24.08.2018 / 1400 - 1600

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தகவல், தொடர்பாடல் தொழினுட்பவியல்   I
Information & Communication Technology   I

20 E I

පැය දෙකයි
இரண்டு மணித்தியாலம்
Two hours

Instructions:

* Answer **all** the questions.
* Write your **Index Number** in the space provided in the answer sheet.
* Instructions are also given on the back of the answer sheet. Follow those carefully.
* In each of the questions 1 to 50, pick one of the alternatives from (1), (2), (3), (4), (5) which is correct or most appropriate and mark your response on the answer sheet with a cross (×) in accordance with the instructions given on the back of the answer sheet.
* Use of calculators is **not** allowed.

1. Consider the following three numbers in decimal, octal and hexadecimal notations, respectively.

   A - 231_{10}
   B - 347_8
   C - $E7_{16}$

   Which of the above is/are equivalent to 11100111_2 in binary notation?

   (1) A only   (2) B only   (3) A and C only   (4) B and C only   (5) All A, B and C

2. What is the decimal equivalent to the binary 110101.11_2?

   (1) 53.00_{10} (2) 53.50_{10} (3) 53.75_{10} (4) 54.25_{10} (5) 54.75_{10}

3. Which of the following describes the term 'telecommuting'?

   (1) ability of an employee to perform duties conveniently from different geographical locations using modern technology
   (2) having online meetings with people at different geographic locations
   (3) using ICT for community services
   (4) using web-based applications to retrieve information
   (5) performing financial transactions online

4. Consider the following statements.

   A - Word size is the number of bits processed by the CPU of a computer in a single action (instance).
   B - Data bus width and register width are directly related to word size of a computer.
   C - Word size of modern general purpose computers is either 32 or 64 bits.

   Which of the above statements is/are correct?

   (1) A only   (2) B only   (3) C only
   (4) B and C only   (5) All A, B and C

5. Consider the following statements.

   A - In public key encryption systems each pair of communicating entities share a single key for encryption and decryption.
   B - Phishing is a type of social engineering attack often used to steal user data such as user name and password.
   C - Port scanning is a method which can be used by attackers to identify open ports or services on a network host.
   D - Digital signatures can be used for email message authentication.

   Which of the above statements are correct?

   (1) B and C only   (2) A, B and C only   (3) A, C and D only
   (4) B, C and D only   (5) All A, B, C and D

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6. Consider the following statements.
   A - DHCP server in an IP network dynamically allocates IP addresses to network devices.
   B - DNS server translates domain names to IP addresses.
   C - FTP server caches the recently accessed web pages.

   Which of the above statements is/are correct?
   (1) A only   (2) B only   (3) A and B only
   (4) B and C only   (5) All A, B and C

7. Consider the following statements.
   A - TCP is a connection oriented and a reliable protocol.
   B - UDP is a connectionless and an unreliable protocol.
   C - TCP and UDP are transport layer protocols.

   Which of the above statements is/are correct?
   (1) A only   (2) B only   (3) A and B only
   (4) B and C only   (5) All A, B and C

8. In the OSI reference model, the network layer is responsible for .... communication.
   Which of the following is suitable to fill the blank in the above statement?
   (1) node to node   (2) source to destination   (3) hop to hop
   (4) switch to router   (5) process to process

9. Which of the following indicates the number of host bits and the number of IP addresses respectively in a class C network?
   (1) 8 and 256   (2) 8 and 65536   (3) 16 and 256
   (4) 16 and 65536   (5) 24 and 256

10. To which of the following network classes does the IP address 192.248.254.1 belong?
    (1) A   (2) B   (3) C   (4) D   (5) E

11. In the OSI reference model, a protocol data unit of the network layer is referred to as a ....
    Which of the following terms is suitable to fill the blank in the above statement?
    (1) frame   (2) segment   (3) window   (4) message   (5) packet

12. Which of the following correctly lists the given computer storage components in the **descending** order of **access speed**?
    (1) cache memory > main memory > magnetic disk > register
    (2) magnetic disk > main memory > cache memory > register
    (3) magnetic disk > main memory > register > cache memory
    (4) register > cache memory > main memory > magnetic disk
    (5) register > main memory > magnetic disk > cache memory

13. Consider the following computer memory types.
    A - CMOS memory
    B - cache memory
    C - flash memory
    D - hard disk
    E - RAM
    F - registers

    Which of the above are *volatile* memory types?
    (1) A, C and D only   (2) A, D and E only   (3) A, E and F only
    (4) B, E and F only   (5) C, E and F only

14. Consider the following statements regarding HTML.
    A - HTML frames are used to divide a browser window into multiple sections.
    B - The rows attribute of <frameset> tag defines the number of vertical frames in an HTML page.
    C - <frameset cols="100, 500, 100"> creates vertical frames with the specified number of millimetres.

    Which of the above statement/s is/are correct?
    (1) A only   (2) B only   (3) A and B only
    (4) B and C only   (5) All A, B and C

15. Consider the following HTML code with labels ❶ – ❸ and the expected output.

HTML code	Expected output

``
<html>
<head> <title>Coffee Shop</title> </head>
<body>
 <❶>
  <❷>Coffee</❷>
  <❸>black hot drink</❸>
  <❷>Milk</❷>
  <❸>white cold drink</❸>
 </❶>
</body>
</html>
``
	Coffee
	    black hot drink
	Milk
	    white cold drink

    What is the correct order of tags for replacing the labels ❶, ❷ and ❸ ?
    (1) dt, dl, dd   (2) dl, dt, dd   (3) dd, dt, dl
    (4) dt, dd, dl   (5) dl, dd, dt

16. Consider the following HTML code for creating a table.

```
<html>
<head><style> table, th, td {border: 1px solid black} </style>
</head><body>
<table>
<tr><th> Name: </th> <td> Kamal </td> </tr>
<tr><th rowspan="2"> Telephone: </th> <td> 55577854</td> </tr>
<tr><td> 55577855 </td> </tr>
</table>
</body>
</html>
```

    Which of the following is the output generated by the above code?

Name: Kamal / Telephone: 55577854 / 55577855	Name: Telephone / Kamal 55577854 / 55577855	Name: Telephone / Kamal 55577854 / 55577855	Name: Kamal / Telephone: 55577854 / 55577855	Name: Kamal / Telephone: 55577854 / 55577855
(1)	(2)	(3)	(4)	(5)

17. Which of the following is the correct HTML statement for inserting an image?
    (1) <img href="image.gif" alt="MyImage">
    (2) <img alt="MyImage">image.gif</img>
    (3) <img src="image.gif" alt="MyImage">
    (4) <image src="image.gif" href="MyImage">
    (5) <img href="image.gif" src="MyImage">

18. Consider the space voyage for landing a human being on the surface of the moon for the first time in 1969. The entire event was broadcast on the radio in Sri Lanka by several commentators based in Sri Lanka and the USA.

    Which of the following events relates to the highest value of information?
    (1) counting down for the launching of the rocket that carried the space shuttle
    (2) the moment the space shuttle escaped from the gravitational field of the earth
    (3) the moment the space shuttle entered the moon's gravitational field
    (4) the moment the astronaut Neil Armstrong placed his first step on the surface of the moon
    (5) the moment the astronauts landed on the sea in their return voyage to earth

19. Consider the following statements related to the development of computers over time.
    A - Both processing speed and power consumption of computers have increased.
    B - Processing speed of a computer has increased while physical size of a computer has decreased.
    C - Both power consumption and the physical size of a computer have reduced.

    Which of the above statements is/are correct?
    (1) A only   (2) B only   (3) A and B only
    (4) B and C only   (5) All A, B and C

20. Consider the following statements.
    A - Providing the personal information of customers stored in a computer by a vehicle servicing centre to an insurance agent is, an issue related to the privacy of customers.
    B - Providing a copy of a single user licensed software to another party is a piracy issue related to the copyright owner of the software.
    C - Unauthorized access to another person's computer is both illegal and unethical.

    Which of the above statements is/are valid?
    (1) A only   (2) B only   (3) A and B only
    (4) B and C only   (5) All A, B and C

21. Consider the following Boolean expression.

    $$\overline{A + B \cdot \overline{C}}$$

    Which of the following is/are equivalent to the above expression?
    I. $\overline{A} + \overline{B} \cdot C$
    II. $\overline{A} \cdot \overline{B \cdot \overline{C}}$
    III. $\overline{A} \cdot \overline{B} + \overline{A} \cdot C$

    (1) I only   (2) II only   (3) III only   (4) I and II only   (5) II and III only

22. Consider the following logic circuit.
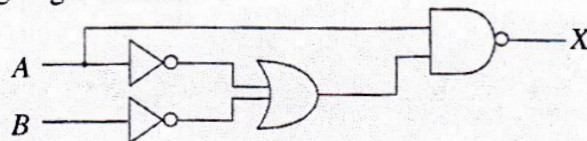
    Which of the following circuit/s is/are equivalent to the above circuit?
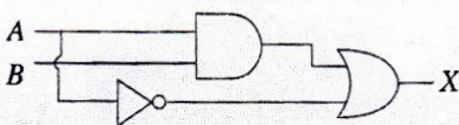
    I   II   III

    (1) I only   (2) II only   (3) III only   (4) I and II only   (5) All I, II and III

● Questions **23 - 25** are based on the flowchart below. (Note that **n%2** represents **n mod 2.**)


```
                          Start
                            │
                   ┌────────────────┐
                   │  i  ←  1        │
                   │  result  ←  0   │
                   └────────────────┘
                            │
                     ┌──────────────┐
                     │   input  n   │
                     └──────────────┘
                            │
                  Yes   ◇ is n%2 = 0? ◇
          ┌───────────────  │
          │              No │
          │         ┌───────────────────────┐
          │         │ result ← result + n   │
          │         └───────────────────────┘
          │                 │
          └──────→ ┌──────────────┐
                   │  i  ←  i + 1 │
                   └──────────────┘
                            │
                     ◇ is i ≤ 10 ? ◇ ──Yes──┐
                            │                │
                          No│                │ (loop back to input n)
                   ┌──────────────┐
                   │ output result│
                   └──────────────┘
                            │
                          Stop
```
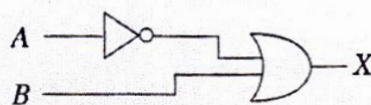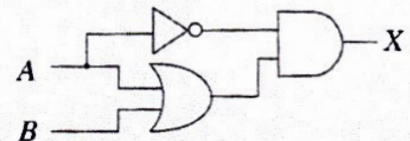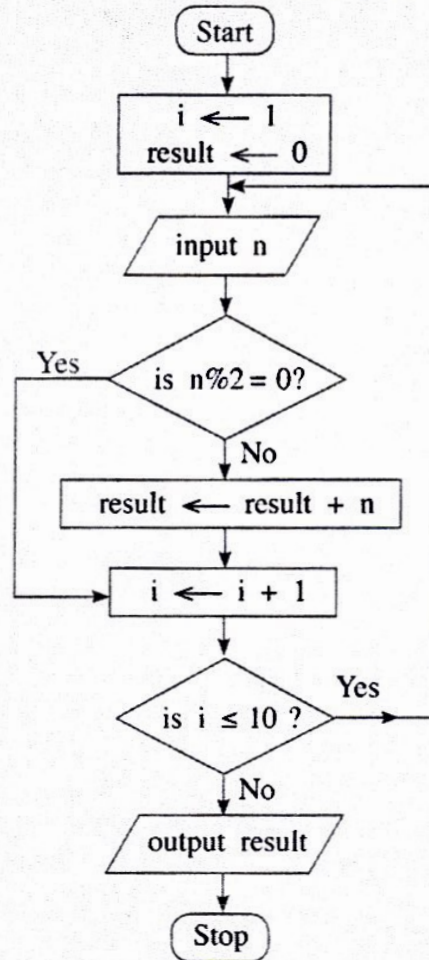
23. Which of the following is/are correct regarding the algorithm expressed by the above flowchart?
   A - It takes 10 inputs.
   B - It computes the sum of the even numbers in the input.
   C - To take 100 inputs, only modifying "is $i \le 10$?" will be sufficient.

   (1) A only   (2) B only   (3) C only   (4) A and B only   (5) A and C only

24. If the following were fed as inputs to the above algorithm, what will be the output?

   2, 8, 9, 3, 4, 10, 6, 5, 13, 19, 12, 7

   (1) 10   (2) 30   (3) 42   (4) 49   (5) 56

25. For any given input, outputs of which of the following Python programs will be the same as the output produced by the algorithm in the above flowchart?

```
I -  i = 1                      II -  result = 0              III -  result = 0
     result = 0                       for i in range(10):            i = 1
     while (i <= 10):                      n = int(input())          while True:
         n = int(input())                  if (not(n % 2 == 0)):         n = int(input())
         if (n % 2 != 0):                      result = result + n       if (not(n % 2 == 0)):
             result += n                   print result                      result = result + n
         i = i+1                                                         i = i + 1
     print result                                                       if (i > 10):
                                                                            break
                                                                    print result
```

   (1) I only   (2) II only   (3) III only   (4) I and II only   (5) All I, II and III

[See page six

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26. Consider the following statements regarding databases.
    A - Candidate key is a column, or a set of columns that can uniquely identify a row in a table.
    B - Alternate key is any candidate key that has not been selected as the primary key.
    C - Primary key can have a NULL value.

    Which of the above statements is/are correct?

    (1) A only   (2) B only   (3) A and B only
    (4) A and C only   (5) All A, B and C

27. Consider the following statements relevant to external entities of Data Flow Diagrams.
    A - An external entity can be a person, system or organization that has predefined behaviour.
    B - An external entity can be a source of input data for a process or/and a destination of the output of a process.
    C - External entities are always data stores.

    Which of the above statement(s) is/are correct?

    (1) A only   (2) B only   (3) A and B only
    (4) B and C only   (5) All A, B and C

28. Consider the following relational schema in a database.

    Subject (SubjectID, TermID, SubjectDescription)

    Here the *SubjectID*, *TermID*, and *SubjectDescription* are .... and *Subject* is ....

    Which of the following are most suitable to fill the blanks, respectively?
    (1) attributes, a relation   (2) relations, an attribute
    (3) tuples (records), a relation   (4) tuples, an attribute
    (5) relations, a tuple

29. Consider the following tasks.
    A - identifying the problems in the existing system
    B - suggesting alternative solutions
    C - prioritizing of the information system's requirements

    Which of the above tasks is/are carried out during the preliminary investigations of systems development life cycle?
    (1) A only   (2) A and B only   (3) A and C only
    (4) B and C only   (5) All A, B and C

30. Which of the following feasibility types is generally **not** carried out during the development of a system to be used only in-house?
    (1) economic feasibility   (2) market feasibility   (3) operational feasibility
    (4) organizational feasibility   (5) technical feasibility

31. Consider the following statements related to e-business.
    A - *Brick-and-click* is a business model by which a company integrates both offline and online presence of the business.
    B - *Pure-brick* is a business model in which a company has only a physical presence.
    C - *Pure-click* business has the presence only on the Internet.

    Which of the above statements is/are correct regarding e-business models?
    (1) A only   (2) B only   (3) C only
    (4) A and C only   (5) All A, B and C

32. A smart home application that automates the controlling of lighting, temperature, entertainment systems, and appliances is an example for
    (1) evolutionary computing.   (2) multi-agent systems.
    (3) nature inspired computing.   (4) software agents.
    (5) ubiquitous computing.

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33. Consider the following statements regarding artificial intelligence.

A - Artificial intelligence systems can be used in email spam filters.

B - Artificial intelligence systems are capable of analyzing uncertain information.

C - An artificial intelligence system is a system for capturing, storing, processing, and displaying data related to positions on earth's surface.

Which of the above is/are correct?

(1) A only   (2) A and B only   (3) A and C only

(4) B and C only   (5) All A, B and C

34. Consider the following statements regarding programming languages and program translation.

A - A compiler translates a program one statement at a time.

B - An assembler converts a program in an assembly language into machine code.

C - An interpreter scans the entire program and translates it as a whole into machine code.

Which of the above statements is/are correct?

(1) A only   (2) B only   (3) C only

(4) A and C only   (5) B and C only

35. What is the value of the following Python expression?

$$(5**2) // 3 \wedge 4$$

(1) 3   (2) 5   (3) 7   (4) 12   (5) 4096

36. Consider the following statements.

A - Disk defragmentation makes files that are fragmented in a disk, contiguous.

B - Swapping is a memory management technique where the main memory contents which were not recently used are copied to disk to make the memory available for other processes.

C - A File Allocation Table (FAT) is a table that an operating system maintains which provides a map of the clusters that a file has been stored in.

Which of the above is/are correct?

(1) A only   (2) A and B only   (3) A and C only

(4) B and C only   (5) All A, B and C

37. Through which of the following, will a device controller that controls a device deal with the operating system?

(1) application software   (2) assembler   (3) compiler

(4) device driver   (5) utility software

38. Consider the following statements relevant to the trends in modern information technology.

A - In traditional computing, data is encoded into binary digits while in quantum computing data is represented in quantum bits or qubits.

B - A wearable device capable of activity tracking that measures data such as the number of steps walked and heart rate is an example for a sensor network.

C - A collection of nodes capable of environmental sensing, local computation, and communication with its peers or with other higher performance nodes is called a Geographic Information System.

Which of the above statements is/are correct?

(1) A only   (2) A and B only   (3) A and C only

(4) B and C only   (5) All A, B and C

39. Consider the following statements regarding databases.
- A - For each attribute of a relation, there is a set of permitted values, called the *domain* of that attribute.
- B - The tuples (records) of the relations are always in sorted order.
- C - Database schema shows the organization of data as a blueprint of how the database is constructed.

Which of the above statements is/are correct?
- (1) A only
- (2) A and B only
- (3) A and C only
- (4) B and C only
- (5) All A, B and C

• Consider the following relational schema consisting of text fields in answering questions **40** and **41**.

Students (admission_number, surname_with_initials, house_number, street_name, village, postal_town, postal_code)

Assume that for a given *postal_town* only one *postal_code* exists.

40. Consider the following statements.
- A - *Students* relation is not normalised.
- B - *Students* is a relation in First Normal Form (1NF) only.
- C - In normalization terms, *Students* is a relation in Second Normal Form (2NF) and hence also in 1NF.

Which of the above statements is/are correct?
- (1) A only
- (2) B only
- (3) A and C only
- (4) B and C only
- (5) All A, B and C

41. Which of the following is displayed as output if the query:

Select * from Students where postal_code ='10120' and house_number ='30A';

is executed?
- (1) postal_code of all records
- (2) postal_code and house_number of records having postal_code as '10120' and house_number as '30A'
- (3) postal_code and house_number of all records
- (4) all fields of records having postal_code as '10120' and house_number as '30A'
- (5) all fields of all records

42. Consider the following statements relating to Entity Relationship (ER) modelling.
- A - Cardinality specifies how many instances of an entity relates to one instance of another entity.
- B - An entity is a 'thing' or 'object' in the real world that can be identified separately (distinguishable) from all other objects.
- C - Cardinality specifies primary key attributes of an entity.

Which of the above is/are correct?
- (1) A only
- (2) A and B only
- (3) A and C only
- (4) B and C only
- (5) All A, B and C

43. Consider the following statements regarding functional and non-functional requirements of a sales system.
- I - Reads barcodes of items purchased and produces the invoice
- II - Accepts user's request and responds in less than 1 second
- III - Processes a minimum of 1,000 transactions per second

Which of the following is the correct classification of requirements?
- (1) I, II and III all functional
- (2) I – functional, II and III – non-functional
- (3) II – functional, I and III – non-functional
- (4) I and III – functional, II – non-functional
- (5) I, II and III all non-functional

44. Consider the following software development lifecycle models.

A - spiral

B - waterfall

C - Rapid Application Development (RAD)

Which of the above requires defining and finalizing requirements in the early phases of the lifecycle?

(1) A only   (2) B only   (3) A and B only

(4) A and C only   (5) B and C only

45. Consider the following statements regarding *Structured* and *Object Oriented* software development methodologies.

A - Structured analysis and design represents systems as a hierarchy of functions.

B - Structured design is a system of interacting objects.

C - Object oriented methodology combines data and processes into individual entities.

Which of the above statements is/are correct?

(1) A only   (2) A and B only   (3) A and C only

(4) B and C only   (5) All A, B and C

46. What is the output of the following Python code segment if executed with 30 as input?

```
n = int(raw_input())
if (n < 40):
    result = 1
    if (n < 10):
        result = 2
    elif (n < 20):
        result = 3
    else:
        result = 4
else:
    result = 5
print result
```

(1) 1   (2) 2   (3) 3   (4) 4   (5) 5

47. What is the output of the following Python code segment?

```
s = 0
for i in range(10):
    s = s + i
print s
```

(1) 0   (2) 10   (3) 45   (4) 55   (5) 100

48. What is the output of the following Python code segment?

```
aList = [2,3,11,13,5,7]
s = 0
for i in range(len(aList)):
    if (aList[i] > 10):
        continue
    s = s + aList[i]
print s
```

(1) 0   (2) 5   (3) 16   (4) 17   (5) 41

49. Consider the following Python code segment with a blank line. (The line numbers on the left are shown for guidance only. They are not part of the code).

```
1        # Function definition starts
2        ...................
3                s = arg1 + arg2
4                return s
5        # Function definition ends
6        total = sum(10,20)
7        print total
```

The above code should consist of a programmer defined function named 'sum'. Which of the following should be entered in the blank on line 2, so that the function 'sum' is correctly defined?

(1) sum(arg1, arg2):   (2) def sum(arg1, arg2):

(3) function sum(arg1, arg2):   (4) def sum(arg1, arg2, s):

(5) def sum( ):

50. Consider the following statements.
   A - BIOS is an example for application software.
   B - A utility software is an example for firmware.
   C - Spyware is an example for malware.

Which of the above is/are correct?

(1) A only   (2) B only   (3) C only

(4) B and C only   (5) All A, B and C

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