ASTQB Certified Tester
AI Testing v1.0
Sample Exam Answers

American Software Testing Qualifications Board

47 Points Possible : Passing Grade = 31 Points

1. Which of these is a machine learning technique? (1 pt)

a. Rule engine
b. Clustering algorithm
c. Case-based reasoning
d. Search algorithm

B is correct. This is a machine learning technique. A and C are reasoning techniques. D is a technology, but not a specific ML technique. (AI-1.4.1 K1 Recognize the different technologies used to implement AI.)

2. Which of the following is a type of AI system that has capabilities similar to the cognitive abilities of humans? (1 pt)

a. Narrow AI
b. General AI
c. Super AI
d. Super-human AI

B is correct. The General AI system is the closest to a human's way of thinking. Narrow AI carries out specific tasks in a limited context. Super AI is capable of replicating human cognition and has access to all human knowledge. Super-human AI doesn't exist. Yet. (AI-1.2.1 K2 Distinguish between narrow AI, general AI, and super AI.)

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3. Which of the following is a benefit of training a model using computing power in the cloud? (1 pt)

a. a. It will be faster than one trained with on-premise servers
b. Once trained it can be deployed on devices with much less computing power
c. It will continue learning as long as it is deployed
d. Once deployed to a device, it can continue to learn from the cloud

B is correct. This is an example, such as a smartphone, that can benefit from a model that has been trained on speech recognition in a much higher-powered environment. Since learning is no longer necessary, it requires less resources to run. (AI-1.6.1 K2 Compare the choices available for hardware to implement AI-based systems.)

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4. A pre-trained model may lack transparency compared to a model generated internally in an organization. Which of the following is a risk that results from this lack of transparency? (1 pt)

a. It may be very slow
b. It will have more vulnerabilities than an internally trained model
c. It may have inherited biases
d. It cannot be modified to be used on a deep neural network

C is correct. Because there is limited transparency, there may have been biases built into the model of which you are unaware. A is unlikely to happen just because it is pre-trained. B is not an absolute truth. An internally trained model can have vulnerabilities too and may have more than a pre-trained model. D is not correct because it can be modified to be used on a deep neural network. (AI-1.8.1 K2 Explain the use of pre-trained AI models and the risks associated with them.)

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5. Which of the following is a true statement about AI-based system and autonomy? (1 pt)

a. No AI-based system is autonomous because all require some level of human intervention
b. Some AI-based systems are autonomous but some require human intervention
c. All AI-based systems are autonomous by default
d. True autonomy can only be achieved by humans, not by AI-based systems

B is correct. (AI-2.2.1 K2 Explain the relationship between autonomy and AI-based systems.)

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6. You are testing an AI-based system that is used to determine the best university major for a high school graduate. In your test data, you have created a set of 10 people who have identical high school records. The only difference is that five are women and five are men. All five of the men received a recommendation for entering a computer science major, and all five of the women got a recommendation for a financial accounting major. You repeated the test with eight men and two women and got the same results with all the men being recommended for computer science.

This is an example of what type of behavior in the AI-based system? (1 pt)

a. Bias
b. Autonomy
c. Evolution
d. Adaptability

A is correct. The results seem to be showing a gender-related bias assuming all the candidates are equal in every other way. (AI-2.4.1 K2 Describe the different causes and types of bias found in AI-based systems.)

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7. You are working with an AI-based system that is supposed to guess a word in five tries or less. The word it is guessing is changed each time, but you have found that the system is guessing it in one try. Looking more closely, you can see that it is not recording its guesses until it gets it right.

This is an example of what type of behavior? (1 pt)

a. Side effect
b. Transparency
c. Bias
d. Reward hacking

D is correct. The system has found a way to get to the goal without incurring any penalties for incorrect guesses. (AI-2.6.1 K2 Explain the occurrence of side effects and reward hacking in AI-based systems.)

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8. An AI-based system is being used to determine the best drugs to use given a set of medical data for an individual. While it performed reliably at the beginning, it is now selecting experimental drugs as well as those that are approved for use. This is an example of what characteristic? (1 pt)

a. Self-learning
b. Lack of robustness
c. Autonomy
d. Transparency

A is correct. This is the most likely explanation and the system seems to be learning about experimental drugs as well as those that are already approved for use. (AI-2.8.1 K1 Recall the characteristics that make it difficult to use AI-based systems in safety- related applications.)

9. If an intelligent agent is rewarded when it makes the correct decision and penalized when it makes the wrong one, what type of learning is this? (1 pt)

a. Classification
b. Clustering
c. Reinforcement
d. Iterative

C is correct. This is reinforcement learning. (AI-3.1.3 K2 Describe reinforcement learning.)

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10. In the ML workflow, what step comes immediately after training the model? (1 pt)

a. Evaluating the model
b. Tuning the model
c. Deploying the model
d. Understanding the objectives

A is correct. The order is train, evaluate, tune, test, deploy, use, monitor and tune. (AI-3.2.1 K2 Summarize the workflow used to create an ML system.)

11. You are working with a model that works well with the data that was used to train it, but it does not provide accurate predictions for new data. What problem has occurred? (1 pt)

a. Underfitting
b. Tuning
c. Unsupervised learning
d. Overfitting

D is correct. This is an example of overfitting because the model tries to fit to every data point, even if they might be noise or outliers. (AI-3.5.1 K2 Summarize the concepts of underfitting and overfitting.)

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12. You are developing an AI-based system that will be used by pet stores. This system will take information regarding buyer behavior, which is recorded via the loyalty program, as well as frequency of purchases. This data will be used to determine which sale items will be most attractive to individual customers. You have decided to use unsupervised learning to build your ML model. What type of problem will you be solving with this approach? (2 pts)

a. Clustering
b. Classification
c. Association
d. Reinforcement

C is correct. This is a situation that needs the model to determine the associations between the purchasing data and use that to predict future buying tendencies. (AI-3.3.1 Given a project scenario, identify an appropriate form of ML (from classification, regression, clustering, association, or reinforcement learning).)

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13. Which of the following contains the three major components of data preparation in the ML workflow? (1 pt)

a. Data identification, data gathering, data labelling
b. Data identification, data cleaning, data sampling
c. Data gathering, data transformation, feature extraction
d. Data acquisition, data pre-processing, feature engineering

D is correct, these are the three major components. A, B, and C are incorrect as these are all tasks within the major areas.Options A, B, and C include tasks within these areas but are not the primary components. (AI-4.1.1 K2 Describe the activities and challenges related to data preparation)

14. When should the test dataset be used for training the ML model? (1 pt)

a. Never
b. Only when it contains data not available in any other dataset
c. Always
d. Only if the training dataset is not large enough without it

A is correct. You should never use the test data in the training dataset because you want it to be an independent test of the model. If the model is trained on the test data, the test data will always work, which is not the goal of the test. (AI-4.2.1 K2 Contrast the use of training, validation and test datasets in the development of an ML model.)

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15. Which of the following is a risk with unbalanced data?(1 pt)

a. It may tend to be negative rather than positive
b. There will be too much data for the model to consume and assimilate
c. There may be an inappropriate bias in the data
d. It is likely that a significant amount of the data will be obsolete

C is correct. The risk with the unbalanced data is that it may have a skew that could result in an inappropriate bias such as race, age, etc. A is not correct because there is no tendency either way. B is not correct because the model can always consume more data. D is not correct because unbalance doesn't have anything to do with quantity. (AI-4.4.1 K2 Recognize how poor data quality can cause problems with the resultant ML model.)

16. You are working on a project that is using outsourced data labelers. They are required to make some subjective judgements regarding the proper labelling. What is a mislabeling error in this scenario that is likely to occur when different annotators are being used for the same dataset? (1 pt)

a. Deliberate errors
b. Tooling issues
c. Conflicting data labels
d. Complex classification categorization

C is correct. Because there are multiple annotators and each is making their own judgement, conflicting data labels are likely to occur. A, B and D do not apply to this scenario. (AI-4.5.2 K1 Recall reasons for the data in datasets being mislabeled.)

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17. You are working with a ML model that predicts shopper habits. In particular, it is predicting the number of targeted shoppers who will buy an item that has been strategically displayed in a grocery store. To evaluate the model, you are particularly interested in its accuracy and precision. You have collected the following data for the confusion matrix:

	Actual Positive	Actual Negative
Predicted Positive	400	100
Predicted Negative	200	300

What is the correct number for the Accuracy and the Precision of this data? (2 pts)

a. Accuracy = 60%, Precision = 90%
b. Accuracy = 70%, Precision = 80%
c. Accuracy = 80%, Precision = 70%
d. Accuracy = 90%, Precision = 60%

B is correct. Calculations:
Table is read: TP | FP

FN | TN

Accuracy = (TP + TN) / (TP + TN + FP + FN) * 100%
Accuracy = (400 + 300) / (400 + 300 + 100 + 200) * 100%
(700 / 1000) * 100%
70%

Precision = TP / (TP + FP) * 100%
= 400 / (400 + 100) * 100%
= (400 / 500) * 100%
= 80%

(AI-5.1.1 K3 Calculate the ML functional performance metrics from a given set of confusion matrix data.)

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18. You are using supervised regression metrics to determine the efficiency of your ML model. You are finding that the Mean Square Error is nearly zero. What does this mean? (1 pt)

a. The data from the metric is not valid because it should be negative
b. The regression model is good
c. There is a high similarity of data points within a cluster
d. The model distinguishes well between classes

B is correct. An MSE approaching zero is an indication that the regression model is good. A is not correct because the value is always positive. C is determined by unsupervised clustering metrics. D is determined by the Area Under Curve in supervised classification metrics. (AI-5.2.1 K2 Contrast and compare the concepts behind the ML functional performance metrics for classification, regression and clustering methods.)

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19. You are working with an ML model that will use facial recognition to identify known offenders for a chain of grocery stores. This model will be trained with photographs of people who have committed any of the following offenses at any one of the chain's stores: shoplifting, exhibiting threatening behavior toward staff, exhibiting threatening or anti-social behavior toward other customers. There has been a considerable amount of negative press about implementing this system, but the stores feel it is critical to maintain a safe environment for staff and customers. It is very important that the recognition does not mistakenly identify innocent people as they will be denied entry and taken aside for questioning by the police.

Given this information, what performance metric would be the most important one to use for this system? (2 pts)

a. Accuracy
b. Precision
c. Recall
d. F1-score

B is correct because there is a high cost for false positives (identifying someone as an offender when they aren't) and the confidence in positive outcomes needs to be high. (AI-5.4.1 K4 Select appropriate ML functional performance metrics and/or their values for a given ML model and scenario.)

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20. In a neural network, where does a neuron get the inputs to compute its activation value? (1 pt)

a. From the activation values for all the neurons in the previous layer of the network
b. From the activation values for all the neurons in the network within the specified classification
c. From the pre-set bias value
d. From the training data

A is correct. This is how the activation values are obtained. (AI-6.1.1 K2 Explain the structure and function of a neural network including a DNN.)

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21. You have been tasked with designing tests to determine the coverage for a neural network. You have determined that you really want to be sure that each neuron receives both positive and negative activation values. Which coverage should you be checking? (1 pt)

a. Threshold
b. Value-Change
c. Sign-Sign
d. Sign-Change

D is correct. This will check to see if the test cases are causing each neuron to achieve both positive and negative activation values. A is not correct because this looks for an activation value over a certain threshold. C is not correct because this is checking to be sure that changing the sign of a neuron on one layer causes the neuron on the next layer to change its sign. B is not correct because this requires that each neuron receives to activation values.(AI-6.2.1 K2 Describe the different coverage measures for neural networks.)

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22. What is a problem with the testers using the same approach to data acquisition and pre-processing as the data scientists used to train the model? (1 pt)

a. It may not be possible to get a large enough amount of data
b. The data may be out of date
c. Defects in the data acquisition and processing methods may be masked
d. The data will contain many duplicates that will invalidate the test metrics

C is correct. A and B shouldn't happen because the same acquisition model is being used. D may happen, but that will be true of the real data as well so it's not a defect. (AI-7.3.1 K1 Recall those factors associated with test data that can make testing AI-based systems difficult.)

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23. How is component integration testing different when AI is provided as a service that is used by the larger system? (1 pt)

a. AI should only be tested at the system level when all components are integrated
b. The AI service should be tested as a component itself and not as an integrated component
c. AI cannot be tested by itself, so it can only be tested from the acceptance testing level
d. The AI service's APIs should be tested as part of the component integration testing

D is correct. The AI service can be tested itself at the component level and the calling of the service can be tested via the APIs. (AI-7.2.1 K2 Describe how AI-based systems are tested at each test level)

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24. You are using your mobile phone to text a message to a work colleague. You were intending to type "I'll be out sick today because I have the stomach flu". The auto correct instead said "I'll be out licking today because I have the stomach fluctuation". You did not notice this "correction" and sent it, much to the amusement of your colleague. What does this demonstrate? (1 pt)

a. You have an automation or complacency bias and did not check the message before you sent it
b. You cannot type fast enough
c. You have an automation or complacency bias because you did not adequately monitor the system you were using
d. You should have tested the auto complete before using it to send a work message

A is correct. B might be right too... C would apply to a different type of system. D is not correct because you are not actually testing the system. (AI-7.4.1 K2 Explain automation bias and how this affects testing.)

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25. You are testing an AI-based cancer detection system. It is imperative that false-negatives are avoided, and that false-positives are minimized. You have been calculating the performance metrics and the F1-score is near to zero. What should you do? (2 pts)

a. Do nothing as the F1-score near zero is the goal for this system
b. Use the Precision metric rather than the F1-score since the F1-score could be giving a one-sided result
c. Have an expert review the training data to be sure it was correct
d. Review the operational pipeline to be sure the integration is working correctly

C is correct. An F1-score near zero indicates the model is poor at detecting positives and this is definitely not the goal. In this case, it's likely the model itself is at fault so having an expert look at the training data should be the next step. A is not correct because you want an F1-score near to 1 for this system. B is not correct because you want both the Precision (being sure about positive predictions) and Recall (not missing any positives) to be considered and those are considered with an F1-score calculation (2 * (Precision * Recall) / (Precision + Recall). D is not correct because that's unlikely the issue in this case. (AI-7.7.1 K4 For a given scenario determine a test approach to be followed when developing an ML system.)

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26. Which testing technique is recommended when testing the ability of an autonomous AI-based system to request human intervention? (1 pt)

a. Equivalence partitioning
b. Boundary value analysis
c. Decision tables
d. Exploratory

B is correct. This will help to understand the conditions that need to be generated to create the situation where the system should either relinquish control or should request human intervention. (AI-8.2.1 K2 Describe how autonomous AI-based systems are tested)

27. What is a testing challenge that is caused when an AI-based system is non-deterministic? (1 pt)

a. Reproducibility may be difficult
b. Exploratory testing cannot be used
c. Test automation must be keyword-driven
d. Including screenshots in the test results may be difficult

A is correct. The biggest problem with non-deterministic systems is that there isn't one "right" answer so when a test is run multiple times, it may get different, but correct, results. This makes automation difficult and regression testing/confirmation testing difficult. (AI-8.4.1 K2 Explain the challenges in testing created by the probabilistic and non-deterministic nature of AI-based systems.)

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28. When testing for transparency in an AI-based system, what is compared? (1 pt)

a. a. The inputs are compared to the outputs
b. The training data is compared to the test data
c. The expected results are compared to the actual results based on the LIME method
d. The documentation on the data and algorithm is compared to the actual implementation

D is correct. (AI-8.6.1 K2 Describe how the transparency, interpretability and explainability of AI-based systems can be tested.)

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29. You are testing an autonomous lawn mower. The mower is expected to ask for human intervention if it finds that it is not on grass, dirt, or a hard surface (such as concrete). This is a feature that is designed to stop it and have it ask for help if it ventures into a flower bed or some other unusual planting.

You have prepared the following test cases:

1. **Place the mower on concrete in front of a patch of flowers and tell it to mow forward**
2. **Place the mower on grass and program it to drive across concrete onto another patch of grass**
3. **Turn off the mower, place it on the dirt, start it and see if it mows forward**
4. **Turn off the mower, place it in a patch of flowers and see if it mows forward**
5. **Place the mower on grass and see if it mows forward**
6. **Place the mower on dirt in front of a patch of flowers and tell it to mow forward**
7. **Place the mower at the edge of a patch of flowers and tell it to mow forward onto the grass**
8. **Place the mower on concrete and tell it to mow backwards onto a patch of grass**
9. **Place the mower in front of a wall and tell it to mow forward**
10. **Place the mower on the grass in front of a patch of flowers and tell it to mow backwards**

Of the following sets of test cases, which one should be used to test the scenario described in the question? (2 pts)

a. 1, 3, 6, 8
b. 2, 6, 8, 9
c. 4, 6, 7, 10
d. 1, 4, 6, 10

D is correct. All of these cause the mower to mow the flowers and should result for a request for human intervention. You could sacrifice a lot of flowers with this test! (AI-8.8.1 K4 Select appropriate test objectives and acceptance criteria for the AI-specific quality)

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30. Why is pairwise testing effective for AI-based systems? (1 pt)

a. Because it can test all possible inputs in an efficient manner
b. Because it can replicate the typical user interactions in an automated fashion
c. Because it will ensure that adequate representatives of good and bad data are tested
d. Because it can take a large set of parameters and test combinations of them efficiently

D is correct. This is a key application for AI-based systems. They have a huge number of parameters that are of interest for testing. Using pairwise to build the combinations to test can significantly reduce the number of tests without significantly compromising the quality of the testing. (AI-9.2.1 K2 Explain how pairwise testing is used for AI-based systems.)

31. What type of testing can be effective against data poisoning in an operational ML system? (1 pt)

a. EDA
b. A/B
c. ML-check
d. Pairwise

B is correct. In the case of a system's data being poisoned while it is in operation, the best way to detect it is with A/B testing which will check the old results against new results and will report any spikes in differences.(AI-9.4.1 K2 Explain how A/B testing is applied to the testing of AI-based systems.)

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32. What is the purpose of the pseudo-oracle in back-to-back testing? (1 pt)

a. To test the non-functional characteristics of the system under test (SUT)
b. To compare its results to those of the SUT
c. To manufacture data to be used for continuous training of the model
d. To generate test cases based on a previously passed test case

B is correct. The pseudo-oracle is developed independently from the SUT with no common code and then is used to test the responses it gets vs the responses from the SUT. Analysis is required to determine which one is more correct more often and why.(AI-9.3.1 K2 Explain how back-to-back testing is used for AI-based systems.)

33. What is the purpose of a "tour" in exploratory testing? (1 pt)

a. It is a set of strategies and goals used to guide exploratory testing
b. It is used for autonomous cars to create a virtual environment for travel
c. It develops test data to be injected into the system for testing
d. It is a method used for data visualization

A is correct. The guiding strategies and goals are used to determine what will be tested such as focusing on bias, underfitting or overfitting. (AI-9.6.1 K2 Explain how experience-based testing can be applied to the testing of AI-based systems.)

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34. You are testing an AI-system that predicts the annual growth of a particular species of tree. The data indicates that there is a direct correlation between the amount of rainfall the tree receives and the growth it achieves in a given year. How can you use metamorphic testing for this system?(2 pts)

a. From a starting test case, keeping all other variables the same, increase the amount of rain and check that the tree growth is proportionate
b. For a set of test cases, sequentially alter the nitrogen ratio in the soil and verify that the tree reacts appropriately
c. For a given set of data, provide both valid and invalid measures of rainfall and see if the system detects and rejects the invalid data
d. From a set of test cases, determine the absolute values for the growth and rain factors and apply those in testing

A is correct. This is an application of metamorphic testing where a number of tests can be generated by morphing the original test (changing the rain value) and observing the growth response. (AI-9.5.1 K3 Apply metamorphic testing for the testing of AI-based systems.)

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35. You are testing a self-learning system that is used by insurance companies to predict lifespans based on a given set of variables. Because the system is always evolving, it has been very difficult to design tests that are reliable or even valid. The development team is getting ready to release a new version which contains a number of defect fixes as well as some new features. You have a full regression test suite that you used on a previous version and you would like to leverage that if you can.

What type of testing would be best suited for performing the regression testing on this new version and why will this approach work? (2 pts)

a. Metamorphic testing; You can use the existing regression tests to generate a new set of regression tests. This will let you avoid having to analyze the test results to determine if they are valid.
b. Back-to-back testing; You have test cases that are available and the previous version of the system can act as the pseudo-oracle, although you will still have to compare the results to determine if any variances are valid.
c. A/B testing; You can use valid and invalid inputs to determine how the system responds, and you can then compare these responses to the requirements documentation to determine if they are correct.
d. Experience-based testing; You can apply error guessing to concentrate on the areas that are likely to fail with this new version. You can widen the testing into less risky areas as time allows during the regression test timeframe.

B is correct. This will leverage the existing regression tests and allows you to leverage the previous version as a type of oracle that will indicate how the software should work. A is not correct because metamorphic testing doesn't work on all tests and, even if you did use it, you'd still have to check that the results are correct. C is not correct because this is not how A/B testing works. D is not correct because this doesn't leverage the existing test cases and is unlikely to give the coverage needed in the timeframe. (AI-9.7.1 K4 For a given scenario, select appropriate test techniques when testing an AI-based system.)

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36. You are testing a multi-agency AI-based system. Which of the following is a challenge you would expect to encounter when establishing a test environment? (1 pt)

a. Because this will operate in a hazardous environment, it will be potentially dangerous to set up and maintain the environment
b. You will need to be able to push the system to extremes to ensure human intervention is possible, but simulating that will be very expensive and may destroy parts of the environment during testing
c. The volume of data that will be required to test and monitor the system will be difficult, if not impossible, to generate
d. In order to effectively mimic the non-determinism of the interfacing systems, the environment has to have its own level of non-determinism

D is correct. This is the issue with multi-agency systems because they are interacting with other systems and may all have a non-deterministic output. Simulating this is difficult. A is not correct as there is nothing to indicate this is necessary operating in a hazardous environment. B is not correct because this is seen more with autonomous systems rather than multi-agency. C is not correct because that is more often seen with big data systems. (AI-10.1.1 K2 Describe the main factors that differentiate the test environments for AI-based systems from those required for conventional systems.)

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37. Which of the following is a way in which ML models can be used to help with processing defect reports? (1 pt)

a. Assigning the defect to the appropriate developer
b. Writing the steps to reproduce the defect
c. Checking the defect report for typos
d. Attaching and verifying screenshots

A is correct. An ML model can be used to assign the defect to the appropriate developer based on information in the report and past routing information. B and D still have to be done manually. C can be done with a spell checker. (AI-11.2.1 K2 Explain how AI can assist in supporting the analysis of new defects.)

38. What is one of the problems with using AI-based tools to generate test cases? (1 pt)

a. They cannot read the requirements
b. They cannot read the code
c. They cannot determine the expected result
d. They cannot determine the steps required to actually run the test

C is the biggest problem because other than gross results (such as a crash), the system does not know what the software should do and what should be checked (such as a certain message appearing). A, B and D are all things AI can do. (AI-11.3.1 K2 Explain how AI can assist in test case generation.)

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39. When an AI-based approach is used to predict defects, which one of the following measures have been found to be most effective? (1 pt)

a. Lines of code
b. Cyclomatic complexity
c. Developer history
d. Function point analysis

C is correct. The best predictors are with people and organizational measures rather than code metrics. (AI-11.5.1 K2 Explain how AI can assist in defect prediction.)

40. How can an AI-based tool help to improve test automation for a GUI? (1 pt)

a. It cannot. AI-based tools are not suitable for GUI testing
b. By reducing the brittleness of the automation code
c. By expanding the scope of the testing
d. By providing a more valid test oracle

B is correct. AI-based automation can help remove the brittleness of the automation code by helping it adapt to changes in object identifiers. (AI-11.6.1 K2 Explain the use of AI in testing user interfaces)

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