cover page. Do not accept a booklet without sticker-seal or open booklet.
   (*ii*) **Tally the number of pages and number of questions in the booklet with the information printed on the cover page. Faulty booklets due to missing pages/ questions or questions repeated or not in serial order or any other discrepancy should not be accepted and correct booklet should be obtained from the invigilator within the period of 5 minutes. Afterwards, neither the Question Booklet will be replaced nor any extra time will be given. The same may please be noted.**
   (*iii*) After this verification is over, the OMR Sheet Number should be entered on this Test Booklet.
4. Each question has four alternative responses marked (A), (B), (C) and (D). You have to darken the circle as indicated below on the correct response against each item.
   Example : where (C) is the correct response.

   (A) (B) ● (D)

5. Your responses to the items are to be indicated in the **OMR Sheet given inside the Booklet only.** If you mark at any place other than in the circle in the OMR Sheet, it will not be evaluated.
6. Read instructions given inside carefully.
7. Rough Work is to be done at the end of this booklet.
8. If you write your Name, Seat Number, Phone Number or put any mark on any part of the OMR Sheet, except for the space allotted for the relevant entries, which may disclose your identity, or use abusive language or employ any other unfair means, you will render yourself liable to disqualification.
9. You have to return original OMR Sheet to the invigilator at the end of the examination compulsorily and must not carry it with you outside the Examination Hall. You are, however, allowed to carry the Test Booklet and duplicate copy of OMR Sheet on conclusion of examination.
10. **Use only Blue/Black Ball point pen.**
11. **Use of any calculator or log table, etc., is prohibited.**
12. **There is no negative marking for incorrect answers.**

विद्यार्थ्यांसाठी महत्त्वाच्या सूचना

1. परिक्षार्थींनी आपला आसन क्रमांक या पृष्ठावरील वरच्या कोपऱ्यात लिहावा. तसेच आपणांस दिलेल्या उत्तरपत्रिकेचा क्रमांक त्याखाली लिहावा.
2. सदर प्रश्नपत्रिकेत **75** बहुपर्यायी प्रश्न आहेत. प्रत्येक प्रश्नास **दोन** गुण आहेत. या प्रश्नपत्रिकेतील **सर्व** प्रश्न सोडविणे अनिवार्य आहे. सदरचे प्रश्न हे या विषयाच्या संपूर्ण अभ्यासक्रमावर आधारित आहेत.
3. परीक्षा सुरू झाल्यावर विद्यार्थ्याला प्रश्नपत्रिका दिली जाईल. सुरुवातीच्या 5 मिनीटांमध्ये आपण सदर प्रश्नपत्रिका उघडून खालील बाबी अवश्य तपासून पहाव्यात.
   (*i*) प्रश्नपत्रिका उघडण्यासाठी प्रश्नपत्रिकेवर लावलेले सील उघडावे. सील नसलेली किंवा सील उघडलेली प्रश्नपत्रिका स्विकारू नये.
   (*ii*) **पहिल्या पृष्ठावर नमूद केल्याप्रमाणे प्रश्नपत्रिकेची एकूण पृष्ठे तसेच प्रश्नपत्रिकेतील एकूण प्रश्नांची संख्या पडताळून पहावी. पृष्ठे कमी असलेली/कमी प्रश्न असलेली/प्रश्नांचा चूकीचा क्रम असलेली किंवा इतर त्रुटी असलेली सदोष प्रश्नपत्रिका सुरुवातीच्या 5 मिनिटातच पर्यवेक्षकाला परत देऊन दुसरी प्रश्नपत्रिका मागवून घ्यावी. त्यानंतर प्रश्नपत्रिका बदलून मिळणार नाही तसेच वेळही वाढवून मिळणार नाही याची कृपया विद्यार्थ्यांनी नोंद घ्यावी.**
   (*iii*) वरीलप्रमाणे सर्व पडताळून पहिल्यानंतरच प्रश्नपत्रिकेवर ओ.एम.आर. उत्तरपत्रिकेचा नंबर लिहावा.
4. प्रत्येक प्रश्नासाठी (A), (B), (C) आणि (D) अशी चार विकल्प उत्तरे दिली आहेत. त्यातील योग्य उत्तराचा रकाना खाली दर्शविल्याप्रमाणे ठळकपणे काळा/निळा करावा.
   उदा. : जर (C) हे योग्य उत्तर असेल तर.

   (A) (B) ● (D)

5. या प्रश्नपत्रिकेतील प्रश्नांची उत्तरे **ओ.एम.आर. उत्तरपत्रिकेतच दर्शवावीत.** इतर ठिकाणी लिहीलेली उत्तरे तपासली जाणार नाहीत.
6. आत दिलेल्या सूचना काळजीपूर्वक वाचाव्यात.
7. प्रश्नपत्रिकेच्या शेवटी जोडलेल्या कोऱ्या पानावरच कच्चे काम करावे.
8. जर आपण ओ.एम.आर. वर नमूद केलेल्या ठिकाणा व्यतिरीक्त इतर कोठेही नाव, आसन क्रमांक, फोन नंबर किंवा ओळख पटेल अशी कोणतीही खूण केलेली आढळून आल्यास अथवा असभ्य भाषेचा वापर किंवा इतर गैरमार्गाचा अवलंब केल्यास विद्यार्थ्याला परीक्षेस अपात्र ठरविण्यात येईल.
9. परीक्षा संपल्यानंतर विद्यार्थ्याने मूळ ओ.एम.आर. उत्तरपत्रिका पर्यवेक्षकांकडे परत करणे आवश्यक आहे. तथापी, प्रश्नपत्रिका व ओ.एम.आर. उत्तरपत्रिकेची द्वितीय प्रत आपल्याबरोबर नेण्यास विद्यार्थ्यांना परवानगी आहे.
10. **फक्त निळ्या किंवा काळ्या बॉल पेनचाच वापर करावा.**
11. **कॅलक्युलेटर किंवा लॉग टेबल वापरण्यास परवानगी नाही.**
12. **चुकीच्या उत्तरासाठी गुण कपात केली जाणार नाही.**

Computer Science and Applications

Paper III

Time Allowed : 2½ Hours] **[Maximum Marks : 150**

Note : This Paper contains **Seventy Five (75)** multiple-choice questions, each question carrying **Two (2)** marks. Attempt *All* of them.

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1. Let combinational function $f(a, b, c, d) = abc' + ab'cd'$ (where x' means complement of x). If all inputs are equally probable, then the probability that the function evaluates to *True* is :

   (A) 5/16 (B) 1/4

   (C) 3/16 (D) 1/8

2. (x86 Real mode versus protected mode addressing) Which of the following is *correct* ?

   (A) Real mode is used in the normal case, protected mode for secure data

   (B) Protected mode is a way to avoid segments

   (C) Real mode was used in the early days, protected mode as memory size increased

   (D) Real and protected modes are like user and kernel modes of Linux

3. Which of the statements below are *correct* ?

   The purpose of microprogramming is :

   (1) to increase the performance of the ALU

   (2) Reduce the size of the ALU

   (3) to simplify the design of the control unit

   (A) 1 (B) 2

   (C) 1 and 2 (D) 3

---

4. In 8086 assembly language, which of the following is *not* in the category of reserved words ?

(A) directive (B) predefined symbol

(C) operator (D) label

5. (8086 .exe and .com programs) : Which of the following statements is *false* ?

(A) An .exe program on disk starts with a 512-byte header file, but not a .com program

(B) A .com program uses separate segments for code, data and the stack

(C) A .exe program can be converted to a .com program

(D) Generally, a .com program is simpler than a .exe program with the same functionality

6. In x86, which of the following is *not* executed by itself ?

(A) cld (B) rep

(C) std (D) nop

Consider the following schema for question numbers 7 and 8 :

STUDENT : (St_Name, Class#, Th_Mark, Dr_Mark)

STUDENT_DRIVING_TEACHER : (St_Name, Dr_T_Name)

TEACHER_THEORY_CLASS : (Class#, Th_T_Name)

TEACHER_VEHICLE : (Dr_T_Name, License#)

VEHICLE : (License#, Make, Model, Year).

A student takes one theory class as well as driving lessons and at the end of the session receives marks for theory and driving. A Teacher may teach theory, driving or both.

7. Which of the following functional dependencies hold :

(A) St_Name$\rightarrow\!\!\!\!\rightarrow$ Th_T_Name (B) License#$\rightarrow\!\!\!\!\rightarrow$ Model

(C) St_Name$\rightarrow$ License# (D) Dr_T_Name$\rightarrow$ Model

8. The schema of Question No. **7** is in which normal form ?

(A) BCNF (B) 5NF

(C) 3NF (D) 4NF

9. Consider the relation Persons_on_Job_Skills :

Persons_on_Job_Skills

Person	Skill_Type	Job
Thomas	Analyst	J1
Thomas	Analyst	J2
Thomas	DBA	J2
Thomas	DBA	J3
John	DBA	J1
Ashish	Analyst	J1

Consider the three statements below :

(*i*) (Person, Skill_type) is a composite primary key.

(*ii*) Functional dependencies Person ->-> Skill_type, Person ->-> Job hold.

(*iii*) Decomposition of relation Person_on_Job_Skills into (Person, Skill_type), (Skill_type, job), (Person, Job) will yield 5NF.

Which of the statements above is/are *true* ?

(A) (*i*) and (*ii*) are true (B) (*iii*) is true

(C) All are true (D) All are false

10. Which of the following queries has better performance while displaying the details of the employees who are managed by the same manager and work in the same department as the employees with identification numbers 174 and 178 ?

(A)
```
SELECT employee_id, manager_id, department_id
FROM employees
WHERE (manager_id, department_id) IN    (SELECT manager_id, department_id
                                         FROM employees
                                         WHERE employee_id IN (178, 174))
AND employee_id  NOT IN (178, 174)
```

(B)
```
SELECT employee_id, manager_id, department_id
FROM employees
WHERE (manager_id) IN          (SELECT manager_id
                                FROM employees
                                WHERE employee_id IN (178, 174))
AND (department_id) IN         (SELECT department_id
                                FROM employees
                                WHERE employee_id IN (178, 174))
AND employee_id  NOT IN (178, 174)
```

(C)
```
SELECT a.employee_id, a.manager_id, a.department_id
FROM employees a
WHERE exists     (SELECT * FROM employees b
                  WHERE b.employee_id IN (178, 174)
                  AND a.manager_id = b.manager_id)
AND exists       (SELECT * FROM employees c
                  WHERE c.employee_id IN (178, 174)
                  AND a.department_id = c.department_id)
AND a.employee_id  NOT IN (178, 174)
```

(D)
```
SELECT a.employee_id, a.manager_id, a.department_id
FROM employees a, employees b
WHERE b.employee_id IN (178, 174)
AND a.manager_id = b.manager_id
AND a.department_id = b.department_id
AND a.employee_id  NOT IN (178, 174)
```

11. ABC bank has just ventured into a retail banking system with the functions Saving Bank Accounts, Current Bank Accounts, Fixed Deposits (FD).

Each function in turn has multiple child processes that work together in harmony for the process to be useful.

Bank maintains record of each customer, savings bank account transactions are updated on real-time basis whereas FD transactions are updated on periodic basis.

Which of the following is appropriate logical design for customers information ?

(A) Customer_Savings_Acc(Cust_no, Name, Address, Nominee, Date_of_birth, Contact_no, Introducer_name, Introducer_acc_no)

Customer_Current_Acc(Organisation_Name, Address, Nominee, Contact_no, Introducer_name, Introducer_acc_no)

Customer_FD_Acc(Customer_Name, Address, Nominee, Contact_no, Interest_rate, Period_in_months, Introducer_name, Introducer_acc_no)

(B) Customer_Master(Cust_no, Name, Address, Nominee, Date_of_birth, Contact_no, Introducer_cust_no, Introducer_acc_no, Status)

Account_Master(Account_no, Cust_no, Account_type, Balance_Amt, dt_of_opening, Status)

Customer_FD_Acc(Account_no, Cust_no, Amount, Interest_rate, Period_in_months, dt_of_opening)

(C) Customer_Accounts(Cust_no, Name, Address, Nominee, Date_of_birth, Contact_no, Introducer_cust_no, Introducer_acc_no, Account_type, Duration, Interest_Rate, Dt_of_opening, Status)

(D) Customer_Master(Cust_no, Name, Address, Nominee, Date_of_birth, Contact_no, Introducer_cust_no, Introducer_acc_no)

Accounts(Acc_no, Cust_no, Account_type, Amount, Dt_of_opening, Duration, Interest_Rate)

12. Consider the three statements below :

(*i*) A NULL in a column always satisfies a UNIQUE constraint.

(*ii*) Oracle Server enforces the UNIQUE constraint by explicitly creating a unique index on the unique key column.

(*iii*) PRIMARY KEY constraint enforces uniqueness of the column/s and ensures that no column that is part of the PRIMARY KEY contains a NULL value.

Which of these statements are *true* in the context of SQL standards ?

(A) Only statements (*i*) and (*iii*) are true

(B) Only statements (*i*) and (*ii*) are true

(C) Only statements (*ii*) and (*iii*) are true

(D) Statements (*i*), (*ii*) and (*iii*) are true

13. Given : MyPalette provides that a colour pixel could be either set to invisible mode or otherwise it is visible. This is obtained by reserving a one bit flag as an attribute of a pixel. Making a coloured pixel invisible is equivalent of :

(A) painting it with white colour

(B) painting it black

(C) either (A) or (B)

(D) neither (A) nor (B)

14. While modifying the normal palette to MyPalette the programmer forgot to write functionality for the bit that determines visibility of a colour pixel. How many different denotations would result in the same colour ?

(A) It won't affect the system. Each denotation determines a unique colour.

(B) Two denotations are mapped to a single colour.

(C) Four denotations are mapped to a single colour.

(D) Eight denotations are mapped to a single colour.

15. Odd man out : {graphics editing, GIMP, Photoshop, grids, Contones, a standard size portrait of Mahatma Gandhi}

(A) grids

(B) Contones

(C) a standard size portrait of Mahatma Gandhi

(D) No exception is found in the set

16. ..... is a deliberately added noise in order to prevent colour bands in the images in web browsers, or to enhance image quality by colour approximation in inexpensive display hardware.

(A) Thresholding (B) Patterning

(C) Mezzotinting (D) Dithering

17. The transformation of rotating an object about a pivot point is :

(*i*) Composite transformation

(*ii*) Preliminary transformation.

(A) Both (*i*) and (*ii*) are true (B) Only (*i*) is true

(C) Only (*ii*) is true (D) Both (*i*) and (*ii*) are false

18. Consider a window in the *xy*-plane as a 20-unit square in the first quadrant with the lower left corner as origin. The lines joining P1(5, 25) and P2(25, 10) intersect the window at :

(A) (11.67, 20) and (20, 13.75) (B) (10, 20) and (50, 0)

(C) (0, 13.75) and (13.75, 20) (D) (20, 11.67) and (10, 13.75)

19. Consider the following grammar G :

$S \rightarrow aSe$

$S \rightarrow B$

$B \rightarrow bBe$

$B \rightarrow C$

$C \rightarrow d$

$C \rightarrow cCe$

Which statement is *true* ?

(A) G is not a regular grammar

(B) G is a context free grammar

(C) G is a context sensitive grammar

(D) G is both a regular and a context free grammar

20. The First and Follow sets of the grammar G in Q1 are :

(A) {*a, b, c, d*}, {*e*} (B) {*a, c, d*}, {*a, e*}

(C) {*a, b, c*}, {*e*} (D) {*a, b, e*}, {*c, d*}

21. The string a^3bde^4 can be derived from the grammar G of Q1 in :

(A) 5 steps (B) 7 steps

(C) 2 steps (D) 6 steps

22. Consider the following sequence of statements, where MOV X, R means load X in register R, ADD Y, R means add Y to R and MOV R, X means store R in X

MOV b, R (1)

ADD c, R (2)

MOV R, a (3)

MOV a, R (4)

ADD e, R (5)

MOV R, d (6)

If there is no more statement after statement 6, which of these statement(s) is (are) redundant ?

(A) Statement 2 (B) Statement 5

(C) Statements 1 and 6 (D) Statement 4

23. What is computed by the code of Q4 above ?

(A) $b = b + c,\ d = a + e$ (B) $a = b + c,\ d = a + e$

(C) $b = a + e,\ d = b + c$ (D) $a = d + c,\ b = a + e$

24. Consider the following source code :

$c = a + b$

$d = c$

$c = c - e$

$a = d - e$

$b = b * e$

$b = d/b$

(A) No optimization is possible

(B)
$d = c$
$c = c - e$
$a = d - e$
$b = b * e$
$b = d/b$

(C)
$c = a + b$
$d = c$
$c = c - e$
$a = d - e$
$b = d/b$

(D)
$c = a + b$
$t = b * e$
$a = d - e$
$b = d/t$
$c = a$

Consider the following information to answer questions 25 to 27 :

Suppose in the near future ISRO wants to send a satellite for finding the water availability on Mars. There has to be a link setup of speed 128-kbps point-to-point between Earth and a rover vehicle on Mars. The distance from Earth to Mars (when they are closest together) is approximately 55 Gm (10^9 m), and data travels over the link at the speed of light (3×10^8 m/s).

25. What is the Round Trip Time (RTT) for the link ?

(A) 256 sec (B) 128 sec

(C) 512 sec (D) 268 sec

26. The delay x bandwidth product for the link is :

(A) 23 Mb (B) 23.5 Mb

(C) 22.5 Mb (D) 22 Mbp

27. After a picture is taken it must be transmitted on the link and be completely propagated before Mission Control can interpret it the total time taken is :

(A) 223 sec (B) 211 sec

(C) 256 sec (D) 345 sec

Consider the following information to answer question Nos. 28 & 29 :

Hosts A and B are each connected to a switch S via 10-Mbps links as in the following figure :

A and B represent nodes in the network and S is the switch connecting the two nodes. The propagation delay on each link is 20 μs. S is a store-and forward device; it begins retransmitting a received packet 35 μs after it has finished receiving it.

28. The total time required to transmit 10,000 bits from A to B as a single packet is :

(A) 2075 μs (B) 2078 μs

(C) 2209 μs (D) 3322 μs

29. If we send the data in two packets the time required for data transfer is :

(A) 1500 μs (B) 1590 μs

(C) 1475 μs (D) 1575 μs

30. Assume a framing protocol that uses bit stuffing. When the frame contains the bit sequence 11010111110101111111010111111110, what is the bit sequence transmitted on the link ?

(A) 1101 0111 1100 1011 1110 1010 1111 1011 0

(B) 1101 0111 1100 1011 1110 1010 1111 1011 0

(C) 1101 0111 1100 1011 1110 101000 1111 1011 0

(D) 1101 000111 1100 1011 1110 1010 1111 1011 0

31. Consider the following algorithm :

```
procedure Test(N)
/* N is positive integer power of 2 */
  for i = 1 to N do
    for j = 1 to i
      Write i, j, N
    endfor
  endfor

  If N > 1 then do
    for i = 1 to 8 do
      call Test (N/2)
    endfor
  enddo
end test
```

Let L(N) denote the number of lines written by Test (N). The recurrence relation for L(N) is :

(A) $L(N) = 8L(N) + N(N + 1)/2$

(B) $L(N) = 8L(N/2) + N(N - 1)/4$

(C) $L(N) = 4L(N/2) + N(N + 1)/2$

(D) $L(N) = 8L(N/2) + N(N + 1)/2$

32. What is the complexity of the program in Q. No. **31** if the call to Test (N/2) is removed from it ?

(A) O(N) (B) $O(N^2)$

(C) O(1) (D) $O(N^3)$

33. If N = 4 how many lines are printed by the program of Q. No. **31** ?

(A) 10 (B) 11

(C) 12 (D) 14

34. If N = 4, and the j-loop and the j variable in the write statement are removed from Q. No. **31**, what is the output of the program ?

(A) 1, 4, 2, 4, 3, 4, 4, 4 (B) 1, 2, 3, 4, 3, 4

(C) 1, 4, 2, 4, 5, 2, 1 (D) 1, 4, 2, 4, 3, 4, 4

35. If the if-statement in Q. No. **31** is removed, how many times is the recursive call made ?

(A) 0 (B) 16

(C) 32 (D) 8

36. If in Q. No. **31** the call to Test (N/2) and the write-statement are swapped and the call to Test (N/2) is modified as a call to test (N) how many lines are printed for N = 1 ?

(A) 0 (B) 100

(C) infinite (D) 1024

37. Which of the following is a Servlet container ?

(A) MySQL (B) Apache Tomcat

(C) JRE (D) Internet Explorer

38. Which of the following statements is *false* ?

(A) A servlet can be invoked through a JavaScript

(B) A servlet can be invoked through an applet

(C) A servlet is executed on the server side

(D) A servlet instance is created for each client request

39. XML is :

(A) designed to be a software and hardware independent language used to transport and store data, with focus on what data is.

(B) designed to be a software and hardware independent language used to transport and store data, with focus on how data looks.

(C) presentation language used to present application data.

(D) designed to handle larger databases.

40. Which of the following statements is *true* ?

(A) Javascript is compiled and executed on client side.

(B) Javascript is interpreted on the client side.

(C) Javascript execution needs JVM on client machine.

(D) Javascript execution needs JRE plug-in in client browser.

41. The main reason for preferring servlet for web application development is :

(A) Increased performance of web application

(B) Easy to develop an application

(C) Platform independent application

(D) More secure application

42. Which of the following statements is *incorrect* ?

(A) HTML should be used only for structuring the content

(B) Cascading Style Sheets should be used for applying visual styles

(C) Javascript should be used for interactive functionality

(D) XML is used for formatting data by applying different styles

43. Let the COCOMO model for estimating the duration of a software project be using formula $D = 2.5 (KLOC)^{0.33}$. The project code length is 27000 lines. Find the most appropriate duration of the project :

(A) 6.25 years (B) 7.2 years

(C) 66 months (D) 16.9 months

44. Albrecht's function point analysis involves subjectivity because of the :

(A) quantification of development efforts for bringing qualities like efficiency and maintainability into the software

(B) confusion in counting inputs and inquiries during on-line transactions

(C) difficulty in identifying a logical files when the software development takes place using sophisticated platforms

(D) All of the above

45. A moderately complex product has 11 external inputs that modify 3 internal files. Apart from 10 external inquiries, the system interfaces with three legacy systems and provides information to users consisting of 2 reports and an error message. Items are of three types : simple, average and complex. External inquiries and external inputs carry the same weight, 3 per simple item. Simple items of type output, interface files and internal files carry the weights 4, 5 and 7 respectively. The weight of a complex item is double that of a simple item of the same type, and the weight of an average item is obtained by rounding to the nearest integer the average of the weights of the simple and the complex items. Assume that the simple, average and complex items are equally uniformly distributed.

Unadjusted function points of this system are :

(A) 513 (B) 171

(C) 35 (D) None of these

46. Suppose the product described in the above question is a centrally managed web application. The features are rated on a three point scale. On-line data entry, on-line updates, ease of operation and availability at multiple sites are strongly influencing features. Ease in installation and reusability are not considered much. However, facilitating change, transaction rate and performance are of moderate significance. (Given : each degree of influence is worth 1% and the technical complexity factor (TCF) has tolerance ± 60%). The value of TCF is :

(A) 20 (B) 38

(C) 0.8 (D) 0.85

47. Considering the results of Q3 and 4 above, the number of function points of this system is :

(A) approximately 410 (B) approximately 436

(C) 1026 (D) none of these

48. A state level educational institution, with 1000 centers serving 500 different courses for 1000000 students per year, decides to go for automation. Out of the two choices of ERP and centre-wise automation and then connecting the subsystems, which one would earn more function points ?

(A) ERP

(B) Centre-wise automation

(C) Both ERP and centre-wise automation will earn equal function points

(D) None of the above

49. Situations where two or more processes are reading or writing some shared data and the final results depend on the order of usage of the shared data, are called :

(A) Race conditions (B) Critical section

(C) Mutual exclusion (D) Deadlocks

50. Which of the following is a high level abstraction over Semaphore ?

(A) Shared memory (B) Message passing

(C) Monitor (D) Mutual exclusion

51. Which of the following is the purpose of Co-operating Process ?

(A) Information Sharing (B) Convenience

(C) Computation Speed-Up (D) All of these

52. Which of the following contains information about the state of a process, its program counter, stack pointer, and other information ?

(A) the scheduler (B) the interrupt vector

(C) the process control block (D) the thread

53. When using two-phase locking, a database application proceeds to lock all records it will need and finds one already locked by another process, what is the algorithm expected to do ?

(A) go on and lock the rest

(B) release all locks and start over

(C) preempt the lock from the other process

(D) wait for the locked record to be released

54. At a particular time, the value of a counting semaphore is 10. Then 20 signal operations and '*x*' wait operations are executed. If final value of semaphore is 5, what is '*x*' ?

(A) 25 (B) 20

(C) 15 (D) 10

55. Given in column I are 4 some structures and in II their types :

	I		**II**
(1)	{(टेल, Tail), (टेल, Tel), (टेल, Tale), (टेल, Tell)}	(*i*)	Function
(2)	Watch is funny if it is owned by a funny person or it doesn't show time in hours	(*ii*)	Predicate
(3)	System's time, or a person's name, or today's date	(*iii*)	Proposition
(4)	p: Madhatter's watch is a funny watch, or q: Walkwater walks on water	(*iv*)	Relation

Which is the *correct* match of the two columns ?

(A) (1)—(*i*), (2)—(*iii*), (3)—(*iv*), (4)—(*ii*)

(B) (1)—(*iv*), (2)—(*iii*), (3)—(*ii*), (4)—(*i*)

(C) (1)—(*i*), (2)—(*ii*), (3)—(*iv*), (4)—(*iii*)

(D) (1)—(*iv*), (2)—(*ii*), (3)—(*i*), (4)—(*iii*)

56. Which of the following visual representations is most appropriate to denote the fact "Each person owns a separate watch" ?

(A)

Watch → owned by Person ↓	W1	W2	W3
P1	√		
P2		√	√
P3			√

(B)

Watch → owned by Person ↓	W1	W2	W3
P1	√		
P2			√
P3	√		√

(C)

Watch → owned by Person ↓	W1	W2	W3
P1	√	√	√
P2		√	√
P3			√

(D) None of these

57. Which of the following predicates is equivalent of the statement : No person owns a separate watch ?

(A) $\forall\ x\ \text{Watch}(x)\ \exists\ pi\ \exists\ pj\ (pi \neq pj, \text{Owns}(pi, x) \wedge \text{Owns}(pj, x))$

(B) $\forall\ x\ \text{Watch}(x)\ \forall\ pi\ \forall\ pj\ (pi \neq pj, \text{Owns}(pi, x) \wedge \text{Owns}(pj, x))$

(C) $\text{Watch}(y2), \text{Watch}(y1), \text{Owns}(x1, y1), \text{Owns}(x2, y2)\ x1 \neq x2, y1 \neq y2$

(D) (A) and (C) but not (B)

58. Which of the following are the most close equivalent representations ?

(*i*) $\exists\ x$ Person(x) $\wedge\ \exists\ y$ Watch(y) $\wedge$ Owns($x,\ y$) $\rightarrow\ \forall\ z\ (z \neq x,$ Person(z) $\wedge$ Owns($z,\ y$)

(*ii*) $\exists\ x$ Watch(x) $\wedge\ \forall\ y$ Person(y) $\rightarrow$ Owns($y,\ x$)

(*iii*) "Ownership of a watch is shared by all persons"

(*iv*) "Ownership of a person's watch has been shared by all the other persons"

(A) (*i*) $\boxed{?}$ (*ii*) and (*iii*) $\boxed{?}$ (*iv*) (B) (*i*) $\boxed{?}$ (*iii*) and (*ii*) $\boxed{?}$ (*iv*)

(C) (*ii*) $\boxed{?}$ (*iii*) and (*i*) $\boxed{?}$ (*iv*) (D) (*i*) $\boxed{?}$ (*ii*) $\boxed{?}$ (*iii*) $\boxed{?}$ (*iv*)

59. Given :

Man(Madhatter)

Man(Walkwater)

Watch(MHW)

Watch(WWW)

Owns(Madhatter, MHW)

Owns(Walkwater, WWW)

Walk(Madhatter, Road)

Walk(Walkwater, Water)

~UnitTime(MHW, Hrs)

UnitTime(WWW, Hrs)

$\forall\ x$ Watch(x) $\wedge$ ~UnitTime(x, Hrs) $\rightarrow$ Funny(x)

$\forall\ x$ Man(x) $\wedge$ Walk(x, Water) $\rightarrow$ Funny(x)

$\forall\ y$ Man(y) $\wedge$ Funny(y) $\wedge$ Owns($y,\ x$) $\rightarrow$ Funny(x)

Out of the above data how many clauses do *not* take part in the proof of the statement : "MHW is a funny watch. Also WWW is funny" ?

(A) 0 (B) 1

(C) 4 (D) 5

60. Which of the following is the most appropriate device-to resolve the spelling ambiguity that arises due to the similarity in the pronunciations of the sentence : "I (tell / tel / tail / tale) you, mine is a long and sad (tell / tel / tail / tale)" ?

(A) Dictionary (B) Thesaurus

(C) Corpora (D) None of these

61. $\Sigma = \{0, 1, 2\}$. Σ^* is a sequence of integers from Σ. Consider L = {all strings with the sum of integers in the string is divisible by 4}. The transition table for the deterministic finite automaton for L is :

(A) (B)

(C) (D)

62. Which of the following statements are *correct* for the Turing Machine whose transition function δ is given by the following table, B is the blank symbol and q_f is the final state :

(A) TM accepts the Language $\{a^n b^n / n > 0\}$

(B) TM has four states

(C) TM accepts the string aabb

(D) TM accepts the string abab

63. The CFG for the language $L = \{a^i b^j c^k | j = i + k, l, j, k > 0\}$ contains the set of productions :

(A) P : $\{S \rightarrow aSbSc | \varepsilon\}$

(B) P : $\{S \rightarrow AB, A \rightarrow aAb | \varepsilon, B \rightarrow bBc | \varepsilon\}$

(C) P : $\{S \rightarrow ASB | \varepsilon, B \rightarrow BSC | \varepsilon, A \rightarrow a, B \rightarrow b, C \rightarrow c\}$

(D) P : $\{S \rightarrow XY, X \rightarrow AXB | AB, Y \rightarrow BYC | BC, A \rightarrow a, B \rightarrow b, C \rightarrow c\}$

64. The Lernpel-Ziv-Welch (LZW) coding assigns :

(A) fixed-length code words to fixed length sequences of source symbols

(B) fixed-length code words to variable length sequences of source symbols

(C) variable-length code words to fixed length sequences of source symbols

(D) variable-length code words to variable length sequences of source symbols

65. If C is a code with minimum distance $d \geq 3$, there is a decoding algorithm that corrects upto :

(A) $[(d - 1)/2]$ errors (B) $[(d + 1)/2]$ errors

(C) $[d/2 - 1]$ errors (D) $[d/2 + 1]$ errors

66. In the frequency domain of the image degradation function :

(A) degradation and noise functions are additive

(B) degradation and noise functions are multiplicative

(C) degradation function is additive and noise function is multiplicative

(D) degradation function is multiplicative and noise function is additive

67. Consider the following problem :

Maximize : $Z = 3x_1 + 5x_2$

Subject to : $x_1 \leq 4$

$2x_2 \leq 12$

$3x_1 + 2x_2 \leq 18, \quad x_1, x_2 \geq 0$

The solution after first iteration of this problem is given by :

(A) $x_1 = 2, \ x_2 = 6$ (B) $x_1 = 4, \ x_2 = 3$

(C) $x_1 = 4, \ x_2 = 0$ (D) $x_1 = 0, \ x_2 = 6$

68. Consider the following network consisting of 6 nodes and 10 arcs :

The minimal spanning tree for the graph is given by :

(A) (B)

(C) (D)

69. The following non-linear programming problem is to be solved by applying KKT conditions :

Minimize : $f(x) = x_1^2 - x_2$

Subject to : $x_1 + x_2 = 6$

$x_1 \geq 1$

$x_1^2 + x_2^2 \leq 26.$

Let $h_1(x) = x_1 + x_2 - 6$

$g_1(x) = x_1 - 1$

$g_2(x) = 26 - x_1^2 - x_2^2.$

Which of the following is *true* ?

(A) $f(x)$ is convex and $g_2(x)$ is concave

(B) $f(x)$ and $g_2(x)$ are both convex

(C) $f(x)$ and $g_2(x)$ are both concave

(D) $f(x)$ is convex, but $g_2(x)$ is neither convex nor concave

70. Match the following learning rules with the type of neurons :

(P)	Perceptron Learning rule	(I)	Linear Neurons
(Q)	α-Least Mean Square learning rule	(II)	Sigmoid Neurons
(R)	Back propagation learning rule	(III)	Threshold (Step) activation Neuron
(S)	Steepest descent rule		

(A) (P)—(I), (Q)—(II), (R)—(III), (S)—(III)

(B) (P)—(III), (Q)—(I), (R)—(II), (S)—(III)

(C) (P)—(I), (Q)—(II), (R)—(II), (S)—(III)

(D) (P)—(III), (Q)—(I), (R)—(II), (S)—(I)

71. Two fuzzy sets A and B both defined on X = $\{x_1, x_2, x_3, x_4, x_5\}$ are as follows :

$\mu(x)$	x_1	x_2	x_3	x_4	x_5
A	.1	.6	.8	.7	.1
B	.9	.7	.5	.2	0

The crisp set $\{x_1, x_2\}$ represents the α-cut for the fuzzy set :

(A) $(A \cup B)_{.7}$ (B) $(A \boxed{?} B)_{.5}$

(C) $(A \boxed{?} \bar{B})_{.5}$ (D) $(\bar{A} \boxed{?} B)_{.7}$

72. Which amongst the following membership functions, depicted graphically, is normal, convex and with crossover of 4 and 8 ?

(A)

(B)

(C)

(D)

73. The following is the source code corresponding to a 'bash' shell script 'sl.sh' in UNIX system;

```
for i in $*
do
    cat $i
done
```

What will be the output if 'sl.sh' is executed from the console as follows :

```
$sh sl.sh *
```

(A) Displays contents of file labeled as '*'

(B) Displays list of all the files in present working directory.

(C) Displays contents of all the files in present working directory.

(D) Displays an error message.

74. Which of the following statements is applicable to a filter utility in UNIX system ?

(A) It generally takes input from standard input and provides output to standard output.

(B) It works with piping facility in a UNIX shell.

(C) It works with redirection facility in a UNIX shell.

(D) All of the above

75. WM_QUIT message in Windows operating system environment refers to :

(A) Request to terminate an application

(B) Signal that a window or an application should terminate

(C) Signal when a window is being destroyed

(D) Signal sent after the destruction of a window

ROUGH WORK