

Candidate's Number: 190407010

*1st/2nd Semester Examination, 20..... 23 / 2024 Session

Faculty ENGINEERING Department: SYSTEMS

Course Code.....

Course Title..... INDUSTRIAL ENGINEERING

(*Cross out the word which does not apply)

UNIVERSITY OF LAGOS

INSTRUCTIONS TO CANDIDATES

1. Write legibly on both sides of the paper.
2. Begin each answer on a fresh page.
3. Write the number of the question at the top of each page.
4. Cross out rough works.
5. In your own interest you should enter in the space provided below, the number of each question attempted (with sub-sections where necessary).
6. If supplementary books are used they must be fastened at the end of this book and inside the cover.
7. In no circumstances must answer books used or unused be removed from the Examination Room by a candidate.
8. Folding of, or tampering with this booklet in any way will attract severe penalty.
9. Do not write anything on your question paper except your matriculation number.
10. For your rough work, use only (a) the inside cover and (b) the last page of your answer booklet.

NUMBER OF QUESTIONS in order in which they
are answered

For Examiners use only	
Question No	Marks
1	22
3	14
5	10
	46
	Total

a) Four constructs of Industrial Engineering.

- i. Work study.
- ii. Project Management
- iii. Quality Management Control
- iv. Human factor / Ergonomics.

i) Work study:- It's a construct of industrial engineering that analyses work processes to improve efficiency, production and also minimize costs and waste.

In work study, there's a breakdown analysis of tasks and all that is required to meet specifications. This work study includes Method study and work performance.

In Method study, this involves analysing methods and ongoing methods, recording these methods and then carefully analyzing these methods to determine flaws and defects; this study then goes further to find methods to improve on these flaws, improve efficiency and also the general productivity level.

In work performance, this involves assessing the overall details and performance of projects and tasks, and workflow involved.

Work study is very essential in minimizing costs, improving efficiency and productivity, and creating a better relationship between workers and the management.

i) Project management:- This involves all the processes involved in planning, analysing a project activity to enable it reach its project requirement.

It's also the planning, analysing, management of a brilliant idea turning it into a feasible idea that is ~~infeasible~~, meets standard requirements and benefits users.

There are different process involved in project management

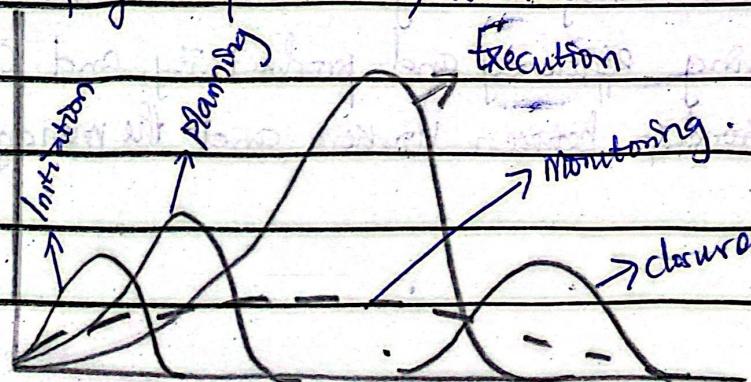
i) Initiation:- This includes the planning process, where the project charter is executed, scope definition, stakeholder and team definitions.

ii) Planning:- This steps includes a proper survey and discussion of what needs to be carried out to make the project a huge success. This include budgeting, risk management, procurement plan etc.

iii) Executing / Execution:- When the tasks are in motion, stages involved in this includes, cost management, time management, risk management etc.

iv) Monitoring / Control:- This process commences from the execution and includes stages like cost control, risk control etc.

v) Closing:- This is the final step and includes, final reporting or project procedures, Archives.



③ Quality management:- They are the processes involved in monitoring and recording the processes involved in a project and ensuring that the quality is maintained at all times and continues to meet quality standard requirement.

There are various processes involved in quality management

i) quality planning - This analyses the company's policy as regards to quality and plans out how best to maintain quality.

ii) Quality assurance:- This is the confidence given during project execution that a product would meet its specified requirements at the end of the day.

iii) Quality Control:- This involves steps and procedures taken to ensure that quality is always maintained throughout the process.

④ Human factors / Ergonomics:- These are processes that relate human experience to system. They involve processes that ensure there's a smooth integration and working process between humans and systems. This construct focuses on creating a safe environment for human's while working. It also puts into consideration the effect of fatigue on production and finds way to reduce stress level. It also focuses on work place byout and how it influences productivity, and interaction of humans with systems.

B) Industry 1.0

This started from The 18th century to Early 19th century

- 1) This saw a growth in manufacturing processes like, steam manufacturing process for production.
- 2) It also saw a growth in iron production with introduction of casting and welding methods in production.
- 3) This era saw a growth in rural-urban migrations.

C) Industry 2.0

This started from Late 19th century to Late 19th century

- 1) This era brought about the use of electricity and electronics to power production machines.
- 2) This era also brought about telephones, easing communication processes.

D) Industry 3.0

This was from early 20th century to mid 20th century

- 1) This era saw the transition from analog to digital uses.
- 2) This era also saw the use of computers and more defined production processes.
- 3) There was an uprise in productivity in this era.

E) Industry 4.0

This was from mid 20th century to late century.

- 1) This era saw the integration of automation and also robotics.
- 2) There was an accelerated hike in technological processes.

in the economy making work processes easier and faster.

Industry 5.0.

This is from 21st century to present.

- 1) This presently sees to an advancement in robotics.
- 2) Integration of Artificial Intelligence.
- 3) More data and heavy side data integration.
- 4) This has also brought about more smart development and AI models like chat gpt, gendific.

Q) Three processes involved in Quality Management.

1) Quality Planning:

This involves taking the company's quality policy into consideration and analysing how best to improve quality, productivity while also meeting specific requirements.

Quality planning is very essential and is the foundation of every quality management process.

In quality planning there are stages involved which includes inputs, tools/techniques and Outputs.

i) for Inputs:- This takes in the scope definition, quality

policy, product quality review, quality audits.

These inputs highlight things taken into account during quality planning.

i) Tools / techniques:- flowcharting, Cost benefit analysis.

These tools are very significant in analysing these inputs as regards to quality management.

ii) Outputs:- Outputs gotten from this are Quality management plan, Operational definition and checklist.

2) Quality Assurance:- After planning, these are intentional steps taken to create confidence in this process that at the end of the day these product quality will reach the required specific quality.

Quality assurance also takes on inputs of quality management plan, operational definition and is acted upon by tools and techniques like flowchart that give outputs of quality audit at the end of the day.

3) Quality control:- This is the final quality management process step that ensures that during each process, recorded analysis are examined and quality is maintained and controlled to always meet specific quality requirements.

It takes input of operational definition, checklist, and quality management plan; it is acted upon by tools and techniques that include Pareto diagrams, six sigma, lean manufacturing, inspection to give output of a completed

checklist, product quality etc.

d) Engineering design is both iterative and cyclic due to its ever growing preeminence of change. In every project design a prototype is sometimes created to envision the project's goal. During the course of this project design, there would be need for improvement on already existing designs put in place. As these changes occur and defects arrive, these products and designs are revisited and worked upon. This causes a continuous chain of iteration and working on already existing designs to improve efficiency.

Also during designs, there are cases of feedback from team members or even consumers that would require this projects to be revisited to effect change and improve the efficiency and quality of these products. This explains the cyclic and iterative nature of product design.

e) Work breakdown structure is the process of breaking down tasks into smaller bits to improve productivity, bring about more clarity and enable efficiency. This is a very needed structure in work study as this allows team members to have more predefined goals and strategies to carry out these work processes efficiently.

i) Time consideration

~~Technology~~ consideration. (Technology)

Economic Consideration.

Human considerations.

In Method study:-

i) Economic Consideration:- This involves the evaluation of the cost that would be required to optimize these work processes to minimize waste while also improving quality and productivity. The cost factor is taken into account to analyse the feasibility of the optimized process.

(i) Technology consideration:- This involves the evaluation of technologies and technologies required to optimize this process. This analyzes the technologies that would be suitable for improving on these processes.

ii) Human Consideration:- This is an important factor as it takes human factors into consideration. This takes human experience into consideration, human safety, workplace layout and the benefit attached to human participation in the work processes.

3b) Method study involves the breaking down and analyzing of already existing methods in work processes and identifying ways to optimize these processes, improve

these methods and also minimize waste, cost and also improve productivity.

Steps involved.

- 1) Selecting the methods/work to be analyzed.
- 2) Recording and collecting data on this work.
- 3) Examining and analyzing the work.
- 4) Developing a new and better process for the work.
- 5) Measuring the new work process.
- 6) Defining the work process to the new users (customers).
- 7) Installing (Install) the new work process.
- 8) Closure or finalizing this work process.

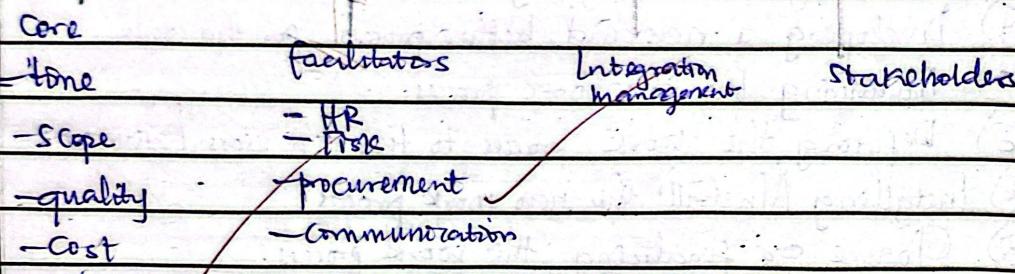
c) Objectives of method study.

- 1) It is used to improve overall productivity.
- 2) It is essential in minimizing waste during work processes.
- 3) It is essential in minimizing cost.
- 4) It is essential in improving a smooth flow in production.
- 5) It is essential in improving efficiency and creating a good worker-management relationship.

?

Q) 10 Knowledge areas of project management.

Project Management



1) Scope management! - This defines the general activity of the project specifying what is to be included and not included in the project.

2) Time management! - This gives a time-frame to tasks and ensures projects meets deadlines.

3) Cost management! - This involves budgeting and analysing the total cost for project management and execution.

4) Quality Management! - This involves maintaining quality and ensuring it meets standard specifications.

5) Procurement Management! - This involves getting a stable supplier to provide resources required for the project.

6) Risk Management! - This involves taking into account risks that would be involved along the way.

7) Communication Management! - Ensures that there is attorney

flow of information

8) Stakeholders! -

have interests tied

9) Integration man

personnel, manage

project

10) Resource man

needed and resou

b.

Initiation

Initiation

1) Defining project

2) Team member

3) Stakeholder

4) Budget and

overviews

flow of information regarding tasks.

5) Stakeholders:- Takes into account personnel and people that have interests tied to this project.

7) Integration management:- Takes into account every step, personnel, management body that would be involved in this project.

10) Resource management:- Taking into account resources needed and resource constraints needed for the project.

b.

Project management

Initiation

Planning

Execution

Project management

Initiation

1) Defining project scope.

Planning

Execution

Control

2) Team member definition

1) Budget analysis

1) Risk management

1) Risk control

3) Stakeholder definition

2) Risk planning

2) Time management

2) Time control

4) Budget and resource

3) Communication

3) Cost management

3) Cost control

overview.

Planning

4) Cost management

4) Product

4) Time schedule planning

2) Lesson learned and review

3) Project

audit.

4) Archives

c) PRINCE^(P) was a key factor to defining project management processes and based his principles on maintaining planning and also sorting out the best methods to turn brilliant ideas into realities.

d)

$$\text{Project 1} = \text{Score} = \frac{2.13 + (2 \times 1.42)}{1.45} = 3.42$$

$$\text{Project 2} = \text{Score} = \frac{1 + (2 \times 1.58)}{1.62} = 2.57$$

$$\text{Project 3} = \text{Score} = \frac{2.13 + (2 \times 1)}{1} = 4.13$$

$$\text{Project 4} = \text{Score} = \frac{2.67 + (2 \times 3.35)}{1.89} = 4.96,$$

$$\text{Project 5} = \text{Score} = \frac{3.33 + (2 \times 2.78)}{0.17} = 4.09,$$

$$\text{Project 6} = \text{Score} = \frac{3.38 + (2 \times 2.7)}{2.12} = 4.21$$

$$\text{Project 7} = \text{Score} = \frac{3.67 + (2 \times 1.34)}{2.49} = 2.55$$

$$\text{Project 8} = \text{Score} = \frac{3.88 + (2 \times 2.37)}{2.51} = 3.43$$

$$\text{Project 9} = \text{Score} = \frac{3.61 + (2 \times 3.34)}{3.17} = 2.78$$

$$\text{Project 10} = \text{Score} = \frac{3.56 + (2 \times 4.22)}{3.58} = 3.35$$

$$\text{Project 11} = \text{Score} = \frac{3.78 + (2 \times 3.54)}{4.44} = 2.45$$

$$\text{Project 12} = \text{Score} = \frac{3.88 + (2 \times 5.74)}{6.39} = 2.403,$$

Now ranking this project in ascending order, from smallest to biggest. Project 12 → Project 11 → Project 7 → Project 2 → Project 9 → Project 10 → Project 1 → Project 8 → Project 5 → Project 3 → Project 6 → Project 4

1) Best 3 projects are Project 4, project 6 and project 3.