SECTION A

- There are 90 questions listed below, each worth 1 mark.
- There is only one correct answer per question.
- Answer all questions on the multiple choice answer sheet provided.

1. Which of the following Microsoft.Net classes is used to read from a text file?

    a) FileReader
    b) TextReader
    c) StreamReader
    d) All of the above
    e) None of the above

2. An association defines a relationship between classes which

    a) Is typically bidirectional and does not imply any particular semantics
    b) Forms the "part-of" relationship
    c) Forms the "is a" relationship
    d) Requires encapsulation
    e) Represents an abstraction

3. Static binding is to method hiding what dynamic binding is to _____

    a) The debugger
    b) Overriding
    c) Abstract classes
    d) GUI applications
    e) Exceptions

4. In UML notation, which symbol is used to indicate a public member?

    a) -
    b) +
    c) #
    d) ~
    e) None of the above

5. Which of the following is NOT an approach to serialisation?

    a) Binary
    b) HTML
    c) SOAP
    d) XML
    e) None of the above

6. A parameter to a function that only is used for input and output is known as a(n) _____.

    a) Value parameter
    b) Output parameter
    c) Reference parameter
    d) Return value
    e) None of the above

7. Which of the following is NOT a method of accessing a file?

    a) Sequential access
    b) Remote access
    c) Random access
    d) All of the above
    e) None of the above

8. Composition defines a relationship between classes which

    a) Forms the "part-of" relationship where the lifetimes are tightly coupled
    b) Forms the "part-of" relationship where the lifetimes are loosely coupled
    c) Forms the "is a" relationship
    d) Requires encapsulation
    e) Represents an abstraction

9. Which class relationship does NOT result in an object relationship?

    a) Aggregation
    b) Association
    c) Composition
    d) Inheritance
    e) All of the above

10. Object-oriented decomposition helps us to master

    a) Polymorphism
    b) Exceptions
    c) Complexity
    d) UML
    e) None of the above

11. Which of the following is polymorphic?

    a) The Main () method
    b) The ToString() method
    c) All properties
    d) All constructors
    e) None of the above

12. Which of the following guidelines for using exceptions is correct?

   a) Throw an exception only for conditions that are truly exceptional
   b) Don't use an exception to pass the buck
   c) Throw exceptions at the right level of abstraction
   d) All of the above
   e) None of the above

13. Which of the following is used to define the member of a class externally?

   a) ::
   b) :
   c) .
   d) #
   e) None of the above

14. Encapsulation maintains a _____ between the interface to an object and its implementation.

   a) Relationship
   b) Separation
   c) Connection
   d) Design
   e) None of the above

15. In C# read only method, which _____.

   a) allows direct access the encapsulate private object variable(s)
   b) allows to retrieve the encapsulate private object variable(s)
   c) has Get and Set method
   d) has Get method only
   e) All of the above

16. Select the class visibility modifiers among the following :

   a) Private, protected, public, internal, protected internal
   b) Private, protected, public, internal
   c) Private, protected, public
   d) Private, Public
   e) All of the mentioned

17. A class member with a protected access modifier can (only) be accessed by _____

   a) Any code in the program
   b) Any code in the same assembly
   c) Any code in the same class or a derived class
   d) Any code in the same class
   e) None of the above

18. Which of the following keywords provides similar functionality to casting?

    a) abstract
    b) as
    c) foreach
    d) switch
    e) this

19. The data members of a class by default are?

    a) protected
    b) public
    c) private
    d) internal
    e) All of the above

20. A lazy class is _____.

    a) A class with very little functionality to perform
    b) A class added to a design late in the development process
    c) A generic class that was added "just in case"
    d) A class consisting of poorly designed Student objects
    e) None of the above

21. Which of the following binary operators requires both expressions to evaluate to true for the overall expression to also be true?

    a) &&
    b) ||
    c) ==
    d) &
    e) ^

22. The _____ can be used to determine how many columns are in a particular row.

    a) Indexer
    b) Length property
    c) Rank property
    d) GetLength() method
    e) GetValue() method

23. The UML object diagram, it is a sub-type of which UML diagram?

    a) Use case diagram
    b) Class diagram
    c) State machine diagram
    d) Activity diagram
    e) Interaction diagram

24. Which of the following statements is correct?

    a) C# provides a copy constructor if the class does not have
    b) A class can have ONLY one copy constructor
    c) A class can have more than one copy constructor
    d) Copy constructor is parameter less method
    e) Copy constructor could have more than one parameters

25. In regular expressions, the escape sequence \s will match

    a) Any character
    b) Any character that is part of a word
    c) Whitespace
    d) Digits
    e) None of the above

26. Which of the following binary operators will only evaluate the first expression (short circuits) if the first expression evaluates to true?

    a) &&
    b) ||
    c) ==
    d) &
    e) ^

27. The capability of an object in C# to take number of different forms and hence display behaviour as according is known as:

    a) Association
    b) Abstraction
    c) Encapsulation
    d) Inheritance
    e) Polymorphism

28. Which of the following symbols is used in C# for inheritance?

    a) #
    b) :
    c) +
    d) ;
    e) @

29. Which of the following UML diagram types shows how two or more objects communicate when performing some function?

    a) Use case diagram
    b) Class diagram
    c) State machine diagram
    d) Activity diagram
    e) Interaction diagram

30. Correct way of declaration an object n for the name class

    a) name n = new name();
    b) name = new name();
    c) name n = name();
    d) name = name();
    e) n name = new name();

31. Consider the following statement:
```
string myString = "null";
```
This string is known as
    a) An empty string
    b) A normal string
    c) A null string
    d) A syntax error
    e) None of the above

32. Which of the following statement is correct about a string in C#.Net?

    a) The System.Array class is used to represent a string
    b) A number cannot be represented in the form of a string
    c) A string has a zero-base index
    d) A string is mutable because it can be modified once it has been created
    e) All of the above

33. Which of the following UML diagram types shows the relationships between classes in a system?

    a) Use case diagram
    b) Class diagram
    c) State machine diagram
    d) Activity diagram
    e) Interaction diagram

34. To perform comparison operation on strings supported operations are:

    a) Compare()
    b) Equals()
    c) Assignment == operator
    d) All of the above
    e) None of the above

35. A class member with an internal access modifier can (only) be accessed by _____

    a) Any code in the program
    b) Any code in the same assembly
    c) Any code in the same class or a derived class
    d) Any code in the same class
    e) None of the above

36. The statement Console.WriteLine(""Welcome to SIT232"") will produce the output _____.

   a) Welcome to SIT232
   b) "Welcome to SIT232"
   c) ""Welcome to SIT232""
   d) Syntax error
   e) Logic error

37. The use of polymorphism in C# requires

   a) Methods in the base class to be abstract or virtual
   b) Methods in the derived class to be overridden
   c) Objects to be referenced using the base class type
   d) All of the above
   e) None of the above

38. Which of the following is NOT a task when designing an object-oriented application

   a) Identifying class functionality
   b) Identifying how objects interact
   c) Identifying how object links are formed
   d) Identifying classes
   e) None of the above

39. Which of the following is NOT a common signature for an exception constructor?

   a) new type(message)
   b) new type(message, inner_exception, line_number)
   c) new type()
   d) new type(message, inner_exception)
   e) None of the above

40. Which of the following UML diagram types is similar to a flow chart, showing the behaviour of a system?

   a) Use case diagram
   b) Class diagram
   c) State machine diagram
   d) Activity diagram
   e) Interaction diagram

41. Primitive obsession refers to programmers new to object-oriented development being hesitant to
   a) Create very small classes, preferring instead to use custom types
   b) Create very small classes, preferring instead to use simple types (primitive types)
   c) Create very large classes, preferring instead to use custom types
   d) Create very large classes, preferring instead to use simple types (primitive types)
   e) Apply intelligence to solving programming problems, preferring instead to hit the computer.

42. Which of the following is NOT an exception type defined by Microsoft.Net?

 a) ArgumentException
 b) BadDataException
 c) DivideByZeroException
 d) InvalidOperationException
 e) OverflowException

43. We can use the phrase 'is a' for _____ relationships.

 a) Aggregation
 b) Association
 c) Composition
 d) Inheritance
 e) All of the above

44. A constructor that has a single parameter of the same type as the class is known as the

 a) Custom constructor
 b) Default constructor
 c) Duplex constructor
 d) Recursive constructor
 e) Copy constructor

45. Which of the following keyword is used to change data or behaviour of a base class by replacing a member of the base class with a new derived member?

 a) overload
 b) sealed
 c) new
 d) base
 e) virtual

46. Concatenating text means that

 a) Two text values are joined together to make a single text value
 b) The text is converted to lower case
 c) The text is converted to upper case
 d) A numeric value is converted to textual data
 e) The text is assigned to a control which has a Text property

47. Which of the following is NOT a type of file?

 a) External file
 b) Text file
 c) Binary file
 d) All of the above
 e) None of the above

48. The _____ provides the total number of elements in an array.

    a) Indexer
    b) Length property
    c) Rank property
    d) GetLength() method
    e) GetValue() method

49. Abstraction focuses on the _____ aspects of the problem.

    a) Relevant
    b) Irrelevant
    c) Fine details
    d) Implementation
    e) None of the above

50. Two classes that inherit from the same base class are otherwise known as

    a) Siblings
    b) Compatible
    c) Concrete classes
    d) Abstract classes
    e) Sealed classes

51. Which of the following elements are NOT inherited by a derived class?

    a) Constructors
    b) Properties
    c) Exceptions
    d) Diagnostic routines
    e) None of the above

52. Which of the following is the correct order for catching exceptions?

    a) More general types before more specific types
    b) More specific types before more general types
    c) System types before custom types
    d) Custom types before system types
    e) None of the above

53. The constructor that is automatically generated by the compiler is known as the

    a) Generated constructor
    b) Compiler constructor
    c) Default constructor
    d) Standard constructor
    e) MSIL constructor

54. Aggregation defines a relationship between classes which

a) Forms the "part-of" relationship where the lifetimes are tightly coupled
b) Forms the "part-of" relationship where the lifetimes are loosely coupled
c) Forms the "is a" relationship
d) Requires encapsulation
e) Represents an abstraction

55. In C# the control structure that allows multiple discrete values to be tested begins with

a) if
b) case
c) abstract
d) switch
e) test

56. When indicating multiplicity in UML, a single '*' represents

a) Optional objects
b) Many objects
c) Zero or more objects
d) A lack of objects
e) Any type of object (a wildcard)

57. When defining a method, specifying a parameter list is _____ and returning a value is _____

a) Optional, optional
b) Mandatory, optional
c) Optional, mandatory
d) Mandatory, mandatory
e) None of the above

58. Which loop executes one iteration even if the condition evaluates to false?

a) do while
b) for
c) while
d) All of the above
e) None of the above

59. A type of class, which does not have its own objects; but acts as a base class for it sub-class is known as _____ class.

a) static
b) sealed
c) abstract
d) base
e) All of the above

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60. During modelling, which of the following elements should NOT be considered when determining the quality of a design?

    a) Cohesion
    b) Completeness
    c) Coupling
    d) Primitiveness
    e) None of the above

61. The `is` keyword is used for determining

    a) Whether a method is polymorphic or not
    b) Whether a method is static or not
    c) The type of an object
    d) Whether an object has been converted or not
    e) The current time

62. The ability of an application to continue executing in the face of errors is referred to as

    a) Defensive coding
    b) Error handling
    c) Exception handling
    d) Robustness
    e) None of the above

63. Which of the following UML diagram types is useful for capturing the requirements of a system?

    a) Use case diagram
    b) Class diagram
    c) State machine diagram
    d) Activity diagram
    e) Interaction diagram

64. Correct statement about run-time polymorphism is

    a) The overridden base method should be virtual / abstract or override
    b) An abstract method is implicitly a virtual method
    c) Both override method and virtual method must have same access level modifier
    d) All of the above
    e) None of the above;

65. Which of these keywords is used to refer to member of base class from a sub class?

    a) abstract
    b) :
    c) protected
    d) virtual
    e) base

66. Method overloading allows having several methods with the same name and

    a) Different parameter types and/or number of parameters
    b) Must have the same return type
    c) Possibly a different return type
    d) a and b
    e) a and c

67. Garbage collection processes _____ in parallel to the continued execution of an application.

    a) Objects that are no longer referenced
    b) Unreachable objects to determine if they require finalisation
    c) Unreachable objects that don't require finalisation by deallocating them
    d) All of the above
    e) None of the above

68. Prior to the development of exceptions, what was commonly used to identify that an error had occurred?

    a) Debuggers
    b) Return values
    c) Status codes
    d) b and c
    e) All of the above

69. What is the process of defining a method in terms of calling itself?

    a) Polymorphism
    b) Abstraction
    c) Encapsulation
    d) Association
    e) Recursive

70. An attribute is _____

    a) A small piece of data which is somewhat related to the object
    b) A small piece of data describing the object
    c) A means to encapsulate a property
    d) Storing the result of the object's operations
    e) None of the above

71. The UML sequence diagram and UML communications diagram, they are sub-types of which UML diagram?

    a) Use case diagram
    b) Class diagram
    c) State machine diagram
    d) Activity diagram
    e) Interaction diagram

72. In UML notation, which symbol is used to indicate a protected member?

    a) -
    b) +
    c) #
    d) ~
    e) None of the above

73. An object is _____

    a) A blue print to build the class
    b) A data type, which defines the class
    c) An instance of the class
    d) A relationship between classes
    e) A template of the class

74. Polymorphism provides _____.

    a) ability to perform operations on unrelated objects without knowing their specific data type
    b) ability to perform operations on unrelated objects knowing their specific data type
    c) ability to perform operations on related objects without knowing their specific data type
    d) ability to perform operations on related objects knowing their specific data type
    e) None of the above

75. When defining a destructor, specifying a parameter list is _____ and returning a value is _____

    a) Optional, optional
    b) Invalid, optional
    c) Optional, invalid
    d) Invalid, invalid
    e) None of the above

76. In regular expressions, the escape sequence \d will match

    a) Any character
    b) Any character that is part of a word
    c) Whitespace
    d) Digits
    e) None of the above

77. When a programmer wishes to make sure that a method or class will not be modified/specialised through inheritance, which of the following keywords do they apply.

    a) Abstract
    b) Override
    c) Sealed
    d) Virtual
    e) None of the above

78. The _____ access modifier limits access to code in the same class or a derived class.

    a) public
    b) private
    c) protected
    d) protected internal
    e) internal

79. What does the following statement do? `throw;`

    a) It causes the program to immediately terminate
    b) It throws an exception that has previously been caught
    c) It causes the debugger to be invoked
    d) It indicates to the programmer that a method has not yet been implemented
    e) It presents an error message to the user

80. Which of the following functionality is facilitated by inheritance mechanism?

    a) Use the existing functionality of base class
    b) Override the existing functionality of base class
    c) Implements new functionality in derived class
    d) Implements containership
    e) All of the above

81. The use of an `@` symbol before a string literal, e.g., `@"Object-Oriented"` is known as a/an

    a) Complex string literal
    b) Email address literal
    c) Timestamped string literal
    d) Verbatim string literal
    e) None of the above

82. Which procedure among the following should be used to implement a 'Kind of' or 'Has a' a relationship between two entities?

    a) Polymorphism
    b) Inheritance
    c) Template
    d) Containership
    e) b and d

83. In a link relationship

    a) A variable must be declared in the supplier object as a value type object
    b) A variable must be declared in the supplier object as a reference type object
    c) The supplier object is able to invoke the methods of the client object
    d) The client object is able to invoke the methods of the supplier object
    e) None of the above

84. The ability of a program to identify when an error has occurred is known as

    a) Error detection
    b) Error recovery
    c) throw
    d) try/catch
    e) None of the above

85. A fixed size collection of objects of the same type is known as a(n)

    a) List
    b) Dictionary
    c) Array
    d) Stack
    e) Queue

86. Which of the following is NOT an element of an object?

    a) Identity
    b) State
    c) Instantiation
    d) Behaviour
    e) None of the above

87. What is the most specified using class declaration ?

    a) type
    b) scope
    c) Relationship
    d) type & scope
    e) All of the above

88. When undertaking OO modelling, it is important to follow an _____ approach.

    a) Incremental
    b) Insightful
    c) Iterative
    d) a and b
    e) a and c

89. A parameter to a function that only provides input is known as a(n) _____.

    a) Value parameter
    b) Reference parameter
    c) Output parameter
    d) Return value
    e) None of the above

90. The derived class inherits _____ defined in the base class.

   a) All the protected members
   b) All the attributes
   c) All the properties
   d) All the functionality
   e) All of the above

[Section A Total: 90 marks]

SECTION B

- Answer **ALL** questions in the answer booklet provided.

Short Answer Questions **[15 + 15 = 30 marks]**

a) Consider the following problem statement:

Consider the following problem statement:
A university Library has employed your organisation to build a computer system to manage their service system. The Library lend two main borrowing of items: books and periodical, however they are considering expanding into other items in the future. The books consist of both textbook and Non-fiction books. For each book, the system is to record the author, title, publisher, edition (first, second, third, etc.), and bar code number. Non-fiction books are prescribed for subjects and the system must keep track of the subject code, subject name, and the instructor who prescribed the text. Only a title, publisher, issue number and bar code number are required for each periodical item. All borrowed records have a due date and patron ID. The due date is based on patron is a staff or student. The staff could borrow in 3 weeks (21 days) and student could have 1 week (7 days) for the normal borrow item. All over-night item, staff or student have to return in the next day. The staff details have the staff ID, Name, email, department and expired date. The student details have student ID, Name, email, course and enrolled date. The student cannot borrow more than 10 items and staff can have maximum 20 items.

Your task is to prepare a UML class diagram illustrating the concepts in the problem statement above. Your class diagram must demonstrate the following elements:

- Attributes, properties, and methods;
- Collections;
- Abstract classes;
- Inheritance;
- Associations (any type); and
- Cardinality.

b) For this task you are required to write C# code satisfying the following requirements:

- An base class named WageEmployee which has:
  - Four string attributes for the employee ID, name, address, contact number, a decimal rate attribute, an integer unit attribute;
  - Read-only properties encapsulating the above attributes;
  - The method ChangeAddress, ChangeContact, ChangeRate, ChangeUnit which has a string parameter to change the associate class's attribute;
  - A custom constructor which takes id, name, address, contact, rate parameters to initialises the attributes and default 38 hours per week to set for unit attribute;
  - An method Weekly Earning has a integer unit parameter to set the unit attribute return a decimal value from (rate * unit); and
  - A ToString() method which returns a string containing the above data in the format:
  Wage Employee ID: id - *name*
    – address – Contact Number: contact
    – Worked Hours: unit – Hour Rate: rate
      – Weekly Earning: WeeklyEarning
- An class named Commission Employee which inherits from the Wage Employee class and has:
  - A custom constructor which takes id, name, address, contact number, and bonus rate parameters, it add the default ZERO bonus unit to initialises the base class;
  - An override method Weekly Earning has a integer unit parameter to change the base unit attribute and return a decimal value from (commission rate /100* unit); and
  - A ToString() method which returns a string containing all of the stored data in the format:
  Commission Wage Employee ID: id - *name*
    – address – Contact Number: contact
    – Bonus Amount: bonus – Commission Rate: rate
    – Weekly Earning: WeeklyEarning

[Section B Total: 30 marks]

[Grand Total: 120 marks]