



PRIFYSGOL CYMRU

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UNIVERSITY OF WALES

Trinity Saint David

Examination Answer Book

24 Pages

Instructions to candidates

1. Please give the information requested in the boxes below.
2. Enter your name in the space provided to the right and seal to hide your name.
3. The answers must be **legibly** written. The Examiners can either ignore illegible script or have it typed and the expense of typing charged to the candidate.
4. Write your answers in ink.
5. Begin each answer on a fresh page. Do all rough work in the answer book and cross it through.
6. No part of this book is to be torn out; it must be handed in complete.
7. If more books than one are used, fasten them together using the tags available from the invigilator(s).
8. **Every book must be handed in. In no circumstances may answer books, used or unused, be taken out of the examination venue.**

1	Student Number	P146279
2	Title of Examination Paper	SYSTEM ENGINEERING
3	Module Code	M6X00947
4	Date and Time of Examination	30/06/2017 10.00
5	Examination Venue	MT102
6	Seat Number	

7	Number of Answer Books handed in	
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List the numbers of the questions you have attempted	Office Use
1(a)	30
1(b)	0
1(c)	32 = 62/100
2(a)	17/40
2(b)	16/30
2(c)	16/30
	111/200
	55.5/100
Total	55.5%

Please complete this section and SEAL before the examination starts.

Surname **CARTWRIGHT** Forename(s) **PAUL EDWARD** (Block Capitals)

1)(a)

A system is a construct of many different elements, which can include, personnel, equipment hardware & software and procedures. The system needs all of the elements to work correctly. The System Lifecycle is a critical element to ensure the delivered system is what the customer has specified and also insures that it works in ~~and~~ conjunction with other systems.

System Lifecycle

- Concepts - concept of the system wanted by the customer, asking if it can actually be done.
- User Requirement - This is where we sit down with the customer and discuss, what the product will be and identify priority requirements using Doors or QFD.
- IDR - Initial design review, the company brings together experts from around the business to see if the project is viable, only once this step is agreed can you move to system requirement.
- System Requirement - using the user requirement, system requirements can be mapped across to ~~prioritise~~ prioritise the user & system requirements this is done using Doors or QFD. This gets sent to the customer for 2 way communications.
- Design - The system requirements are transferred into the system design, if a prototype is required this is ~~sent to the~~ demonstrate to the customer for approval before the project goes into full production. It is ~~also~~ also where any changes can be made at lower cost. ~~FAT~~
- FAT - Factor ^{acc} acceptance testing this is to show the

Not really.
Change then go
to requirement.

1)(a)

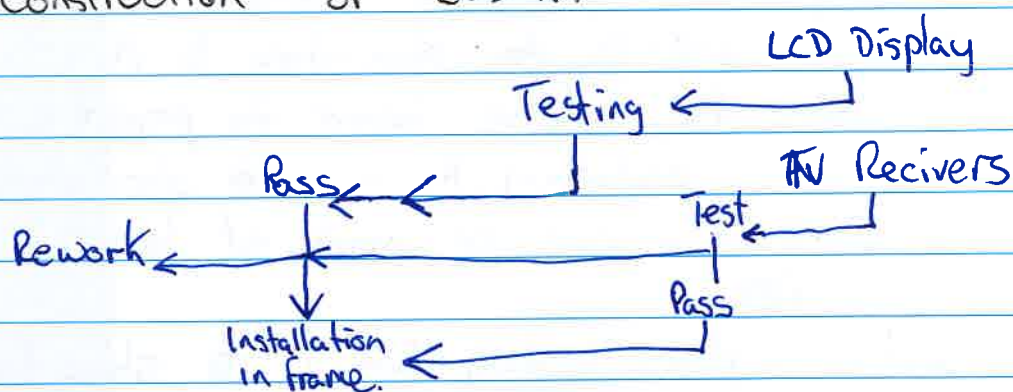
customer that the product does as specified in the user requirement.

- CDR - Critical Design Review - meeting with customer to insure the project and product meet with Here aproval before going in to full production
- User exeeptance testing - the customer test product on end users, ~~training~~ training and validation.
- Instalation or production - system or product is installed or constructed.
- AR & M - Availability, Reliability & Maintainability testing to ensure the system/Product is performing as specifiide by the customer.
- Disposal - ensuring all waist is removed after installaiton, but also that the system/product can be recycled or reused.

1)(b)

Shift left is a very good way of insuring the customer has value for money, it allows the system or product designer to continually asses the project, It allows the designer to stop, test & rework at any point in the design phase. It is extremely productive in ~~prod~~ projects where software meets hardware as this is normally the point of complexity.

Shift left example.



1)(b)

If all the product testing is done in the design phase of the project it has less cost implication than re-working the product in the production phase

Wrong concept.
Nothing to the question :-

②

1)(c)

System engineering allows for disposal cost to be engineered into the design of the testing, this is done in the concepts of Design for test, where what you are testing is design to have very low impact of disposal cost or recycling cost.

ish

Design for disposal, the project is ~~all~~ already decided that the test will destroy the product and disposal will be the only option,

✓

Design for Manufacture, the test is designed to be easy to manufacture to reduce cost.

✓

example 2,

testing a new munition which is fired from aircraft which actively seeks target autonomously. During the testing phase the missiles would be fired to prove safe separation from the aircraft and splash in the sea. Due to strict MOD regulation all parts off the missile had to be recovered which meant sending out a dive team which was very costly. If the missile had a parachute designed into its recovery ~~the~~ mechanism it would have made the testing repeatable as only damage would have been to the parachute panel. It would have save time & a lot of money in disposal & clean up cost.

✓

parachute, I think!

✓

✓

1)(c) example 2.

test firing small arms. This is done on closed Ranges, where the firing is done via a command wire, The spend cases fly out of the ejection port and land on the Range floor, at the end of each day, all the spend cases are collected for recycling. this can take up to an hour even two depending on the amount of rounds fired. The design of the firing system was changed to include a spend cases catcher which caught the rounds as the ejected out of the weapon, A simple fix but saved at least 2 man hours per day picking up empty brass,

2)(a)

Lean is a systematic approach to reduce waste, with every step adding value to the customer. The 5 principles of lean are -

- Define the value, This is ~~what~~ what the customer is expecting with regards a product or service.
- Map the value stream, does it Add value to the customer or take value away.
- make the process flow, insuring the process is continued through the complet product lifecycle.
- pull from the customer, Making sure there is no overproduction and the production is based on customer request.
- strive for exelence, try and improve the process and reduce the waist to as low as possible.

32
40
62
100

2

1

2

1

3

1

2

1

2

1

17

2)(b)

The whole objective of lean is to add value to the customer, value is when the customer is willing to pay.

Non-Value Adding activities

reworks

Defects

wrong tooling

movement of Inventory

waiting

not interpreting the customer specification correctly.

overprocessing the product.

Value Adding activities

Following the lean steps

understanding the customer needs, to reduce reworks,

Reducing waste,

Use QFD to map the priorities of the customer requirements

16

2)(c)

MUDA is the Japanese word for waste, there waste adds cost and time to the reducing the customer values. There are 8 waste.

Talent - under utilising your work force skills, not giving them the correct training.

Inventory - having inventory cost time & money in its storage and maintenance,

solution - use the customer pull process (this means the only produce being produced is at the customers request.

Motion - personnel moving between workstation,

solution - rework the shop floor so the process flows

2
16

2)(c)

Waiting - This is caused by the station waiting for parts of the process to catch up with production.

Solution - Use Just in time, where parts are requested as they are needed through the customer orders, pull the order through the process not start in anticipation of an order. 3

Transportation - Moving inventory from place to place or parts from factory to factory

Solution - bring all the manufacturing to one location, may have a large outlay but will save money in the future. 2

Defects - having fault product sent back to the manufacturing process

Solution - ensure a robust testing plan is in place to eliminate reworks in the testing phase of the product. 2

Overproduction - producing product when there is no demand.

Solution - only produce from customer requests 2

Overprocessed - making a product that is better than the customer specified costing more time & money.

Solution - only build what the customer asks for in the specification, keep open communication with the customer. 2

(17)