



UNIVERSITY OF COLOMBO, SRI LANKA

UNIVERSITY OF COLOMBO SCHOOL OF COMPUTING

DEGREE OF BACHELOR OF INFORMATION TECHNOLOGY (*EXTERNAL*)

Academic Year 2004/2005 – 1st Year Examination – Semester 2

IT2402 – Fundamentals of Software Engineering
Multiple Choice Question Paper

31st July, 2005
(TWO HOURS)

Important Instructions:

- The duration of the paper is **2 (Two) hours**.
- The medium of instruction and questions is English.
- The paper has **50** questions and **12** pages.
- All questions are of the MCQ (Multiple Choice Questions) type.
- All questions should be answered.
- Each question will have 5 (five) choices with one or more correct answers.
- All questions will carry equal marks.
- There will be a penalty for incorrect responses to discourage guessing.
- The mark given for a question will vary from -1 (*All the incorrect choices are marked & no correct choices are marked*) to +1 (*All the correct choices are marked & no incorrect choices are marked*).
- Answers should be marked on the special answer sheet provided.
- Note that questions appear on both sides of the paper.
If a page is not printed, please inform the supervisor immediately.
- Mark the correct choices on the question paper first and then transfer them to the given answer sheet which will be machine marked. **Please completely read and follow the instructions given on the other side of the answer sheet before you shade your correct choices.**

- 1) The failure rate of a software product decreases first and then increases with time approximating a *bath tub* like curve as for other tangible products. Which of the following may be the reason(s) behind this phenomenon?
- (a) Software does not wear and tear.
 - (b) Software products change with time as customer requirements change.
 - (c) Maintenance is the costliest phase of the software development life cycle.
 - (d) A change to a piece of code may implicitly effect the functions of the rest of the code.
 - (e) Software maintenance is given little consideration by companies developing software.
- 2) What type of software could be an autopilot system of a modern aircraft?
- (a) Business software
 - (b) Real time software
 - (c) Safety critical software
 - (d) Scientific software
 - (e) Embedded software
- 3) Which of the following **does not** justify the need for a software engineering discipline?
- (a) Deliver software on time with desired quality.
 - (b) Overcome a crisis situation in software development.
 - (c) Enforce tight control on the software development process in order to meet deadlines.
 - (d) Enforce a code of ethics on software developers.
 - (e) Promote object oriented programming techniques.
- 4) Identify the correct sentences with regards to software products.
- (a) Software is an intangible intellectual artefact.
 - (b) One cannot change software easily without changing the design.
 - (c) Increased use of software will not introduce any defects.
 - (d) Software is configurable from component software.
 - (e) Software products deteriorate more slowly than hardware.
- 5) Which of the following are internal qualities of a software product?
- (a) correctness, reliability, robustness, efficiency, usability
 - (b) maintainability, reusability, portability, interoperability
 - (c) reliability, robustness, efficiency, maintainability, reusability
 - (d) efficiency, usability, maintainability, reusability, portability
 - (e) maintainability, reusability, portability, efficiency, correctness
- 6) Which of the following is / are true with regard to the spiral model of software development?
- (a) It is an evolutionary model that includes an explicit risk analysis phase.
 - (b) Spiral model is an incremental software development model.
 - (c) It is a universal model that may incorporate other models such as the linear sequential model or the prototyping model during different epochs.
 - (d) It is applicable for projects with clear and stable requirements.
 - (e) It is not suitable for a project such as developing a nuclear power plant control system.
- 7) The software process
- (a) is the general set of activities undertaken to develop a software product.
 - (b) includes project management activities such as planning and scheduling.
 - (c) uses various process models to engineer software.
 - (d) includes configuration management activities as part of it.
 - (e) is concerned with engineering high quality defect free software.

8) Which of the following is / are **incorrect** with respect to formal systems development?

- (a) It is based on the transformation of a mathematical specification to an executable program.
- (b) It is embodied in the clean room approach for software development.
- (c) It is often used as it is straightforward to apply.
- (d) It is suitable for safety critical systems.
- (e) It is often utilized as part of extreme programming.

9) Which of the following is an / are advantage(s) of evolutionary prototyping over throw away prototyping?

- (a) Evolutionary prototyping can be applied when the requirements are vague and ambiguous.
- (b) A working version of the system is available for customer comments from the beginning.
- (c) Evolutionary prototyping could be used when requirements are unstable and continue to change with time.
- (d) Certain features may be left out of the prototype to simplify rapid implementation.
- (e) The effort pumped into the initial prototype is not wasted as with throw away prototyping.

10) Incremental development

- (a) is often used in commercial software development where increments of the desired functionality is delivered to the market as versions.
- (b) is similar to prototyping in the sense that early increments act as prototypes to help elicit requirements for the later increments.
- (c) does not require the establishment of an overall system architecture since the overall functionality is not delivered in a single release.
- (d) is more difficult to manage than evolutionary prototyping.
- (e) lowers the risk of overall project failure because complete functionality is not delivered in a single step.

11) Which of each of the following is **not** an activity of the project planning process?

- | | |
|------------------------------|--|
| (a) Draw up project schedule | (b) Establish project constraints |
| (c) Review project progress | (d) Define project milestones and deliverables |
| (e) Product reviews | |

Read the following scenario and answer questions (12) – (16).

EBiz is a recently established organization in the business of buying and selling used computers. It has been in operation for 5 years and looks forward to improve its business process by automating some parts of its existing manual process, in the quest of gaining competitive advantage over its rivals. The EBiz management has decided to go online for transactions and plans to develop a web portal to display its stock of computers. With the new system, buyers can request a catalogue of the stock whereas sellers can post details of their computers online. Ebiz will notify successful tenderers in due course.

12) Which of the following would be correct statements, given the information above?

- (a) The linear sequential model is the most suitable process model to automate the core business process of Ebiz.
- (b) Rapid application development would be suitable to develop the system.
- (c) Evolutionary prototyping would be suitable to develop the interfaces with customer feedback.
- (d) Spiral model would be the most suitable process model to develop the system.
- (e) Formal systems development is not suitable as the process model for this project.

13) What are the two most important software quality attributes the system should have?

- | | | |
|-----------------|----------------|-----------------|
| (a) Reliability | (b) Robustness | (c) Correctness |
| (d) Usability | (e) Safety | |

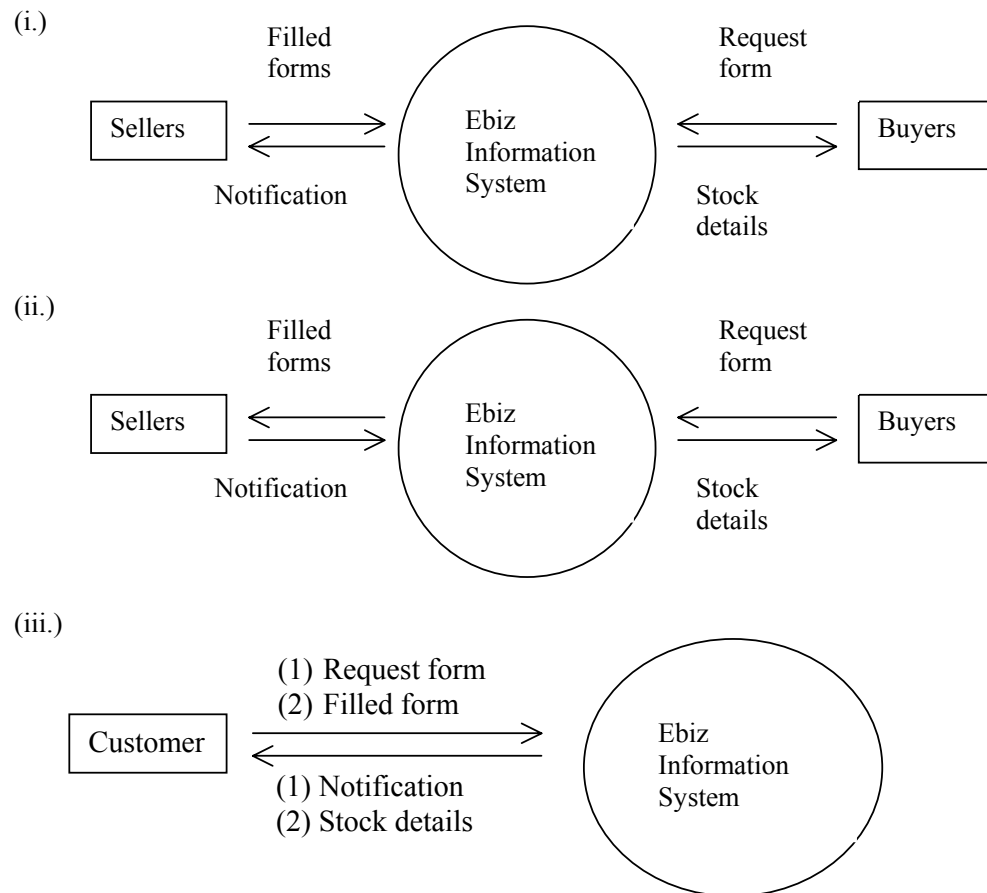
14) What would be the most suitable architecture to develop the system?

- | | | |
|----------------------|------------------------------|-------------------------|
| (a) Island model | (b) Multi processor model | (c) Client server model |
| (d) Repository model | (e) Distributed system model | |

15) Which of the following is a / are functional requirement(s) of the Ebiz system?

- | |
|---|
| (a) Buyers need to request a catalogue of the stock. |
| (b) The interfaces should be customizable so that a wide variety of users could use the system effectively. |
| (c) Sellers need to post details of their computers to the system. |
| (d) Ebiz needs to notify successful tenderers. |
| (e) Time taken to download images in the catalogue should not irritate users. |

16) Consider the following Data Flow Diagrams (DFDs).



Which of the following are correct DFDs for the Ebiz system?

- | | | |
|-----------------------|---------------|----------------|
| (a) (i) only | (b) (ii) only | (c) (iii) only |
| (d) (i) and (ii) only | (e) All | |

17) What is / are the correct statement(s) with respect to software quality?

- (a) The Capability Maturity Model (CMM) is a scheme to classify a software development organization according to its capability.
- (b) The quality management process starts after the design stage of the software development process.
- (c) A quality plan sets out the desired product qualities and how they are assessed.
- (d) Each deliverable of the software development process is an input to the quality management process.
- (e) Quality assurance and quality control are not activities of the quality management process.

18) Which of the following is a / are software quality metric(s)?

- | | | |
|-------------------|---------------------------|-----------------|
| (a) Reliability | (b) Cyclomatic complexity | (c) Reusability |
| (d) Lines of code | (e) Fog index | |

19) The items in column X have to be matched with the descriptions in column Y.

	Column X		Column Y
1	Fortran	A	Rapid application development
2	ADA	B	System programming
3	C + +	C	Scientific computing
4	Visual Basic	D	Expert systems development
5	Java	E	Real time systems development
6	Prolog	F	Object oriented programming
7	C	G	Distributed computing applications

Which of the following is a / are proper match(es)?

- | |
|---|
| (a) 1 & C 2 & E 3 & F 4 & A 5 & G 6 & D 7 & B |
| (b) 1 & C 2 & C 3 & B 4 & A 5 & F 6 & D 7 & C |
| (c) 1 & C 2 & E 3 & F 4 & A 5 & F 6 & D 7 & B |
| (d) 1 & B 2 & C 3 & F 4 & A 5 & F 6 & D 7 & E |
| (e) 1 & C 2 & C 3 & B 4 & A 5 & G 6 & D 7 & E |

20) What of the following is / are true with respect to CASE tools?

- | |
|---|
| (a) Lower CASE tools refer to those which support early process activities such as requirement analysis and design. |
| (b) CASE tools can be applied to completely automate the software development process. |
| (c) Integrated CASE tools refer to tools which operate in collaboration with one another. |
| (d) CASE tools reduce development and maintenance costs. |
| (e) Configuration management workbenches are examples for integrated CASE tools. |

21) What is **incorrect** with regard to maintenance costs?

- | |
|--|
| (a) Maintenance costs are far greater than development costs and usually take up to about two thirds of the total software life cycle costs. |
| (b) Corrective maintenance costs are usually higher than costs to adapt software to a new environment. |
| (c) Costs incurred in adding new functionality to a piece of code are the highest of the maintenance costs. |
| (d) Maintenance costs decrease with software maintenance over time. |
| (e) Team stability and the effective use of CASE tools reduce maintenance costs. |

22) Which of each of the following is **incorrect** about reverse engineering?

- (a) Re engineering often precedes reverse engineering.
- (b) Reverse engineering supports program maintenance.
- (c) Reverse engineering is concerned with analyzing the software with a view of understanding its design.
- (d) Reverse engineering is easy if the original developers of the system are involved in it.
- (e) Program restructuring is a process that is carried out within reverse engineering.

23) Which of the following correctly reflects the steps of the maintenance process in sequential order?

- (a) change request, impact analysis, system release planning, change implementation, system release
- (b) change request, system release planning, impact analysis, change implementation, system release
- (c) change request, system release planning, change implementation, impact analysis, configuration management, system release
- (d) corrective maintenance, adaptive maintenance, perfective maintenance, re-engineering
- (e) corrective maintenance, adaptive maintenance, perfective maintenance, reverse engineering, re-engineering

24) Which of the following sayings is / are true about architectural evolution?

- (a) More the functionality distributed from the server to the client is the higher the costs of architectural evolution.
- (b) A common architectural evolution strategy for a legacy system is to encapsulate the legacy system as a server and to implement a distributed user interface.
- (c) Source code translation, program structure improvement and data re-engineering are activities of the architectural evolution process.
- (d) The simplest distribution model is user interface distribution where only the user interface is implemented on the sever.
- (e) Automatic program restructuring tools can be used to automate the architectural evolution process.

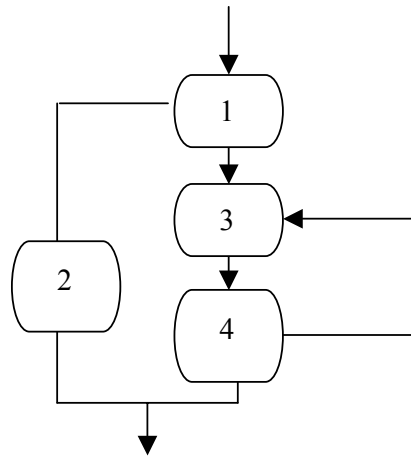
25) The items in column X have to be matched with the descriptions in column Y.

	Column X		Column Y
1	Release	A	An instance of a system, which is functionally distinct in some way from other system instances
2	Derivation history	B	An instance of the system, which is functionally identical but non functionally distinct from other instances of a system
3	Version	C	Distributed to users outside of the development team
4	Variant	D	Record of changes applied to a document or code component

Which of the following match(es) is / are appropriate?

- (a) 1 & C 2 & D 3 & B 4 & A
- (b) 1 & C 2 & D 3 & A 4 & B
- (c) 1 & A 2 & D 3 & C 4 & B
- (d) 1 & B 2 & D 3 & C 4 & A
- (e) 1 & B 2 & D 3 & B 4 & A

- 26) Consider the following flow graph.



What are the code fragments which correspond to it? Assume that a and b are real numbers.

- | | | |
|---|--|---|
| (a) function test (a, b)
if a < b then
halt
else
do a = a-1
while a < b | (b) function test (a, b)
if a < b then
return(1)
else while a < b
a = a - 1 | (c) function test (a, b)
if a < b then
return(1)
else
return(test(a/2,b)
+ test(a/2,b) |
| (d) function test (a, b)
if a < b then
return(1)
else
return(test(a-1,b)
+ test(a-1,b) | (e) function test (a, b)
if a < b then
halt
else
repeat a = a-1
until a < b | |

- 27) What are the true statements with respect to equivalence partitioning?

- | |
|---|
| (a) Input data and output results often fall into different classes where all members of a class are related. |
| (b) It is a method to partition the requirements into equivalent classes during the requirement analysis process. |
| (c) Test cases should be chosen to be representative of each equivalence partition. |
| (d) It is recommended that only boundaries are checked in each partition. |
| (e) It is recommended that boundaries as well as mid points are checked in each partition. |

- 28) Testing is often referred to as a destructive process where each test phase usually corresponds to different stages of the software development process. Which of the following **do not** match?

Test phase	Stage of development
(a) Unit testing	Coding / Design
(b) Integration testing	Design
(c) Acceptance testing	Requirement analysis
(d) Regression testing	Requirement analysis / Design
(e) Alpha testing	Design

- 29) Which of the following represents the correct sequence of steps of the inspection process?
- (a) individual preparation, overview, planning, inspection meeting, rework, follow up
 - (b) overview, planning, individual preparation, inspection meeting, rework, follow up
 - (c) planning, overview, individual preparation, inspection meeting, rework, follow up
 - (d) overview, individual preparation, planning, inspection meeting, rework, follow up
 - (e) individual preparation, planning, overview, inspection meeting, rework, follow up
- 30) Which of the following is a / are correct statement(s)?
- (a) Software verification tries to answer the question “Are we building the product right?”
 - (b) Inspections cannot check non functional requirements such as performance and usability.
 - (c) The philosophy behind clean room software engineering is defect avoidance rather than defect removal.
 - (d) A working version of the software is required to start the verification process.
 - (e) Inspections are both a verification technique and a validation technique.
- 31) Which of the following sentences is / are true?
- (a) Automated static analyzers are lower CASE tools which analyse the code to discover erroneous conditions.
 - (b) Clean room software engineering uses rigorous static analysis.
 - (c) Stages of static analysis are (1) Control flow analysis (2) Data use analysis (3) Interface analysis (4) Information flow analysis and (5) Path analysis.
 - (d) Rigorous software testing can prove that a program is defect free.
 - (e) An inspection meeting is chaired by the author of the document under consideration.
- 32) Which of the following sentences is / are true?
- (a) In white box testing, test cases are derived from the system specification.
 - (b) The objective of path testing is to ensure that the set of test cases is such that each path through the program is executed at least once.
 - (c) Usually all the paths of a control flow graph are covered by the test cases leading to 100 % path coverage.
 - (d) Path testing is a white box testing technique.
 - (e) Cyclomatic Complexity (CC) of a flow graph is defined by the formula:

$$CC = | \text{Edges} | - | \text{Nodes} | + 2.$$
- 33) Which of the following requirements is a / are non functional requirement(s) of a proposed library system?
- (a) The system shall not disclose any personal information about a customer apart from his name and reference number.
 - (b) The user should be able to search for a library item by specifying a keyword.
 - (c) The system should be easy to use by inexperienced users and hence should provide with a graphical user interface.
 - (d) Students should be able to reserve a library item online.
 - (e) The system should respond quickly to user queries.
- 34) Non functional requirements can be divided into
- (a) Product requirements, Organizational requirements and External requirements.
 - (b) Product requirements, Legislative requirements and Efficiency requirements.
 - (c) Reliability requirements, Efficiency requirements and Security requirements.
 - (d) Safety requirements, Organizational requirements and Legislative requirements.
 - (e) Performance requirements, Legislative requirements and External requirements.

35) Which of the following is / are correct?

- (a) Requirement engineering is the process of discovering the services which the customer requires from a system and the constraints under which the system operates.
- (b) Requirement validation often follows the requirement engineering process.
- (c) The requirement specification acts as the basis for a contract between the client and the software developer.
- (d) Requirement validation is the process that checks whether the requirements are accurate and complete.
- (e) Requirement analysis is a task that is within the system analysis process.

36) Which of the following is a / are problem(s) generally encountered during requirement analysis?

- (a) Stakeholders may not completely know what they really want.
- (b) The technical staff may be unaware of how to use CASE tools.
- (c) Stakeholders express their needs in different terms leading to ambiguous interpretations.
- (d) There is a possibility that requirements change during analysis.
- (e) Developers may not know what process model to use in order to develop the system.

37) Which of the following is a / are correct statement(s)?

- (a) Volatile requirements are those derived from the core activity of the customer organization.
- (b) Requirement management is the process of managing changing customer needs.
- (c) A feasibility study is a short study, which aims to check the feasibility of the project with respect to available resources.
- (d) Requirement validation is the process that checks the accuracy and the completeness of the requirements.
- (e) Fixing a requirement error is relatively cheaper than correcting an implementation error.

38) Which of the following is / are **not** (a) tool / s generally used during requirement analysis?

- | | |
|--------------------------------|-----------------------|
| (a) Control flow graphs | (b) Activity networks |
| (c) Data Flow Diagrams (DFDs) | (d) Natural language |
| (e) Module dependency diagrams | |

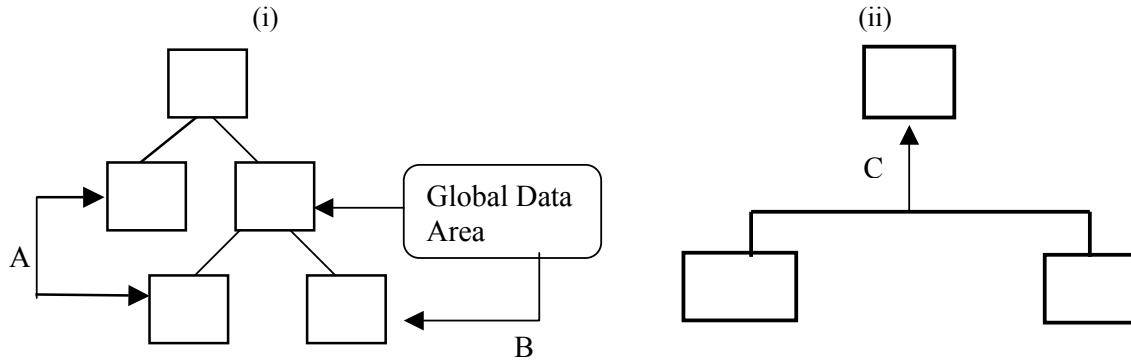
39) Which of the following sentences is / are **not** true with regard to user interface design?

- (a) First generation interfaces are command line interfaces where users have to remember and type commands to interact with the computer.
- (b) Graphical User Interfaces (GUIs) are the most famous interface category today.
- (c) Casual users of an interface have a good understanding of the functionality and the mechanism of interacting with it.
- (d) Content of the human long term memory has more semantic structure.
- (e) The higher the response time of an interface the better.

40) Which of the following notational systems is a / are tool(s) used in the design phase?

- | | | |
|---------------------------------|--------------------|-----------------------|
| (a) Physical data flow diagrams | (b) Pseudocode | (c) Use case diagrams |
| (d) State diagrams | (e) Class diagrams | |

- 41) Consider the following module dependency diagram (i) and the class diagram (ii).



What are the types of coupling possible in the above diagrams corresponding respectively to the labellings A, B and C?

- (a) Content coupling, Common coupling, Object coupling
- (b) Content coupling, External coupling, Object coupling
- (c) Control coupling, Common coupling, Object coupling
- (d) Control coupling, Data coupling, Class coupling
- (e) Content coupling, Data coupling, Object coupling

- 42) Which of the following sentences is / are correct with respect to software design?

- (a) Protecting information from direct access by other modules and providing access to this information through well defined interfaces is called abstraction.
- (b) Stepwise refinement and partitioning respectively refer to increasing the level of detail of the design and allocating functionality to modules.
- (c) Information hiding is one of the three aspects generally considered within the architectural design process.
- (d) Software design stage has the greatest influence on software quality.
- (e) The four aspects of software design are architectural design, data design, procedural design and interface design.

- 43) A Java applet could best be described as functioning according to the

- (a) thin - client architecture. (b) three - tier architecture. (c) multi - tier architecture.
- (d) fat - client architecture. (e) client - server architecture.

- 44) Which of the following sentences is / are correct with respect to object oriented design?

- (a) Object oriented design facilitates information hiding and encapsulation.
- (b) Object oriented design separates operations from data values.
- (c) A sub class inherits all the attributes of the super class.
- (d) Java is not a pure object oriented language which supports multiple inheritance.
- (e) Use case diagrams, which are defined in UML are useful as a design tool in object oriented design.

45) Consider the following five code fragments.

(1)	(2)	(3)
<pre> Class Account { Void open account () { ... } Void credit bonus () { ... } } </pre>	<pre> class InitFuns { void initDisk() { ... } void initPrinter() { ... } void initMonitor() { ... } } </pre>	<pre> class MyFuns { void initPrinter() { ... } double calcInterest() { ... } Date getDate() { ... } } </pre>
(4)	(5)	
<pre> Class MakeCake { void addIngredients() { ... } void mix() { ... } void bake() { ... } } </pre>	<pre> class AreaFuns { double circleArea() { ... } double rectangleArea() { ... } double triangleArea() { ... } } </pre>	

Identify the cohesion category each of the above fragments corresponds to

- | |
|--|
| (a) (1) Sequential (2) Temporal (3) Coincidental (4) Procedural (5) Logical |
| (b) (1) Procedural (2) Sequential (3) Coincidental (4) Procedural (5) Logical |
| (c) (1) Sequential (2) Temporal (3) Coincidental (4) Sequential (5) Procedural |
| (d) (1) Sequential (2) Temporal (3) Logical (4) Procedural (5) Coincidental |
| (e) (1) Procedural (2) Sequential (3) Logical (4) Sequential (5) Coincidental |

46) A vehicle has several parts such as the set of wheels and the engine. Busses and cars are examples of some vehicles found on the roads. Consider the following classes :

- (i) Engine and Vehicle
- (ii) Vehicle and Car
- (iii) Vehicle and Road

The correct relationships between the above classes are

- | |
|---|
| (a) (i) aggregation (ii) association (iii) inheritance. |
| (b) (i) aggregation (ii) inheritance (iii) association. |
| (c) (i) inheritance (ii) aggregation (iii) association. |
| (d) (i) association (ii) inheritance (iii) association. |
| (e) (i) aggregation (ii) inheritance (iii) aggregation. |

47) What is true with respect to the repository model of software development?

- | |
|---|
| (a) It is a system architecture based on the concept of a shared database. |
| (b) An example of a repository model is the architecture of an integrated CASE tool. |
| (c) It is not suitable for control systems such as nuclear reactor control software. |
| (d) The repository is difficult to manage as it houses a large volume of data from several sub systems. |
| (e) It is suitable when one subsystem is dependant on the outputs of another subsystem. |

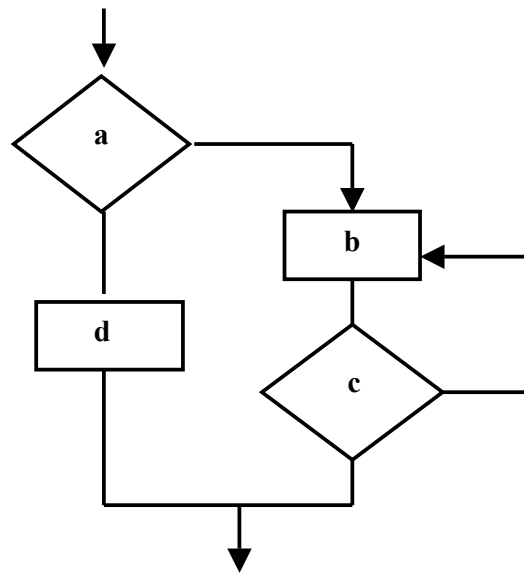
48) Structured programming

- (a) promotes good procedural design that is comprehensible, testable and maintainable.
- (b) defines a small set of logical constructs to specify the control flow within a program.
- (c) defines sequential, conditional and recursive constructs as building blocks of programs.
- (d) uses control flow graphs as the technique of representing procedural designs.
- (e) specifies the use of one input and one output control structure to develop code.

49) Which of the following is a / are cost estimation technique(s) of project management?

- | | | |
|-----------------------------|--------------------------------|------------------------|
| (a) Function point analysis | (b) Estimation by analogy | (c) Divide and conquer |
| (d) Expert judgment | (e) Algorithmic cost modelling | |

50) Consider the following flow chart.



Choose the correct code fragment(s) which show(s) its logic.

- | | | |
|--|--|--|
| (a) if a then
repeat b
until c
else d | (b) if a then d
else
repeat c
until b | (c) if a then d
else
repeat b
until c |
| (d) if a then d
else
do b
while c | (e) if a then d
else
while b
do c | |
