

1

SULIT



BAHAGIAN PEPERIKSAAN DAN PENILAIAN  
JABATAN PENDIDIKAN POLITEKNIK  
KEMENTERIAN PENDIDIKAN TINGGI

JABATAN TEKNOLOGI MAKLUMAT & KOMUNIKASI

PEPERIKSAAN AKHIR

SESI JUN 2017

**DFC2023 : ALGORITHM AND DATA STRUCTURE**

**TARIKH : 21 OKTOBER 2017**

**MASA : 8.30 PAGI - 10.30 PAGI (2 JAM)**

---

Kertas ini mengandungi **DUA PULUH LAPAN (28)** halaman bercetak.

Bahagian A: Objektif (30 soalan)

Bahagian B: Struktur (2 soalan)

Dokumen sokongan yang disertakan : Tiada

---

**JANGAN BUKA KERTAS SOALAN INI SEHINGGA DIARAHKAN**

(CLO yang tertera hanya sebagai rujukan)

SULIT

**SECTION A: 45 MARKS****~~BAHAGIAN A: 45 MARKAH~~****INSTRUCTION:**

This section consists of **THIRTY (30)** objective questions. Mark your answers in the OMR form provided.

**ARAHAN :**

*Bahagian ini mengandungi TIGA PULUH (30) soalan objektif. Tandakan jawapan anda di dalam borang OMR yang disediakan.*

CLO1  
C1

1. Identify which of the following is **NOT** the characteristics of a good algorithm.

*Kenalpasti yang manakah di antara berikut BUKAN ciri algoritma yang baik.*

A. Output: An algorithm produces at least one output.

*Output: Sesuatu algoritma menghasilkan sekurangngnya satu output.*

B. Input: An algorithm has zero or more but only finite, number of inputs.

*Input: Sesuatu algoritma mempunyai bilangan input yang tetap.*

C. Definiteness: Each step in an algorithm is unambiguous which can be performed without any confusion.

*Ketetapan: Setiap langkah dalam sesuatu algoritma bernilai tetap iaitu boleh dilaksanakan tanpa sebarang kekeliruan.*

D. Infiniteness: An algorithm continues processing the output whenever looping condition is fulfilled.

*Ketidakterhinggaan: Sesuatu algoritma terus menerus memproses output jika konsisi gelung masih memenuhi syarat.*

CLO1  
C1

2. Based on Figure A1, identify the maximum index of the array.

*Berdasarkan Rajah A1, kenalpasti indeks tertinggi bagi tatasunan.*

20	10	50	15	9	25	30
----	----	----	----	---	----	----

Figure A1/ Rajah A1

A. 5

C. 7

B. 6

D. 8

- CLO1  
C2
3. Identify the best answer which describes the given statement.
- Kenalpasti jawapan terbaik yang merujuk kepada pernyataan yang diberi.*
- “The integers, reals, logical data, character data, pointers and reference. These data types are available in most programming languages as built in type.”**
- “Integer, reals, logical data, character data, penunjuk dan reference. Data berjenis ini boleh didapati di dalam kebanyakan Bahasa pengaturcaraan sebagai built-in”**
- A. Linear / *linear*
- B. Primitive / *primitive*
- C. Non-linear / *tidak linear*
- D. Non-primitive / *Bukan primitive*

- CLO1  
C3
4. Identify the best answer for Label B in Figure A2.
- Kenalpasti jawapan terbaik bagi Label B berpandukan Rajah A2.*

```

myPhone * newNode = new myPhone
newNode->phoneBrand = iPhone; ← Label B
newNode->back= NULL;

newNode->back = head;
head = newNode;

```

Figure A2/ *Rajah A2*

- A. Insertion a new node with brand = iPhone.  
*Masukkan nod baru dengan nilai jenama iPhone.*
- B. Assign the last node” next” as NULL.  
*Setkan nilai “next” pada nod akhir sebagai NULL.*
- C. Insert new node with brand “iPhone” at the beginning of the node.  
*Masukkan nod baru dengan nilai jenama “iPhone” di permulaan nod.*
- D. Add a new node in the middle of two nodes with brand = iPhone.  
*Tambah nod baru ditengah antara dua nod dengan nilai jenama iPhone.*

CLO2  
C1

5. Select statements which best describe non-primitive data type?

*Pilih pernyataan yang menerangkan data jenis bukan-primitif?*

- I. can contain only one data type  
*boleh mengandungi satu data sahaja*
- II. can contain more than one data type  
*boleh mengandungi lebih dari satu jenis data*
- III. a type which is defined by a programmer  
*jenis yang ditakrifkan oleh pengaturcara*
- IV. a type which is defined in the language itself  
*jenis yang ditakrifkan oleh bahasa pengaturcaraan sendiri*

- A. I, II
- B. II, III
- C. III, IV
- D. II, III, IV

CLO2  
C1

6. Choose the best data structure which describe the given statement?

*Pilih struktur data yang menerangkan pernyataan yang diberi?*

**“A data structure where elements can be added or removed at either end or front and in the middle too.”**

**“Struktur data dimana elemen boleh dimasukkan dan dikeluarkan sama ada di belakang, depan atau di tengah tengah.”**

- A. Tree  
*Pepohon*
- B. Stack  
*Tindanan*
- C. Queue  
*Baris gilir*
- D. Linked List  
*Senarai berpaut*

CLO2  
C2

7. Choose the **CORRECT** answer if 'T' being insert as second node and 'D' being deleted from the linked list based on Figure A3 below.

Pilih jawapan yang **TEPAT** jika 'T' dimasukkan sebagai nod kedua dan nod 'D' dipadamkan daripada senarai berpaut seperti Rajah A3 dibawah.

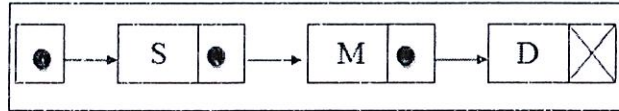


Figure A3/ Rajah A3

- A. 

```

graph LR
    Node1[ ] --> Node2[S]
    Node2 --> Node3[M]
    Node3 --> Node4[T]
    style Node4 stroke-dasharray: 5 5
  
```
- B. 

```

graph LR
    Node1[ ] --> Node2[S]
    Node2 --> Node3[T]
    Node3 --> Node4[M]
    style Node4 stroke-dasharray: 5 5
  
```
- C. 

```

graph LR
    Node1[ ] --> Node2[T]
    Node2 --> Node3[S]
    Node3 --> Node4[M]
    style Node4 stroke-dasharray: 5 5
  
```
- D. 

```

graph LR
    Node1[ ] --> Node2[T]
    Node2 --> Node3[S]
    Node3 --> Node4[M]
    Node4 --> Node5[D]
    style Node5 stroke-dasharray: 5 5
  
```

CLO2  
C2

8. Based on the Figure A4, determine what will happen when given code segment is executed?

Berdasarkan Rajah A4, kenalpasti apa yang akan berlaku apabila segmen kod dibawah dilaksanakan.

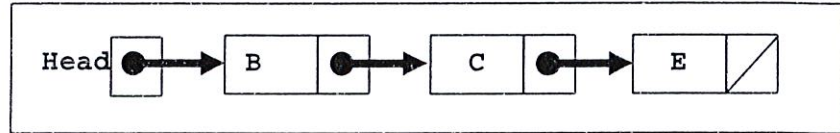
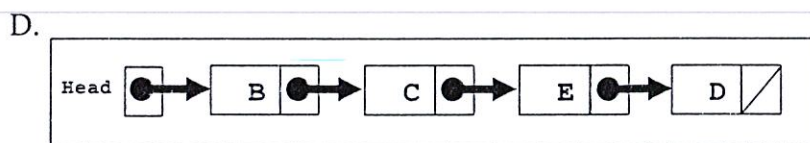
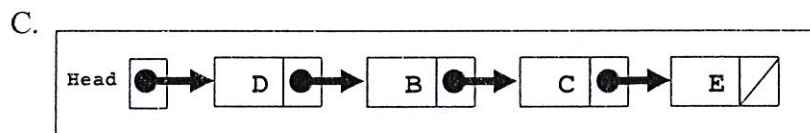
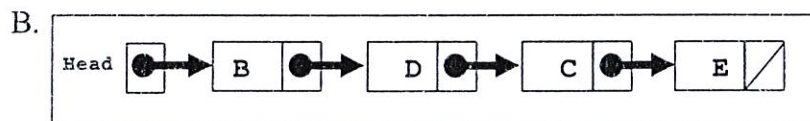
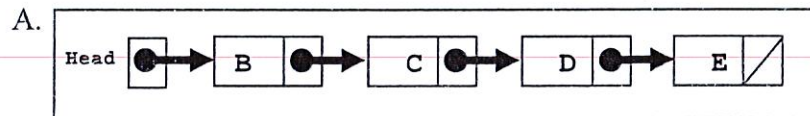


Figure A4/ Rajah A4

```
newPtr = new Node;
newPtr->data = 'D';
newPtr->next = Head;
Head = newPtr;
```



CLO2  
C1

9. State the principle that is used in stack.

*Nyatakan prinsip yang digunakan di dalam tindanan.*

- A. LIFO
- B. FIFO
- C. Bottom UP
- D. Traversal Concept

CLO2  
C210. Describe the meaning of “**the entries in stack are ordered**”.*Terangkan maksud pernyataan “**kemasukan data ke dalam tindanan adalah tersusun**”*

- A. A collection of stacks can be sorted.  
*Koleksi tindanan boleh disusun ikut turutan.*
- B. There is a first entry, a second entry, and so on.  
*Ada masukan pertama, kedua dan seterusnya.*
- C. The entries must be stored in a linked list.  
*Kemasukan mesti disimpan dalam Senarai Berpaut.*
- D. Stack entries may be compared with ‘<’ operator.  
*Kemasukan data ke dalam tindanan boleh dibandingkan dengan operator ‘<’.*

CLO2  
C1

11. State the data structure that refers to Figure A5.

*Nyatakan struktur data yang merujuk kepada Rajah A5.*

Items are inserted at rear/ tail/ back and removed from the head/ front.

*Item dimasukkan di bahagian belakang / ekor / belakang dan dikeluarkan daripada kepala / depan.*

Figure A5 / Rajah A5

- A. Queue  
*Baris Gilir*
- B. Stack  
*Tindanan*
- C. Tree  
*Pepohon*
- D. Linked List  
*Senarai Berpaut*

CLO2  
C112. Choose the **CORRECT** statement to expel the data from the Queue by using Circular Array.

*Pilih pernyataan yang **BETUL** untuk menyingkirkan data daripada Baris Gilir dengan menggunakan Tatasusunan Membulat.*

- A.  $q \rightarrow tail = (q \rightarrow tail) \% ArraySize$
- B.  $q \rightarrow head = (q \rightarrow head) \% ArraySize$
- C.  $q \rightarrow tail = (q \rightarrow tail + 1) \% ArraySize$
- D.  $q \rightarrow head = (q \rightarrow head + 1) \% ArraySize$



CLO2  
C2

13. Given a circular queue with array size of  $[max]$ , **FRONT** is 0 and **REAR** is  $max-1$ . Identify the value of **COUNT**.

*Diberi baris gilir membulat dengan Tatasusunan saiz  $[max]$ , **DEPAN** adalah 0 dan **BELAKANG** adalah  $max-1$ . Kenalpasti nilai **KIRAAN**.*

- A. **COUNT** is 0  
*KIRAAN* adalah 0
- B. **COUNT** is 1  
*KIRAAN* adalah 1
- C. **COUNT** can be 0 or  $max-1$   
*KIRAAN* boleh jadi 0 atau  $max-1$
- D. **COUNT** must be equal to  $max$   
*KIRAAN* mesti bersamaan dengan  $max$

CLO2  
C1

14. Based on Figure A6 below, identify the parent nodes.

*Berdasarkan pada Rajah A6 di bawah, kenalpasti nod "parent".*

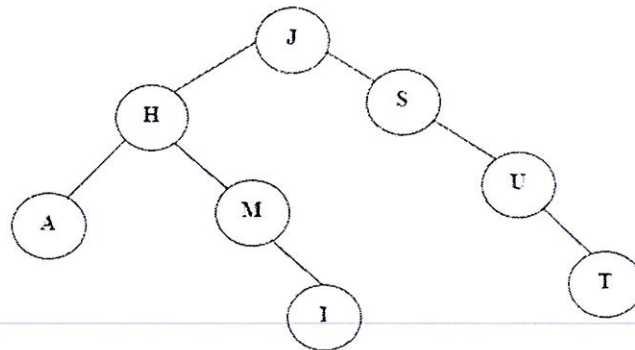
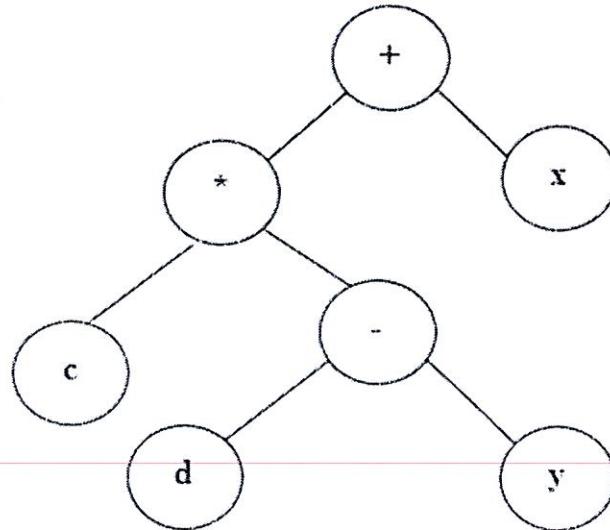


Figure A6 / Rajah A6

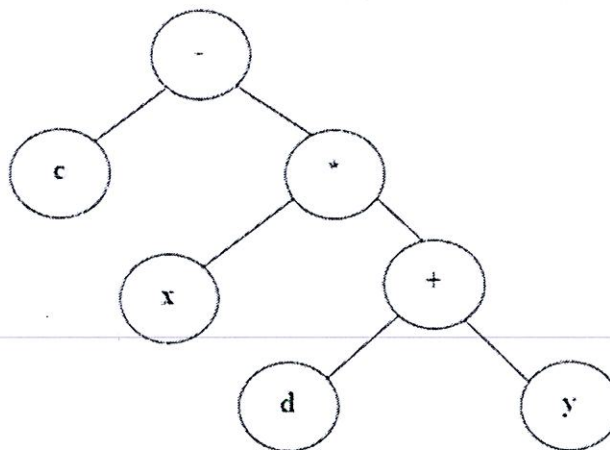
- A. U, M, A, S, H
- B. U, M, H, S, J
- C. H, U, S, A, J
- D. H, A, M, U, S

CLO2  
C215. Determine the **CORRECT** Binary Tree for the statement  $x - c * (d + y)$ .*Tentukan Pohon Dedua yang **BETUL** bagi pernyataan  $x - c * (d + y)$ .*

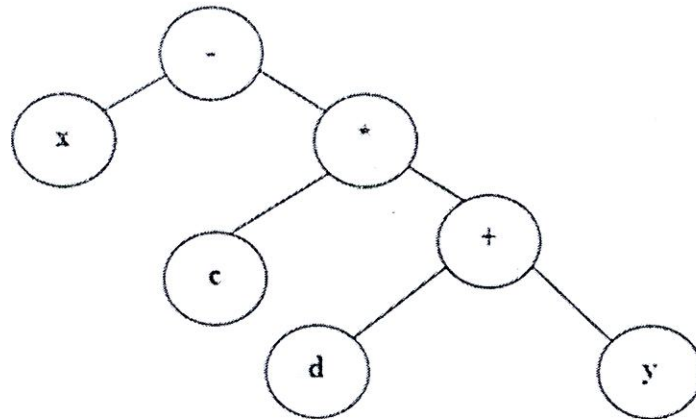
A.



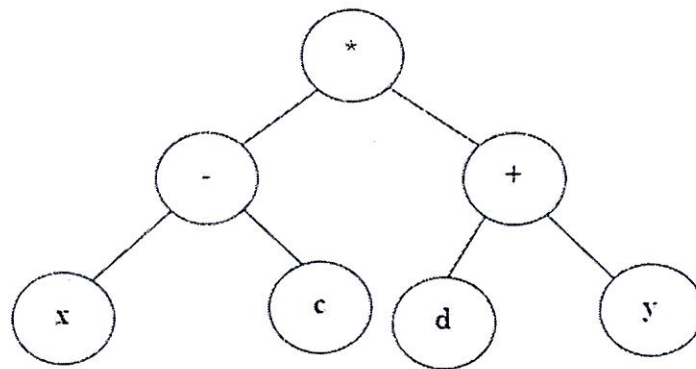
B.



C.



D.



CLO2  
C316. Choose the **CORRECT** Binary Search Tree after deleting value 9 in Figure A7.

Pilih Pohon Carian Dedua yang **BETUL** setelah nilai 9 dihapuskan dalam Rajah A7.

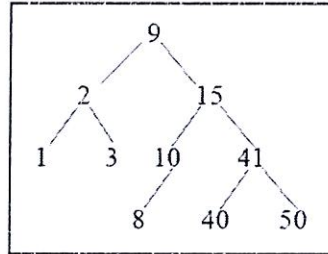
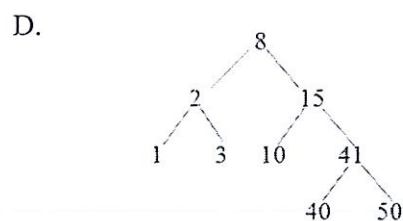
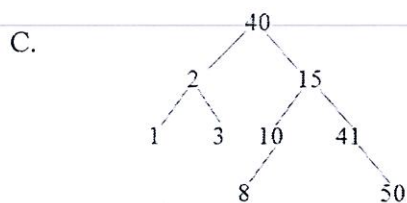
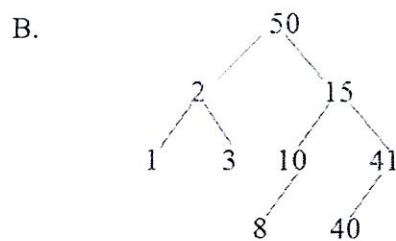
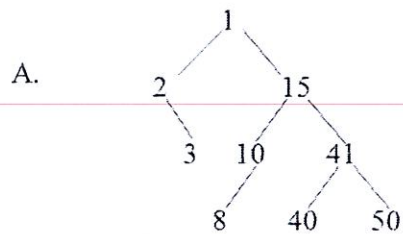


Figure A7 / Rajah A7



CLO2  
C2

17. The statement in Figure A8 above refers to **X**. Identify **X**.

*Pernyataan dalam Rajah A8 di atas merujuk kepada X. Kenalpasti X.*

Find the smallest element and exchange it with the first element in index 1. Then find the second smallest element and exchange it with the second element in index 2, and so on until the array is sorted.

*Cari elemen yang terkecil dan tukarkan ia dengan elemen pertama pada index pertama. Kemudian cari elemen yang kedua terkecil dan tukarkan ia dengan elemen kedua pada index kedua dan seterusnya sehingga tatasusunan tersisih.*

Figure A8 / Rajah A8

- A. Bubble Sort / *Isihan Buih*
- B. Quick Sort / *Isihan Cepat*
- C. Merge Sort / *Isihan Gabung*
- D. Selection Sort / *Isihan Pilihan*

CLO2  
C3

18. An array contains the elements shown in Figure A9 below. The first two elements have been sorted using a selection sort.

*Satu tatasusunan mengandungi elemen-elemen seperti yang ditunjukkan di dalam Rajah A9 di bawah. Dua unsur yang pertama telah diisih menggunakan isihan pilihan.*

B	C	M	F	H	G	L
---	---	---	---	---	---	---

Figure A9 / Rajah A9

Determine the values of the elements in the array after two more passes of the selection sort were executed.

*Tentukan nilai elemen-elemen di dalam tatasusunan selepas dua kali lagi pertukaran menggunakan isihan pilihan dijalankan.*

- A. B, C, F, G, H, M, L
- B. B, C, F, H, G, M, L
- C. B, C, L, G, H, M, F
- D. B, C, F, M, G, H, L

CLO2  
C3

19. Calculate many steps are needed to sort the following number in ascending order using selection sort?

*Kira berapa langkah yang diperlukan untuk menyusun nombor di bawah secara menaik dengan menggunakan isihan pilihan?*

5, 1, 12, -5, 16, 2, 12, 14

- A. 7  
B. 6  
C. 9  
D. 10

CLO3  
C1

20. Choose 'mystack' after the statement is Figure A10 are executed.

*Pilih "mystack" selepas pernyataan di dalam Rajah A10 di laksanakan.*

```
Create mystack();
mystack.push (10);
mystack.push (20);
```

Figure A10/ Rajah A10

A.

[1]	20
[0]	10

B.

[1]	10
[0]	20

C.

[1]	NULL
[0]	10

D.

[1]	15
[0]	10

CLO3  
C3

21. Determine the output for the statement in Figure A11.

*Tentukan output bagi pernyataan di dalam Rajah A11.*

Top (PUSH (Stack, X))

Figure A11 / Rajah A11

- A. 0
- B. -1
- C. X
- D. NULL

CLO3  
C1

22. If the characters 'J', 'K', 'L', 'M' and 'N' are sequentially inserted into a queue, choose the first character that will be deleted from the queue.

*Jika aksara 'J', 'K', 'L', 'M' and 'N' dimasukkan secara berturutan ke dalam baris gilir, pilih aksara pertama yang akan dihapuskan daripada baris gilir tersebut.*

- A. J
- B. K
- C. L
- D. N

CLO3  
C1

23. Identify the situation in queue, when the value of **rear is equal to front** in a circular array.

*Kenalpasti situasi dalam baris gilir, apabila nilai rear sama dengan front di dalam tatasusunan giliran membulat.*

- A. Queue is full / Baris gilir penuh
- B. Queue is empty / Baris gilir kosong
- C. Queue has one item / Baris gilir mempunyai satu item
- D. Queue is set to NULL / Baris gilir ditetapkan kepada kosong

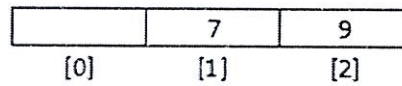
CLO3  
C3

24. Trace the output after the statements below are executed.

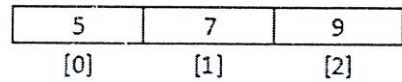
*Dapatkan output selepas pernyataan di bawah dilaksanakan.*

1. Create Queue (Q);
2. Enqueue (Q, 5);
3. Enqueue (Q, 7);
4. Dequeue (Q);
5. Enqueue (Q, Q.REAR+2);

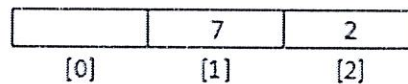
A.



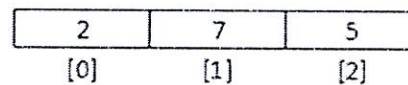
B.



C.



D.

CLO3  
C1

25. Based on Figure A12, determine the height of the binary tree?

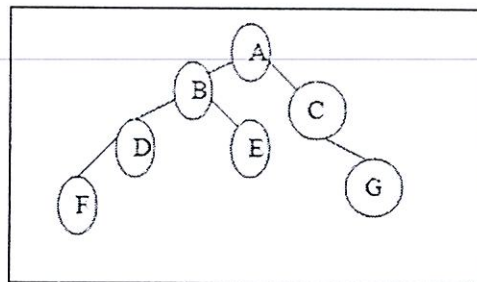
*Berdasarkan pada Rajah A12, kenalpasti ketinggian bagi pepohon dedua tersebut?*

Figure A12 / Rajah A12

- A. 2
- B. 3
- C. 4
- D. 5



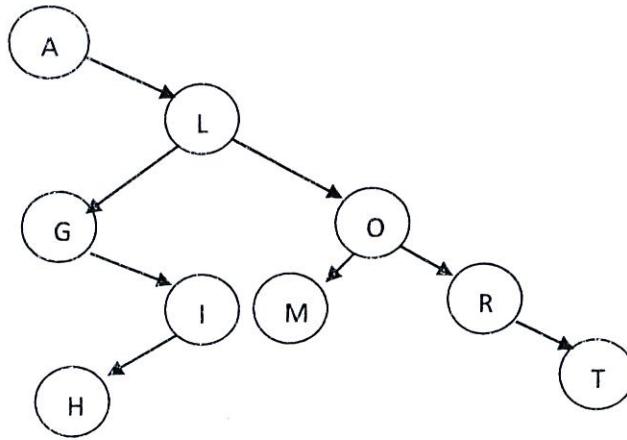
CLO3  
C226. Choose the **CORRECT** preorder traversal based on Figure A13.*Pilih susunan preorder yang **BETUL** berdasarkan Rajah A13.*

Figure A13 / Rajah A13

- A. H, I, G, M, T, R, O, L, A
- B. A, L, O, R, T, M, G, I, H
- C. A, L, G, I, H, O, M, R, T
- D. A, G, H, I, L, M, O, R, T

CLO3  
C3

27. A binary search tree where a node is inserted in the following order:

*Satu pokok carian binari di mana nod telah dimasukkan dalam turutan yang berikut:*

**60, 55, 95, 40, 30, 100, 35.**

Identify the part where the next node with a value of 47 will be inserted into the binary search tree.

*Kenalpasti pada bahagian manakah nod seterusnya dengan nilai 47 akan diselitkan kepada pokok carian binari tersebut.*

- A. left of node 30  
*kiri nod 30*
- B. right of node 35  
*kanan nod 35*
- C. right of node 40  
*kanan nod 40*
- D. right of node 55  
*kanan nod 55*

CLO3  
C2

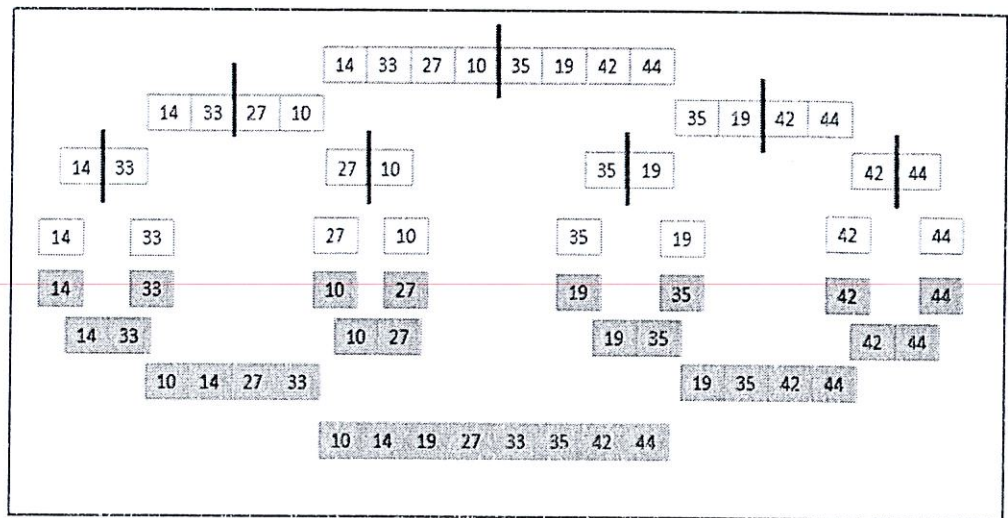
28. Illustrate a diagram to show the process of sorting the numbers contained in the Figure A14 to a set of numbers in ascending order by using merge sort method.

*Lukiskan rajah bagi menunjukkan proses mengisih nombor-nombor yang terdapat dalam Rajah A14 kepada satu susunan nombor dalam turutan menaik dengan menggunakan kaedah isihan cantum.*

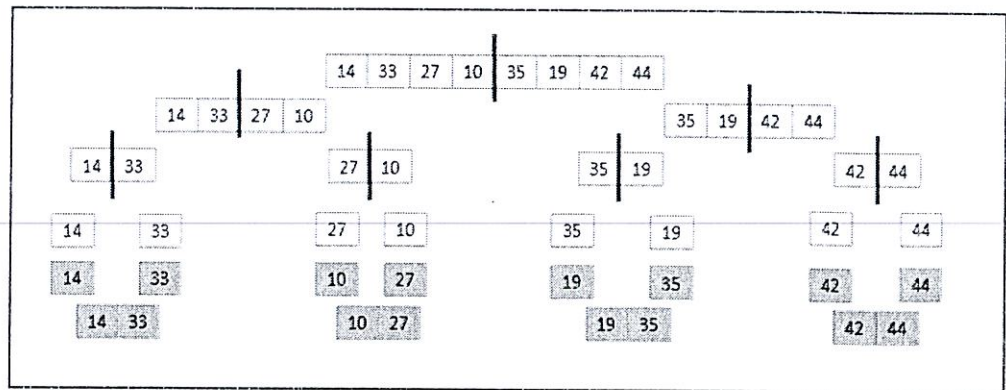
14	33	27	10	35	19	42	44
----	----	----	----	----	----	----	----

Figure A14 / Rajah A14

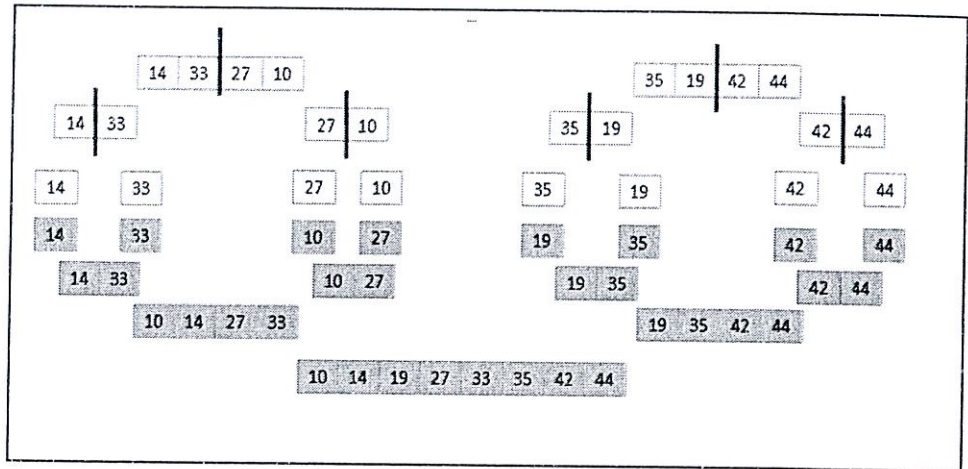
A.



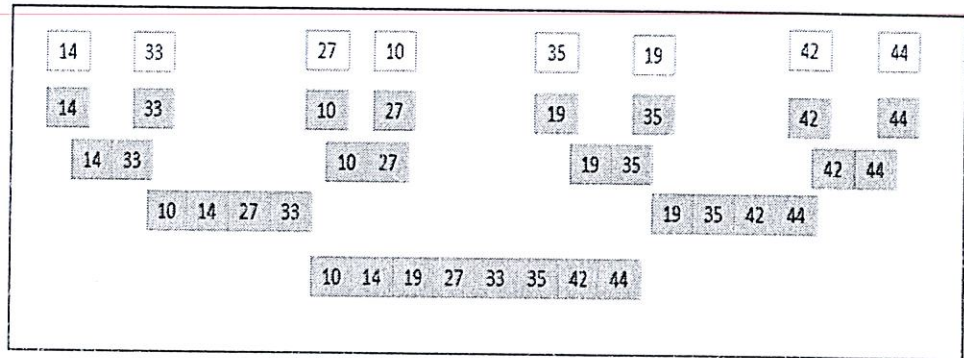
B.



C.



D.



CLO3  
C3

29. Given array {56, 23, 89, 34, 22, 76}. Determine is the result after applying the **second phase** of descending selection sort?

*Diberi tatasusunan {56, 23, 89, 34, 22, 76}. Kenalpasti output selepas fasa kedua sisihan pilihan secara menurun diaplikasikan.*

- A. {23, 56, 89, 34, 22, 76}
- B. {23, 22, 89, 34, 56, 76}
- C. {89, 56, 23, 34, 22, 76}
- D. {89, 76, 56, 34, 22, 23}

CLO3  
C3

30. Choose the correct sorting method based on the following statement.  
~~“The way a card game player arranges his cards as he picks them up one by one”~~

*Pilih kaedah sisihan yang betul berdasarkan pernyataan berikut.*

*“Pemain kad menyusun kadnya dengan mengambil satu demi satu”*

- A. Bubble Sort  
*Isihan Buih*
- B. Selection Sort  
*Isihan Pilihan*
- C. Merge Sort  
*Isihan Gabung*
- D. Insertion Sort  
*Isihan Kemasukan*

## SECTION B: 55 MARKS

**BAHAGIAN B: 55 MARKAH****INSTRUCTION:**

This section consists of **TWO (2)** structured questions. Answer **ALL** questions.

**ARAHAN:**

*Bahagian ini mengandungi DUA (2) soalan berstruktur. Jawab semua soalan.*

**QUESTION 1****SOALAN 1**CLO1  
C1

(a)

- i. Define algorithm  
*Takrifkan algoritma*

[2 marks]

[2 markah]

- ii. State 2 (TWO) characteristics of a good algorithm.  
*Nyatakan 2 (DUA) ciri-ciri algoritma yang baik.*

[2 marks]

[2 markah]

CLO1  
C1

(b) Define the terms below:

*Takrifkan istilah di bawah:*

- i. List  
*Senarai*

[2 marks]

[2 markah]

- ii. Linked List.  
*Senarai berpaut.*

[2 marks]

[2 markah]

CLO2  
C1(c) State **ONE (1)** example of data structure and **ONE (1)** of its application in real life.

*Nyatakan SATU (1) contoh struktur data dan SATU (1) aplikasinya di dalam kehidupan sebenar.*

[3 marks]

[3 markah]

CLO2  
C2

(d) Based on Figure B1, draw the result after:

- i. node 30 is deleted
- ii. node 40 is inserted at the end of list.

*Berdasarkan Rajah B1, lukis hasil selepas :*

- i. *nod 30 dihapuskan*
- ii. *nod 40 dimasukkan pada penghujung senarai.*

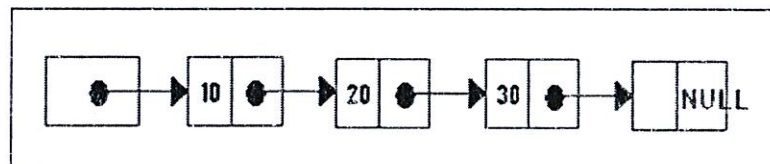


Figure B1/ Rajah B1

[3marks]

[3markah]

CLO2  
C2

(e) Explain the LIFO concept in Stack. Sketch the picture to support your answer.

*Terangkan konsep LIFO dalam tindanan. Lakarkan gambar untuk menyokong jawapan anda.*

[4 marks]

[4markah]

CLO3  
C1

(f) Based on Figure B2, state the situation when:

*Berdasarkan Rajah B2, nyatakan situasi apabila:*

[2]	30
[1]	15
[0]	10

Figure B2/ Rajah B2

- i. element 90 is inserted in the stack  
*elemen 90 dimasukkan ke dalam stack.*

[2 marks]

[2markah]

- ii. all the elements are popped.  
*semua element dihapuskan.*

[2 marks]

[2markah]



## QUESTION 2

## SOALAN 2

CLO2  
C1

(a) Define the difference between enqueue and dequeue.

*Berikan perbezaan diantara Enqueue dan Dequeue.*

[2 marks]

[2 markah]

CLO2  
C2

(b) Based on Figure B3, draw the diagrams after each operation is executed by using Queue applications in Linked List.

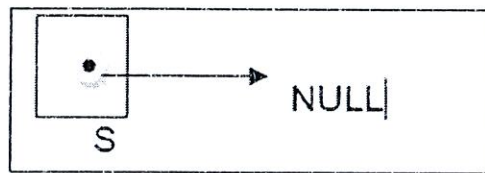
*Berdasarkan Rajah B3, lakarkan rajah selepas setiap operasi dilaksanakan menggunakan aplikasi susunan dalam senarai berpaut.*

Figure B3/ Rajah B3

- i. Enqueue ( 88, &S)
- ii. Enqueue ( 100, &S)
- iii. Enqueue ( 90, &S)
- iv. Dequeue (&S)
- v. Dequeue ( &S)

[5 marks]

[5 markah]

CLO3  
C3

(c) Draw Circular Queue diagram for each statement below. Clearly indicate front, rear and count according to related diagram

*Lukis rajah Barisan Bulatan bagi setiap pernyataan di bawah. Tunjukkan dengan jelas kedudukan depan, belakang dan kiraan berdasarkan setiap diagram.*

- i. Create CircularQueue(Q); Size = 3
- ii. enqueue(88,Q);

[4 marks]

[4 markah]

CLO2  
C1

(d) Based on Figure B4, list all the parent nodes.

*Berdasarkan Rajah B4, senaraikan semua nod 'parent'*

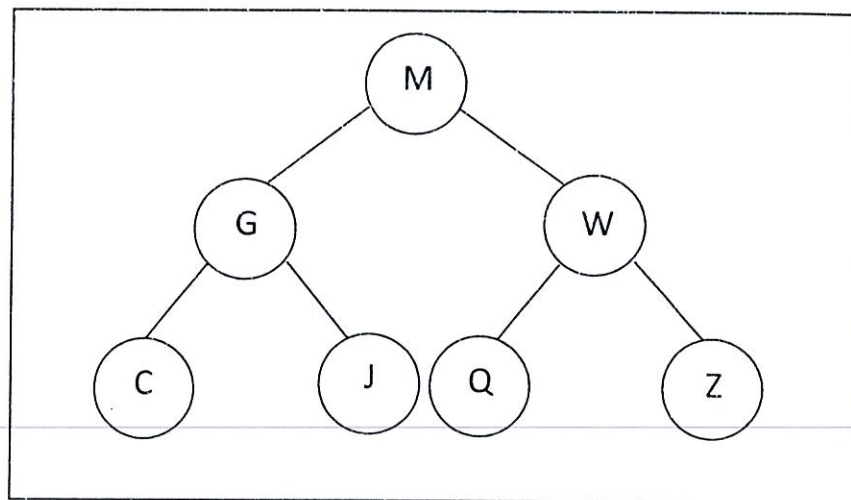


Figure B4/ Rajah B4

[3 marks]

[3markah]

CLO3  
C3

(e) Draw a Binary Search Tree (BST) for each of below:

*Lukis satu Binary Search Tree (BST) di bawah untuk setiap satu:*

i. 20, 30, 45, 31, 23, 19, 15, 18, 13, 50, 21

ii. M, O, R, T, C, F, E, A, S, N, Q

[8 marks]

[8markah]

CLO2  
C1(f) List **TWO (2)** examples of sorting application in daily life.*Senaraikan DUA (2) contoh aplikasi sisihan dalam kehidupan seharian.*

[2 marks]

[2 markah]

CLO2  
C2

(g) Demonstrate Selection Sort for below numbers based on Figure B5.

*Laksanakan Selection Sort untuk nombor di bawah berdasarkan Rajah B5.*

7	4	5	9	8	2	1
---	---	---	---	---	---	---

Figure B5/ Rajah B5

[4 marks]

[4 markah]

CLO3  
C3

(h) Based on Figure B6, by using Merge Sort, show step by step procedure to execute the sorting process.

*Berdasarkan Rajah B6, dengan menggunakan Merge Sort tunjukkan langkah demi langkah dalam melaksanakan proses isihan tersebut.*

38 27 43 3 9 82 10
--------------------

Figure B6/ *Rajah B6*

[5 marks]

[5 markah]

**SOALAN TAMAT**