

## Question 1

Correct

Mark 1.00 out of 1.00

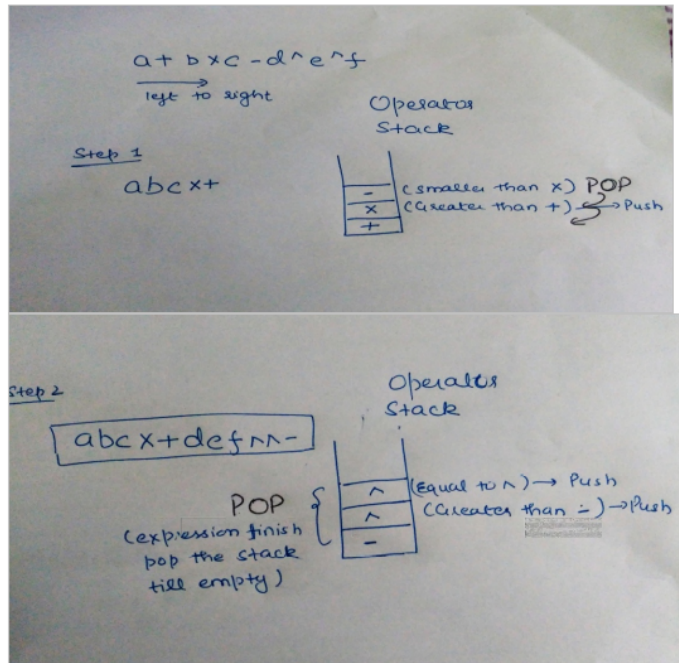
Assume that the operators  $+$ ,  $-$ ,  $\times$  are left associative and  $^$  is right associative. The order of precedence (from highest to lowest) is  $^$ ,  $\times$ ,  $+$ ,  $-$ . The postfix expression corresponding to the infix expression  $a + b \times c - d^e^f$  is

Select one:

- ☒ a.  $abc \times + def \wedge \wedge -$



**Explanation:**  $^$  is right associative.



- ☐ b.  $abc \times + de \wedge f \wedge -$
- ☐ c.  $ab + c \times d - e \wedge f \wedge$
- ☐ d.  $- + a \times bc \wedge \wedge def$

The correct answer is:  $abc \times + def \wedge \wedge -$

## Question 2

Correct

Mark 1.00 out of 1.00

The five items: A, B, C, D, and E are pushed in a stack, one after other starting from A. The stack is popped four items and each element is inserted in a queue. The two elements are deleted from the queue and pushed back on the stack. Now one item is popped from the stack. The popped item is

Select one:

- ☐ a. A
- ☐ b. B
- ☐ c. C
- ☒ d. D



**Explanation:** When five items: A, B, C, D, and E are pushed in a stack: Order of stack becomes: A, B, C, D, and E (A at the bottom and E at the top.) stack is popped four items and each element is inserted in a queue: Order of queue: B, C, D, E (B at rear and E at the front) Order of stack after pop operations = A. Two elements deleted from the queue and pushed back on the stack: New order of stack = A, E, D (A at the bottom, D at the top) As D is on the top so when pop operation occurs D will be popped out. So, correct option is (D).

The correct answer is: D

### Question 3

Correct

Mark 1.00 out of 1.00

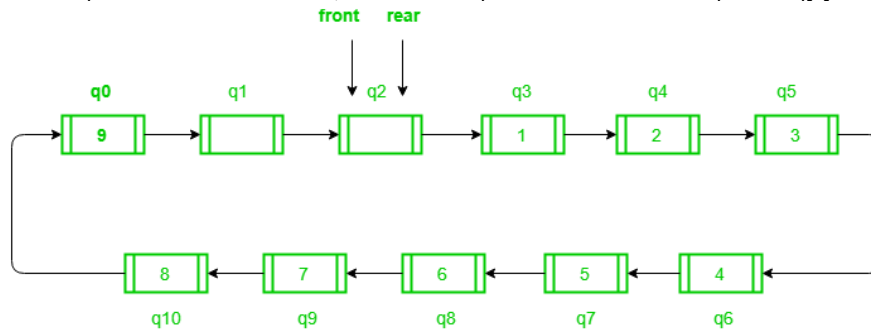
Consider a standard Circular Queue 'q' implementation (which has the same condition for Queue Full and Queue Empty) whose size is 11 and the elements of the queue are  $q[0]$ ,  $q[1]$ ,  $q[2]$ , ...,  $q[10]$ . The front and rear pointers are initialized to point at  $q[2]$ . In which position will the ninth element be added?

Select one:

- ☒ a.  $q[0]$

Explanation:

Circular queue whose total size is 11, front and rear pointers are initialized to point at  $q[2]$ :



Therefore, 9th element will be added at pointer  $q[0]$ .

- ☐ b.  $q[1]$
- ☐ c.  $q[9]$
- ☐ d.  $q[10]$

The correct answer is:  $q[0]$

### Question 4

Correct

Mark 1.00 out of 1.00

The following postfix expression with single digit operands is evaluated using a stack:

8 2 3 ^ / 2 3 \* + 5 1 \* -

Note that ^ is the exponentiation operator. The top two elements of the stack after the first \* is evaluated are:

Select one:

- ☒ a. 6, 1

Explanation :

First three tokens are values, so they are simply pushed. After pushing 8, 2 and 3, the stack is as follows

8, 2, 3

When ^ is read, top two are popped and power( $2^3$ ) is calculated

8, 8

When / is read, top two are popped and division( $8/8$ ) is performed

1

Next two tokens are values, so they are simply pushed. After pushing 2 and 3, the stack is as follows

1, 2, 3

When \* comes, top two are popped and multiplication is performed.

1, 6

- ☐ b. 5,7
- ☐ c. 3,2
- ☐ d. 1,5

The correct answer is: 6, 1

## Question 5

Correct

Mark 1.00 out of 1.00

If the sequence of operations - push (1), push (2), pop, push (1), push (2), pop, pop, pop, push (2), pop are performed on a stack, the sequence of popped out values

Select one:

☒ a. 2,2,1,1,2


**Explanation:** The pop sequence can be seen from the following table:

Operation	Stack	Pop Sequence
Push 1	1	
Push 2	1, 2	
Pop	1	2
Push 1	1, 1	
Push 2	1, 1, 2	
Pop	1, 1	2, 2
Pop	1	2, 2, 1
Pop	Empty	2, 2, 1, 1
Push 2	2	
Pop	Empty	2, 2, 1, 1, 2

☐ b. 2,2,1,2,2

☐ c. 2,1,2,2,1

☐ d. 2,1,2,2,2

The correct answer is: 2,2,1,1,2

## Question 6

Correct

Mark 1.00 out of 1.00

Consider the set of process with arrival time (in milliseconds), CPU burst time (in milliseconds) and priority (0 is the highest priority) shown below. None of the process have I/O burst time

Process	Arrival Time	Burst Time	Priority
$P_1$	0	11	2
$P_2$	5	28	0
$P_3$	12	2	3
$P_4$	2	10	1
$P_5$	9	16	4

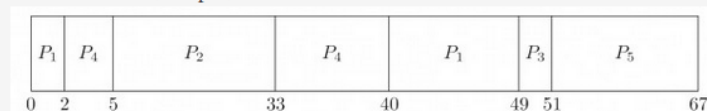
The average waiting time (in milli seconds) of all the process using preemtive priority scheduling algorithm is \_\_\_\_\_

Select one or more:

☐ a. 28

☒ b. 29


Gantt Chart for above problem looks like :



Waiting Time = Completion time - Arrival time - Burst Time

$$\sum AT = 0 + 5 + 12 + 2 + 9 = 28$$

$$\sum BT = 11 + 28 + 2 + 10 + 16 = 67$$

$$\sum CT = 67 + 51 + 49 + 40 + 33 = 240$$

$$\text{Waiting time} = 240 - 28 - 67 = 145$$

$$\text{Average Waiting Time} = \frac{145}{5} = 29 \text{ msec.}$$

☐ c. 30

☐ d. 31

Your answer is correct.

The correct answer is: 29

### Question 7

Correct

Mark 1.00 out of 1.00

Assume that the following jobs are to be executed on a single processor system. The jobs are assumed to have arrival at time 0 and in the order p,q,r,s,t. Calculate the completion time for job p if scheduling is round robin with time slice .

p.id	B.T
p	4
q	1
r	8
s	1
t	2

Select one or more:

- ☐ a. 4
- ☐ b. 10
- ☒ c. 11

✓

p q r s t p r t p r p r r r r r

0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16

- ☐ d. 12

Your answer is correct.

The correct answer is: 11

### Question 8

Correct

Mark 1.00 out of 1.00

A system shares 9 tape drives. The current allocation and maximum requirement of tape drives for that processes are shown below:

Process	Current Allocation	Maximum Requirement
P1	3	7
P2	1	6
P3	3	5

Which of the following best describes current state of the system?

Select one or more:

- ☐ a. Safe, Deadlocked
- ☒ b. Safe, Not Deadlocked

✓

Process	Current Allocation	Max Requirement	Need
P1	3	7	4
P2	1	6	5
P3	3	5	2

Given there are total 9 tape drives,

So, according to the above table we can see we have currently allocated (7 tape drive), so **currently Available tape drives = 2**

So, P3 can use it and after using it will release it 3 resources **New Available = 5**

then P1 can use it and will release it 3 resources so **New Available = 8**

and lastly P2 so, all the process are in **SAFE STATE** and there will be **NO DEADLOCK**

Safe Sequence will be **P3 → P2 → P1** or **P3 → P1 → P2**.

**Answer will be (B) only.**

- ☐ c. Not Safe, Deadlocked
- ☐ d. Not Safe, Not Deadlocked

Your answer is correct.

The correct answer is: Safe, Not Deadlocked

## Question 9

Correct

Mark 1.00 out of 1.00

A computer has six tape drives, with  $N$  processes competing for them. Each process may need two drives. What is the maximum value of  $N$  for the system to be deadlock free?

Select one or more:

☐ a. 6☒ b. 5

6 resources,  $n$  processes and maximum demand for each process is 2.

For getting maximum value of  $n$ ,

Consider an extreme case of deadlock wherein a chain of  $n$  processes, each process just only needs 1 more resource to start execution. Means each process has been allocated resources equal to 1 less than its actual demand.

Now, if we have 1 more resource, in our system, then this chain of deadlock can be broken and then the deadlock will never occur.

$N \times (2-1)$  (Give all  $n$  processes 1 less resource than max demand)  $+1$  (This extra resource will break deadlock)  $= 6$

$N+1=6$

$N=5$ .

**Cross Check**

P1	P2	P3	P4	P5
1	1	1	1	1

Now, only 1 resource remaining and this will break above chain of deadlocked processes.

Hence, **answer-5**

☐ c. 3☐ d. 4

Your answer is correct.

The correct answer is: 5

## Question 10

Correct

Mark 1.00 out of 1.00

An operating system uses the *Banker's algorithm* for deadlock avoidance when managing the allocation of three resource types  $X$ ,  $Y$ , and  $Z$  to three processes  $P0$ ,  $P1$ , and  $P2$ . The table given below presents the current system state. Here, the *Allocation matrix* shows the current number of resources of each type allocated to each process and the *Max matrix* shows the maximum number of resources of each type required by each process during its execution.

	Allocation			Max		
	X	Y	Z	X	Y	Z
<b>P0</b>	0	0	1	8	4	3
<b>P1</b>	3	2	0	6	2	0
<b>P2</b>	2	1	1	3	3	3

There are 3 units of type  $X$ , 2 units of type  $Y$  and 2 units of type  $Z$  still available. The system is currently in a **safe** state. Consider the following independent requests for additional resources in the current state:

**REQ1:**  $P0$  requests 0 units of  $X$ , 0 units of  $Y$  and 2 units of  $Z$

**REQ2:**  $P1$  requests 2 units of  $X$ , 0 units of  $Y$  and 0 units of  $Z$

Which one of the following is **TRUE**?

Select one or more:

- ☐ a. Only REQ1 can be permitted.
- ☒ b. Only REQ2 can be permitted



Request 1 if permitted does not lead to a safe state.

After allowing Req 1,

	Allocated			Max			Requirement		
<b>P0</b>	0	0	3	8	4	3	8	4	0
<b>P1</b>	3	2	0	6	2	0	3	0	0
<b>P2</b>	2	1	1	3	3	3	1	2	2

Available :  $X = 3, Y = 2, Z = 0$

Now we can satisfy  $P1$ 's requirement completely. So Available becomes :  $X = 6, Y = 4, Z = 0$ .

Since,  $Z$  is not available now, neither  $P0$ 's nor  $P2$ 's requirement can be satisfied. So, it is an unsafe state.

- ☐ c. Both REQ1 and REQ2 can be permitted.
- ☐ d. Neither REQ1 nor REQ2 can be permitted.

Your answer is correct.

The correct answer is: Only REQ2 can be permitted

**Question 11**

Correct

Mark 1.00 out of 1.00

What is the output of the following code?

```
1: class Mammal {  
2: public Mammal(int age) {  
3: System.out.print("Mammal");  
4: }  
5: }  
6: public class Platypus extends Mammal {  
7: public Platypus() {  
8: System.out.print("Platypus");  
9: }  
10: public static void main(String[] args) {  
11: new Mammal(5);  
12: }  
13: }
```

Select one or more:

- ☐ a. Platypus
- ☐ b. Mammal
- ☐ c. PlatypusMammal
- ☐ d. MammalPlatypus
- ☒ e. The code will not compile because of line 8.



E. The code will not compile because the parent class Mammal doesn't define a no-argument constructor, so the first line of a Platypus constructor should be an explicit call to super(int age). If there was such a call, then the output would be MammalPlatypus, since the super constructor is executed before the child constructor.

- ☐ f. The code will not compile because of line 11.

Your answer is correct.

The correct answer is: The code will not compile because of line 8.

**Question 12**

Correct

Mark 1.00 out of 1.00

Which statement(s) are correct about the following code? (Choose all that apply)

```
public class Rodent {
    protected static Integer chew() throws Exception {
        System.out.println("Rodent is chewing");
        return 1;
    }
}

public class Beaver extends Rodent {
    public Number chew() throws RuntimeException {
        System.out.println("Beaver is chewing on wood");
        return 2;
    }
}
```

Select one or more:

- ☐ a. It will compile without issue.
- ☐ b. It fails to compile because the type of the exception the method throws is a subclass of the type of exception the parent method throws.
- ☒ c. It fails to compile because the return types are not covariant.
- ☐ d. It fails to compile because the method is protected in the parent class and public in the subclass.
- ☒ e. It fails to compile because of a static modifier mismatch between the two methods.

C, E. The code doesn't compile, so option A is incorrect. Option B is also not correct because the rules for overriding a method allow a subclass to define a method with an exception that is a subclass of the exception in the parent method. Option C is correct because the return types are not covariant; in particular, Number is not a subclass of Integer. Option D is incorrect because the subclass defines a method that is more accessible than the method in the parent class, which is allowed. Finally, option E is correct because the method is declared as static in the parent class and not so in the child class. For nonprivate methods in the parent class, both methods must use static (hide) or neither should use static (override).

Your answer is correct.

The correct answer is: It fails to compile because the return types are not covariant., It fails to compile because of a static modifier mismatch between the two methods.

**Question 13**

Correct

Mark 1.00 out of 1.00

Which of the following statements about polymorphism are true? (Choose all that apply)

Select one or more:

- ☐ a. A reference to an object may be cast to a subclass of the object without an explicit cast.
- ☒ b. If a method takes a superclass of three objects, then any of those classes may be passed as a parameter to the method.
- ☒ c. A method that takes a parameter with type java.lang.Object will take any reference.

B, C. a reference to an object requires an explicit cast if referenced with a subclass, so option A is incorrect. If the cast is to a superclass reference, then an explicit cast is not required. Because of polymorphic parameters, if a method takes the superclass of an object as a parameter, then any subclass references may be used without a cast, so option B is correct. All objects extend java.lang.Object, so if a method takes that type, any valid object, including null, may be passed; therefore, option C is correct. Some cast exceptions can be detected as errors at compile-time, but others can only be detected at runtime, so D is incorrect. Due to the nature of polymorphism, a public instance method can be overridden in a subclass and calls to it will be replaced even in the superclass it was defined, so E is incorrect.

- ☐ d. All cast exceptions can be detected at compile-time
- ☐ e. By defining a public instance method in the superclass, you guarantee that the specific method will be called in the parent class at runtime.

Your answer is correct.

The correct answer is: If a method takes a superclass of three objects, then any of those classes may be passed as a parameter to the method., A method that takes a parameter with type java.lang.Object will take any reference.



**Question 14**

Correct

Mark 1.00 out of 1.00

What is the output of the following code?

```
1: interface Nocturnal {  
2:     default boolean isBlind() { return true; }  
3: }  
4: public class Owl implements Nocturnal {  
5:     public boolean isBlind() { return false; }  
6:     public static void main(String[] args) {  
7:         Nocturnal nocturnal = (Nocturnal)new Owl();  
8:         System.out.println(nocturnal.isBlind());  
9:     }  
10: }
```

Select one or more:

- ☐ a. true  
☒ b. false



B. This code compiles and runs without issue, outputting false, so option B is the correct answer. The first declaration of isBlind() is as a default interface method, assumed public. The second declaration of isBlind() correctly overrides the default interface method. Finally, the newly created Owl instance may be automatically cast to a Nocturnal reference without an explicit cast, although adding it doesn't break the code

- ☐ c. The code will not compile because of line 2.  
☐ d. The code will not compile because of line 5.  
☐ e. The code will not compile because of line 7  
☐ f. The code will not compile because of line 8.

Your answer is correct.

The correct answer is: false

**Question 15**

Correct

Mark 1.00 out of 1.00

What is the output of the following code?

```
1: abstract class Reptile {  
2:     public final void layEggs() { System.out.println("Reptile laying eggs");  
3: }  
4:     public static void main(String[] args) {  
5:         Reptile reptile = new Lizard();  
6:         reptile.layEggs();  
7:     }  
8: }  
9: public class Lizard extends Reptile {  
10:     public void layEggs() { System.out.println("Lizard laying eggs"); }  
11: }
```

Select one or more:

- ☐ a. Reptile laying eggs  
☐ b. Lizard laying eggs  
☐ c. The code will not compile because of line 4.  
☐ d. The code will not compile because of line 5.  
☒ e. The code will not compile because of line 9.



E. The code doesn't compile, so options A and B are incorrect. The issue with line 9 is that layEggs() is marked as final in the superclass Reptile, which means it cannot be overridden. There are no errors on any other lines, so options C and D are incorrect.

Your answer is correct.

The correct answer is: The code will not compile because of line 9.