



OXFORD BROOKES UNIVERSITY

BACHELOR OF SCIENCE (HONOURS)

DECEMBER 2009 EXAMINATION

MARKING SCHEME

U08182: INFORMATION SYSTEMS DESIGN

TIME : 2 Hours + 10 Minutes Reading

NUMBER OF PAGES : 1 Cover Sheet and 5 Pages of Questions



INSTRUCTIONS :

- ☐ Answer any **THREE** questions.
- ☐ **PART A QUESTION IS COMPULSORY.**
- ☐ Choose any **TWO** questions from PART B.
- ☐ **Please start every question on a new page.**
- ☐ **Answers will not be marked if they are illegible.**
- ☐ Enter the question numbers (in the order you have attempted) in the boxes provided in the answer script.
- ☐ Write your **INDEX NUMBER** and **MODULE NUMBER** on the cover page of the answer script.

PART A

(Compulsory Question)

QUESTION 1

(a) Explain the role of validation and verification processes in Testing.

[6 marks]

Validation:

- Demonstrate that system satisfies users requirements
- Normally assessed using dynamic testing
- Performance Testing
- Regression Testing
- Acceptance Testing
- Usability Testing
- Stress Testing
- Security Testing
- Recovery Testing
- Alpha and Beta Testing

Verification:

- Ensure component or system works (conforms) to its specification, i.e. the output conforms to its inputs (even if the specification is incorrect)
- Applies to complete system (product), or to separate development stages (process)
- Includes both static and dynamic testing activities
- Includes process tractability
- Not the same as demonstrating correctness – i.e. usually does not provide any check or proof as to the correctness of a system
- Program verification, which includes formal methods, may provide a high level of assurance.

(b) Test plan is required for the following pseudo-code:

```
integer a
boolean x,y,z;
a:=0;
if x OR y then
  if z then
    a:=1
  else
    a=2
  endif
endif
```

Provide suitable test plans for the following testing strategies:

- statement testing
- path testing
- condition testing

[9 marks]

Statement testing :

Both if statements are exercised.

a = 0
x = T or y = T
r = T
a = 1

Branch testing :

Both if statements and else statements are executed.

x = T or y = T, z = T expected a = 1

x = T or y = T z = F expected a = 2

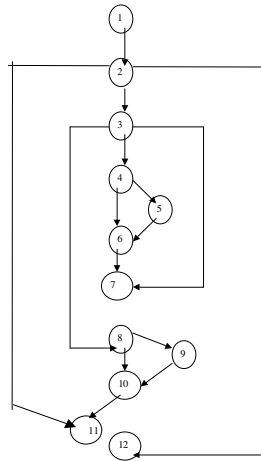
Condition testing:

x	y	z	Result a
T	T	T	1
T	T	F	2
T	F	T	1
T	F	F	2
F	T	T	1
F	T	F	2
F	F	T	0
F	F	F	0

(c) Construct a flow graph for the following Sort procedure pseudo-code and Determine the McCabe complexity for this procedure pseudocode

1. *Sort(a[1..n], n)*
2. *For i=1..n-1*
3. *min := i+1*
4. *for j=i+1..n*
5. *if a[j]<a[min]*
6. *min:=j*
7. *endif*
8. *endforloop*
9. *if a[min]<a[i]*
10. *swap(a[i], a[min])*
11. *endif*
12. *endforloop*

[9 marks]



Edges = 15

Nodes = 12

McCabe Complexity Index = Edges – Nodes + 2
= 15- 12+2 = 5

Flow graph - 5 Marks

McCabe Cyclomatic index – 1 Mark

Derivation – 2 Marks

Correct Answer- 1 Mark

(Total – 9 Marks)

- (d) The following is a description of a use case for an existing customer booking for a taxi through telephone. Detail of the customer's name, address, telephone numbers (Hand phone number and Residence phone number), the last two locations from where the taxi had been booked earlier are available with the Taxi Company.

When a customer calls the taxi company, customer is identified and taxi company checks the customers detail. Customer has to confirm his/her identity. Then taxi company check the starting point from the stored data and the customer has to confirm or give the new location. Next taxi company asks for the destination of the travel and after getting the destination, it gives the taxi number and time of arrival of the taxi.

Actor: Member	Taxi Company
Customer calls the taxi company	Verifies the Customer detail, Name address.
Customer confirms the detail	Checks the starting point available from the list
Customer confirms and chose any one of the stored locations or give the new starting point.	Taxi company records the starting point and asks for the destination
Customer gives the destination detail.	Destination is recorded and taxi number and arrival time is given to the customer.

- (i) Identify the input and output variables of the system, and the data to be stored in the system using a table of the following form:

Example: Test data for to book a Taxi

Variables		Test data
Input		
Output		
Stored data		

[6 marks]

Variables		Test data
Input	Customer Telephone No	Customer detail: Name and address
	Select the starting location 1 or 2 Or providing the new location	Selected from the list
Output	Give the taxi number and time of arrival	
Stored data	Customer detail: Name and address and two locations	

Input, output and stored data – 3 x 2 = 6 marks

- (ii) Make a concrete scenario from the above use-case description, and then derive test data from the scenario and fill the second column of the table above.

Example Concrete scenario:

Actor: Member	Taxi Company
	.

[6 marks]

Actor: Member	Taxi Company
Customer calls the number	Verifies the Customer detail

65521111 (taxi company number)	Give the Name and address of the customer.
Customer confirms the address	Verifies the starting locations 1 and 2
Customer confirms 1 or 2 OR give the new stating point Jurong East, Informatics Computer School	Record the starting point. Ask for the new destination
Customer gives the new destination Changi Airport	Taxi company give the taxi number S1254Z Time of arrival – 10 minutes time.

Concrete scenario

- 6 marks

[TOTAL MARKS FOR QUESTION 1: 36 MARKS]

PART B

(ANSWER ANY TWO QUESTIONS)

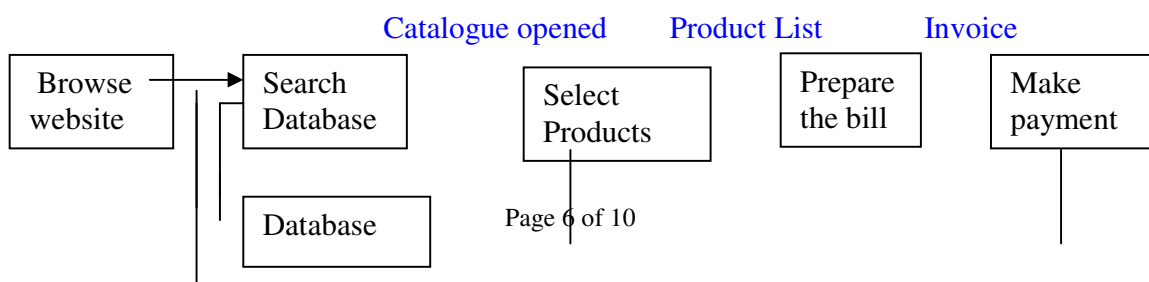
QUESTION 2

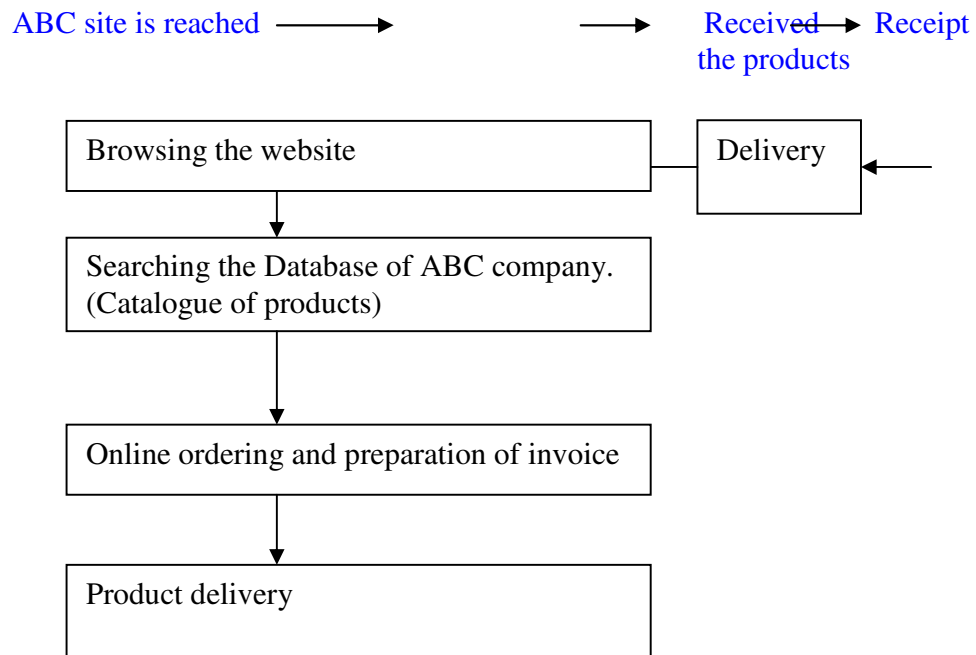
- (a) ABC company is a business to customer, e-commerce system. It sells products on-line to the customers. A product catalogue is available in the database of ABC company. Customers can browse the web site and search for the catalogue of ABC and order the products on-line. A bill is prepared for the order. Customers make payment-using credit card and ABC makes arrangement for door delivery.

Design the following architecture styles for the ABC company.

- (i) Pipe and filter architecture style
- (ii) Layered system architecture

[24 marks]





Sample Diagram: Pipe and Filters

Components – 4 marks

Connectors – 4 marks

Outputs – 2 marks

Input – 2 marks

Sample Diagram: Layered architecture

Components – 6 marks

Connectors – 6 marks

(b) Compare the above two styles in terms of the nature of computation and quality concern.

[8 marks]

Style	Nature of Computation	Quality Concerns
Layered systems	The computational tasks can be divided between those specific to the application and those generic to many applications but specific to the underlying computing platform	Portability across computing platforms. Reuse of an already developed computing infrastructure layer, such as operating system, network packages, etc.

Pipe and Filter	The computation involves transformations on continuous streams of data. The transformations are incremental, i.e. applied on the elements of the stream of data. One transformation can begin before the previous step has completed.	Scalability, especially to process the input data of unbounded length of data stream. Performance, to respond to the input as soon as an element of the input data is fed into the system before the whole stream of data is obtained.
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[TOTAL MARKS FOR QUESTION 2: 32 MARKS]

QUESTION 3

- (a) Quality Builders, a construction company, is interested in developing a computer-based information system to maintain records on selecting contractors, estimating quotation, allotting the job to the contractors and supervising the progress of a job. The company has many departments to do the above tasks

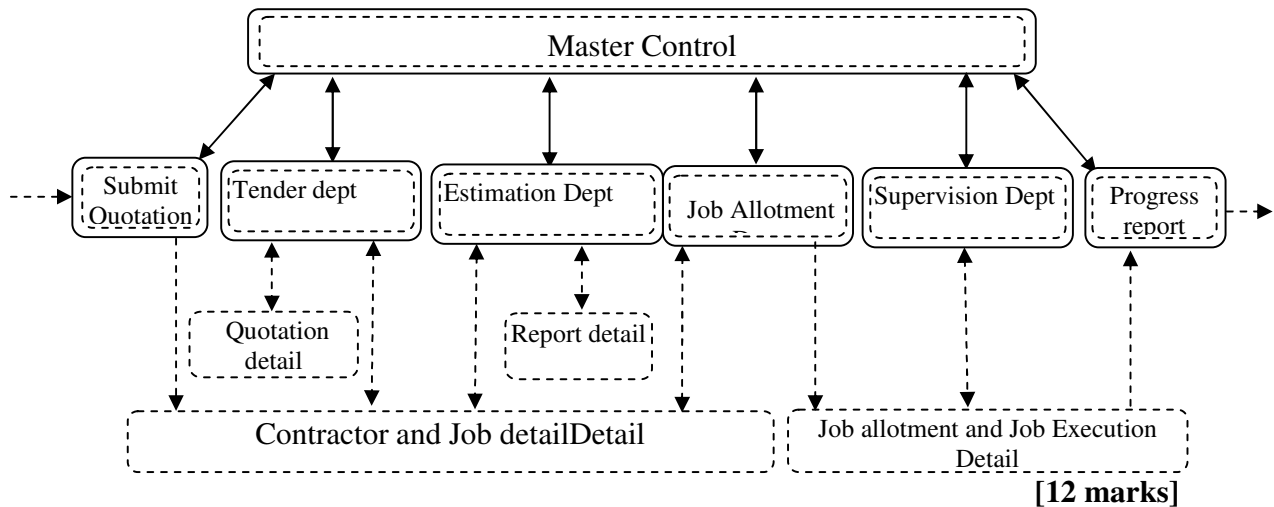
Tender Department: The Tender department of QB invites quotations to build buildings from contractors. Contractors submit quotations.

Estimation Department: An estimation department of QB checks the estimates mentioned in the quotations. Estimation department submits a report to the job allotment department.

Job Allotment Department: The job allotment department allots jobs to the contractors.

Job Supervision Department: The job supervision department monitors the progress of the each job.

Explain with suitable diagram the main program and subroutine software architecture styles.



**Call and Return groups - main program and subroutine
Diagram and explanation – 12 marks**

- (b) A software designer says that data centered software architecture styles is the best suited architecture styles for the above scenario of QB. You may or may not accept the above statement. Draw the data centered software architecture styles for the above scenario. Justify your view on the above statement.

You may use the following factors to support your opinion.

- o changes in the processing algorithm,
- o changes in data representation
- o enhancement to system function
- o reusability

[20 marks]

Data centered architecture style: Diagram with explanation.

Diagram - = 12 marks

Comparison with respect to the quality attributes - 6

Agreement to statement- Yes/NO = justification- 2marks.

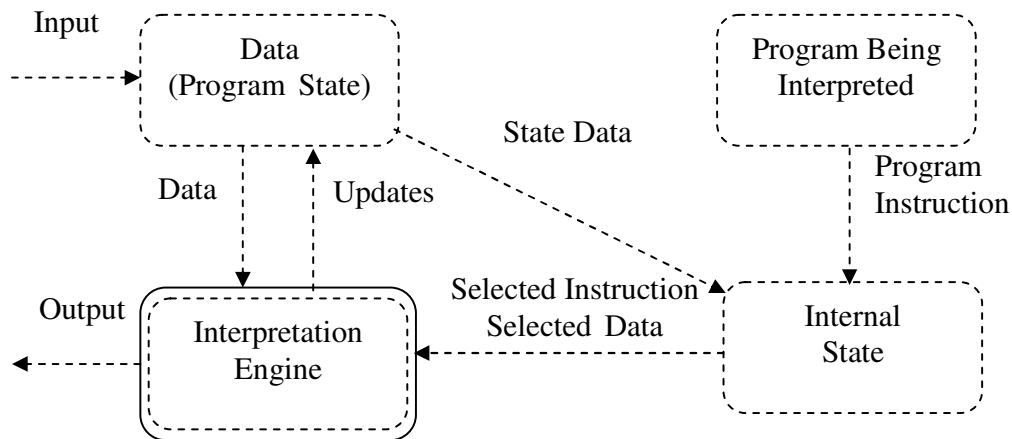
Attribute- Architecture	Data centered	Main program and subroutine
Changes in the transaction algorithm	Yes	--
Changes in data representation	Yes	Yes
Enhancement to system function	Yes	Yes

[TOTAL MARKS FOR QUESTION 3: 32 MARKS]

QUESTION 4

(a) Explain with an example Virtual machine architecture style.

[16 marks]



Virtual machine architecture style

Diagram = 12 marks

Explanation on: [4 marks]

(b) Propose a Hierarchical heterogeneous architecture style (diagram) mixing with main program and subroutine architecture styles for one of the components of the Virtual machine architecture styles given in question 4.a).

[16 marks]

Heterogeneous architecture style

Interpretation Engine is expanded with a main program and subroutine architecture styles

Virtual machine + main program and subroutine architecture style

Diagram = 12 marks

Explanation on: [4 marks]

[TOTAL MARKS FOR QUESTION 4: 32 MARKS]

- END OF MARKING SCHEME -