ADSSE Exam answers 2019

1. a) true
   b) false
   c) true
   d) false
   e) true
   f) false
   g) true
   h) true
   i) true
   j) true

[1 mark for each part a - e]

2. a) $T(n) = \Theta(n^3)$
   b) $T(n) = \Theta(\sqrt{n}\, lg\, n)$
   c) $T(n) = \Theta(\sqrt{n})$
   d) $T(n) = \Theta(n^2\, lg\, n)$
   e) $T(n) = \Theta(n^3)$

[2 marks for each part a - e]

3. a) {4,2,1,3,4,7,5,6,8,9}
   b) 5
   c) $O(n)$
   d) Anything strictly less than linear. For example, ω(1) or $\omega(\sqrt{n})$.
   e) *r*

[2 marks for each part a - e]

4. a) Queue [1 mark]
   b) Stack [1 mark]
   c) Push(S,x)

```
if S.top == S.length
        print “Cannot push x onto S – S is full”
S.top++
S[S.top] = x
```

   [3 marks]
   d) O(1) [1 mark]
   e) Dequeue(Q)

```
if Q.tail == Q.head + 1
        print “Stack underflow error”
if Q.head == Q.length and Q.tail == 1
        print “Stack underflow error”
x = Q[Q.head]
if Q.head == Q.length
        Q.head = 1
else
        Q.head++
```

return x

[3 marks]

f) Θ(1) [1 mark]

5. a)

i) Values of input features / input values / output values of the previous layer's nodes [1 mark]

‘ ii) Weight used to multiply x1 [1 mark]

iii) Bias [1 mark]

b) lower case sigma symbol or box with binary-step symbol in it [1 mark]

c) binary (step) [1 mark]

d) Vanishing gradient [1 mark]

e) Overfitting [1 mark]

f) Using dropout [1 mark]

g) i. binary classification (not single-label, multi-class or multi-label-multi-class) [1 mark]

ii. regression producing a numerical value [1 mark]

6. WWWWWWW = 25. model.add(layers.Dense(50, activation="relu")) [2 marks]

XXXXXXX = 26. model.add(layers.Dropout(0.2, noise_shape=None, seed=None)) [2 marks]

YYYYYYY = 27. model.add(layers.Dense(50, activation="relu")) [2 marks]

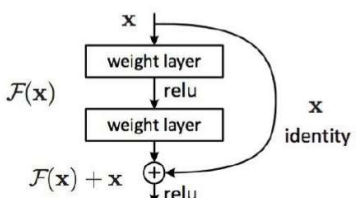
ZZZZZZZ = 28. model.add(layers.Dense(1, activation="sigmoid")) [2 marks]

a) Splitting the data into training and test splits. [1 mark]

b) 40000 [1 mark]

7. a) Convolutional, pooling, fully-connected, decision, loss [1/2 mark for each correct type]

b)



[2.5 marks]

c) For generalization, to eliminate overfitting [1 mark]

d) x = 4, y = 2 [2 marks]

e) [[4, 6, 5], [6, 6, 8], [9, 8, 8]] [2 marks]

8. a) 543

b) Some doc

c) 123

d) 543

e) hello Albert

f) Albert

g) Fred

h) hello Charles 3.141

i) Error - j is only defined in the constructor

j) Error - self is not assigned

[1 mark for each correct part]

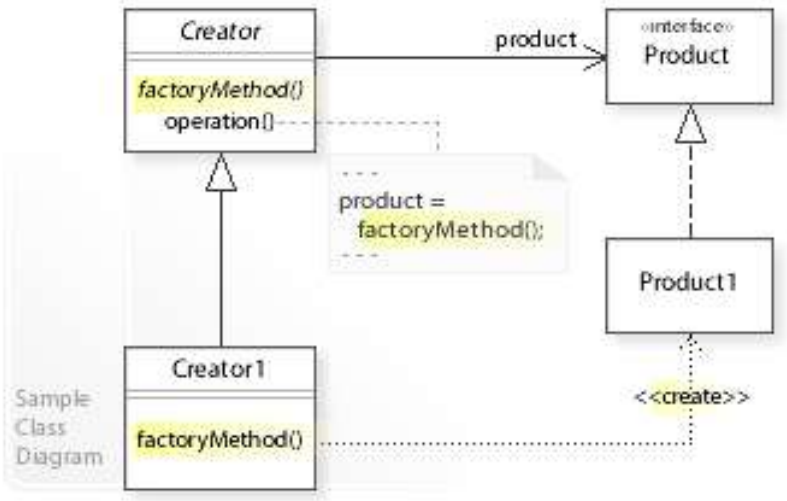
9.

a) Object composition is where the functionality of a class B is added to a class A by allowing each instance of class A to refer to an instance of class B. [2 marks]

Object composition is usually preferable to inheritance because the containing class is not locked into using a specific implementation of the functionality provided by the service class. You can replace the component object with any other that has the same interface without having to modify the containing class. Object composition does not break encapsulation, whereas inheritance does. [2 marks]

b) Programming to an interface is the practice of ensuring that client code refers to objects whose type is as high up the inheritance tree as possible. That is, the client code should use objects whose classes are as generic as possible – preferably interfaces. The benefit of this is that the runtime type of the server modules can be changed without changing the client code. [2 marks]

c)



Creational pattern that promotes programming to an interface. Allows client code to refer to Creator objects without having to specify the runtime type of these objects. Each Creator object can own a Product type object to which the client code can also refer without knowing the specific runtime type of these owned objects. [4 marks]

10.

a) Product backlog is the model of the work to be done, ordered list of product requirements, includes user stories, features, bug fixes, visible to everyone but only changed by product owner. [2 marks]

b) Sprint is a time-boxed iteration lasting 1 week to 1 month. Starts with a planning event, ends with a sprint review and retrospective. At end of each sprint, software should be integrated, tested, documented and potentially releasable. [2 marks]

c)

i. Product owner represents product's stakeholders, responsible for the product backlog, defines product in user-centric terms, adds user stories to product backlog and prioritizes them, focuses on business side, not the scrum master.[2 marks]

ii. The development team delivers a potentially releasable product after each sprint, consists of 3 to 9 members, is self-organising, facilitated by scrum master. [2 marks]

iii. Scrum master removes obstacles to the team achieving its goals, ensures scrum framework is followed, helps product owner maintain product backlog, helps team determine when job is done, coaches team, promoting self-organization, not a manager. [2 marks]