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Q. Study about Holland's theory on personality types. (RIASEC model)

Sol:- Holland's theory of personality types, also known as RIASEC model suggesting people to perform best in environments that match their personality.

Holland identified 6 personality types :-

1. Realistic (Doers):-

Characteristics :- • Like to do hands-on work
• Focus on things in physical realm
• Uses physical skills

Preferences :- • Work with tools, machinery
• Prefer practical solutions over abstract ideas

Careers :- Mechanics, engineers, carpenters, electrician etc

2. Investigate (Thinkers):-

Characteristics :- • Like to collect and analyse data
• Motivated by analysing and researching
• Curious and tend to be creative

Preferences :- • Work by analysing data and conducting research
• Prefer solving problems through observation

Careers :- Scientists, researchers, mathematicians

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3. Artistic (Creators) :-

Characteristics :- • Like to focus on self-expression through music/art/words
• Focus on creativity
• Expressive and independent

Preferences :- • Express themselves through mediums like music, art, writing
• Dislike structured/complicated solutions
• Prefer solving problems through creativity

Careers :- Artists, writers, musicians

4. Social (Helpers) :-

Characteristics :- • Like to cooperate and help people
• Focus on guiding/teaching others
• Empathetic, helpful, verbal

Preferences :- • They value human connections
• They like working alongside people
• Prefer solving problems through communications

Careers :- Teachers, counselors, nurses

5. Enterprising (Persuaders) :-

Characteristics :- • Like to work with/through people by leadership
• Focus on financial gain
• Confident, sociable, persuasive

Preferences :- • They are good leaders
• Have good decision making skill for solving problems

Careers :- Managers, ~~salesm~~ business people

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6. Conventional (Organizers):-

Characteristics :- • Like to pay lot of attention to details
• Focus more on responsibility, follow rules
• They are organised and detail-oriented

Preferences :- • Work with data, organising information
• Complete tasks within a structured environment

Careers :- Data analysts, accountants, bankers

Q2. Layers of CDIO.

Sol:- The CDIO (Conceive-Design-Implement-Operate) is structured into 4 layers, each representing a distinct phase in engineering lifecycle.

1. Conceive :- Understand and defining the problem/opertunity

Eg:- • Identifying customer's needs
• Developing concepts and techniques

2. Design :- Developing detailed plans/blueprints

Eg:- • Creating detailed designs, algorithms and drawings
• Exploring alternatives and selecting optimal solutions

3. Implement :- Transform designs into tangible solutions

Eg:- • Prototyping, manufacturing, coding and testing
• Validating if the product meets design specifications

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4. Operate :- Deploying, using and maintaing product/system

Eg:- • Installing and managing the product in real life conditions
• Retiring a system when necessary

Q3. Summarize the four dimensions of engineering in detail.

Sol:- The 4 dimensions of engineering are:-

1. Basic Sciences :- Engineer as scientist

Engineers are seen as scientists applying analytical methods to understand and manipulate natural phenomena.

They produce knowledge through research, analysis and experimentations

2. Social Sciences :- Engineer as sociologist

Engineers are seen as social experts, understanding how their work impacts and integrates with team dynamics.

3. Design ~~Dimension~~ :- Engineer as designers

Engineers are seen as designers who craft solutions by balancing technical and practical factors

4. Practical Realization :- Engineer as doer

Engineers are seen as doers, translating plans into reality and ensuring functionality through hands-on application

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Q4. How ADDIE model is used for software development

Sol^n :- ADDIE model used by instructors and training developers (designers).
There are 5 phases of ADDIE :-

1. Analysis :- Understand the software's objectives, user requirements and constraints

Here, • Target users and their needs are identified
• Analyze existing systems for improvements

2. Design :- Plan the structure and functionality of the software

Here, • Create system architecture and design database
• Create user interface and plan out user experience

3. Development :- Build the software based on design specification

Here, • ~~Write~~ Write code for the software
• Develop and test ~~the~~ the code
• Integrate various functions to create functional software

4. Implementation :- Deploy the software

Here, • Prepare documentation for users about the software
• Deploy the software to a client system

5. Evaluation :- Assess software performance and make necessary improvements

Here, • Conduct evaluation based on user testing
• Gather user feedback for future updates

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Q5. Explain in detail about how the sciences and engineering technology domains are related.

Sol:- The domains of science & engineering are interconnected by a relationship that drives innovation, discovery and practical applications.

Science :- • Study of natural phenomena through observation, experimentation and theoretical analysis
• Study of laws of motion and natural phenomena

Engineering :- • Application of scientific principles to solve practical problems and develop tools
• Using laws of science & motion to build effective systems

Science provides foundational knowledge that engineers apply to build real-life functional systems

Q6. Difference between engineering design and scientific method

Sol:-

| Scientific Method | V/S | Engineering Design |
|---|---|---|
| • Formulate hypothesis, identify variable | | • Specify requirements |
| • Test hypothesis through experimentation | | • Build prototype |
| • Analyse results and draw conclusions | | • Test and redesign for improvements |

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Q7. Different types of questions in Philosophy of Engineering?

Sol^n:- (i) What is the nature of engineering knowledge?
(ii) What are the ethical responsibilities of engineers?
(iii) What is the role of creativity in engineering?
(iv) How do engineering and science differ in their goals and methods
(v) What is the relationship between technology and society?

Q8. How to develop softwares or apps using engineering design process?

Sol^n:- Stages of developing software/apps using engineering design process are:-

i) Define the Problem :- Understand the user needs, target audience and functional requirements of the app.

ii) Research & Brainstorm Problems :-
- Research existing solutions, similar apps and technological posibilities
- Brainstorm ideas and approaches for solving the problem

iii) Develop Prototypes :- Create initial prototypes of the app. Using tools like Figma or Adobe XD to visualize user interface (UI) and user experience.

iv) Test and Refine :- Test the prototype or early version of app and feedback from the users. Then refine the app based on feedback and performance.

v) Implementation and Deployment :-
- Implement appropriate programming languages, to create the full app.
- After testing, deploy the app to relavant platforms

vi) Evaluate and Iterate :- Monitor user feedback and apps performance, fixing bugs and make improvements. The process is iterative with continuous improvements

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