SECTION A Multiple Choice

Instruction: Write the letter of the correct answer in the box provided. Each correct answer is worth 1 mark.

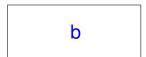
1.	Which phase in the	ne compilation	process	translates	а	compilation	unit	into	an
	assembler file?								

- (a) Preprocessing
- (b) Compilation
- (c) Assembly
- (d) Linking



2. Which of the following is an invalid integer literal?

- (a) 1234
- (b) Oxbeer
- (c) -100U
- (d) 0234



3. Which of the following is a valid C identifier?

- (a) 1node
- (b) break
- (c) first-last-name
- (d) None of the above



4. A C program contains the following declarations:

```
int i, j;
long ix;
short s;
float x;
```

What is the resulting data type of the following expression?

(int) ix / s - 2.6 * c + x * i / j ? (a) int

(b) long

(c) float

(d) double

d

5. What value is assigned to j in the expression j = ++i % i - 1 when i = 3?

- (a) 2
- (b) 1
- (c) 0
- (d) -1

d

6. Consider the following C code snippet:

int i = 1, j = 2, k = 10; i = j += k / 2;

What is the value of i after the second statement?

- (a) 2
- (b) 5
- (c) 7
- (d) 8

C

7. In call by value, the values of formal parameters are copied to actual parameters.

- (a) True
- (b) False

b

8. Consider the following function-like macro:

#define MACRO(X, Y) X * Y - X / Y

What value does the macro evaluate to when invoked as MACRO(2+6, 4-2)?

- (a) 12
- (b) 15
- (c) 18
- (d) 21

d

9. Consider the following statement:

int array $[10] = \{1, 2, 3, 4, 5\};$

Which of the following statements are valid?

- i. array has 5 elements.
- ii. The number of elements in array can be obtained by sizeof(array).
- iii. The value of array [0] is 1.
- iv. The value of array [5] is 5.
- (a) i and ii
- (b) iii
- (c) iv
- (d) They are all invalid

b

10. Consider the following statement:

char str[12] = "Twelve";

What is the length of the string str?

- (a) 6
- (b) 7
- (c) 11
- (d) 12

a

11. Given the declaration below:

```
char name[30];
```

Which of the following statements are **valid**?

```
i. strcpy(name, "Alice");
ii. name = "Bobby";
iii. name = {'C', 'a', 'k', 'e'};
iv. name[0] = 'D';
```

- (a) i and iii
- (b) i and iv
- (c) ii and iii
- (d) They are all valid

b

12. Consider the following C code snippet:

```
char str1[] = "String 1";
char *str2 = "String 2";
```

Which of the following statements involving str1 and str2 are valid?

```
i. str1[0] = 's';
ii. str2[0] = 's';
iii. strcpy(str1, str2);
iv. strcpy(str2, str1);
v. str2 = str1;
vi. str1 = str2;
```

- (a) i, iii, and v
- (b) ii, iv, and vi
- (c) i and ii
- (d) They are all valid

a

13. Consider the following declarations:

int
$$n[] = \{1, 2, 3, 4\};$$

int *p = n + 1;

What is the value of p[1]?

- (a) 1
- (b) 2
- (c) 3
- (d) 4



14. Using the same declarations from question (13), what is the value of *p+1?

- (a) 1
- (b) 2
- (c) 3
- (d) 4

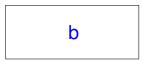


15. Consider the following C code snippet:

enum { apple, banana, cherry=5, date } myfruit = banana;

What is the value of myfruit?

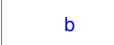
- (a) 0
- (b) 1
- (c) 2
- (d) 6



16. Which of the following statements regarding storage classes are valid?

- i. A variable with static storage class will always have global scope.
- ii. A variable that is declared outside any function will be stored in the data segment.
- iii. The initial value of an uninitialized automatic variable is garbage.

- iv. A variable with register storage class will always be stored in a register.
- v. Variables stored in the heap segment will have static lifetime.
- (a) i and ii
- (b) ii and iii
- (c) iv and v
- (d) The are all valid



- 17. Which of the following is equivalent to the call malloc(10 * sizeof(double))?
 - (a) calloc(10*sizeof(double))
 - (b) calloc(10)
 - (C) calloc(sizeof(double))
 - (d) calloc(10, sizeof(double))



- 18. Which of the following statements regarding memory leak are valid?
 - i. Program will not be able to access leaked memory.
 - ii. Leaked memory will no longer be in the heap segment.
 - iii. Leaked memory cannot be freed, potentially causing program memory usage to keep on growing.
 - iv. Leaked memory is automatically freed using garbage collection.
 - v. Every instance of memory leak will always result in undefined program behaviour.
 - (a) i and iii
 - (b) ii and iv
 - (c) i, iii and v
 - (d) ii, iv and v

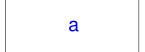


19. Consider the following code snippet:

```
char *ptr = (char *)malloc(16*sizeof(char));
realloc(ptr, 32*sizeof(char));
```

After the call to realloc() on the second line, ptr still points to the previously allocated memory on the the first line.

- (a) True
- (b) False



20. Consider the following code snippet:

```
union {
    char c;
    short s;
    long l;
} u;

u.c = 'A';
```

What is the size of the variable u be equal to?

- (a) sizeof(char)
- (b) sizeof(short)
- (c) sizeof(long)
- (d) None of the above

C

SECTION B Short Answer

Instruction: Write your answer in the box provided.

21. Declare a macro symbolic constant CHARGE with a single-precision floating point value 1.602×10^{-19} . (2 marks)

```
#define CHARGE 1.602e-19f
```

22. Consider the following C program: (2 marks)

```
#include <stdio.h>
int func(int a, int b)
{
    return --a * b;
}
int main(void)
{
    int i = 5;
    int j = 2 * func(1+2, i+1);
    printf("%d %d", i, j);
    return 0;
}
```

What is the output of the program?

```
5 24
```

23. Re-write func(int a, int b) in program in question 22 into a function-like macro FUNC(A, B), such that when the call to func(1+2, i+1) in the program is replaced with FUNC(1+2, i+1), the outputs will remain the same. (2 marks)

```
#define FUNC(A,B) (((A)-1)*(B))
```

24. Using only one C statement, declare an array which can hold 1000 integers named intarray with initial values 1, 2, 3 and 4 for the first four elements, and 0 for the remaining elements: (2 marks)

```
int intarray[1000] = {1, 2, 3, 4};
```

25. Given the following array and pointer declarations: (3 marks)

```
int iarray[] = {1,2,3,4,5};
int *ip = array;
```

Write 3 C expressions showing 3 different ways to access the value stored in the **first element** of iarray.

```
Any 3 of the following: iarray[0], *iarray, *ip, ip[0]
```

26. Declare an enumeration type with identifiers low, medium, and high having values of 10, 11, and 12, respectively. Use risk_level as tag of the enumeration type. (3 marks)

```
enum risk_level { low = 10, medium, high };
```

27. Given the following variable declarations:

```
int a[] = {1, 2, 3, 4, 5};
int *ip = a;
```

Suppose that an int occupies 4 bytes in memory. The array a is at memory address 600, while ip is at memory address 500 (all addresses are in decimal).

(a) What is the numeric value of the expression a? (1 mark)

```
600
```

	(b)	What is the numeric value of the expression ip+1?	(1 mark)
		600+1*4 = 604	
	(c)	What is the numeric value of the expression &a[2]? ((1 mark)
		600+2*4 = 608	
	(d)	What is the numeric value of the expression *(ip+1)? ((1 mark)
		2	
	(e)	What is the numeric value of the expression *++ip? ((1 mark)
		2	
28.	Co	nsider the following C code snippet: (1 mark)	
		ar *cp; = (char *)malloc(15*sizeof(char));	
		suming that the allocation is successful, what is the size (in bytesemory block pointed to by ${\tt cp}$?	s) of the
		15	
29.		efly explain why a function that returns an address to an automatic va problem. (2 marks)	ariable is
	f	An automatic variable only exists within the function. Ther fore, returning an address to this variable would cause udefined program behaviour.	

30. Consider a singly-linked list which contains a list of integers. A node in this list is defined as follows:

```
typedef struct node {
    int data;
    struct node *next;
} Node;
```

Suppose that the node head points to the head of the list. Suppose further the list contains the integers 4, 2, 7, 9, and 6, where 4 is at the head of the list.

(a) What is the value of head->data? (1 mark)

(b) What is the value of head->next->next->data? (1 mark)

(c) What is the output of the following code snippet? (1 mark)

```
Node *p = head->next;
while(p != NULL) {
    printf("%d", p->data);
    p = p->next;
}
```

2796

* * * * * * * * * * * * * * * *