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**Question Paper Code: U9774**

B.E. / B.Tech. DEGREE EXAMINATION, NOV 2024

Open elective

Mechanical Engineering

21UME974 – BASICS OF INDUSTRIAL LAYOUT DESIGN AND SAFETY

(Common to All Engineering branches)

(Regulations 2021)

Duration: Three hours

Maximum: 100 Marks

Answer All Questions

PART A - (10 x 1 = 10 Marks)

1. Activity relationship chart (ARC) is a tool used to CO1 U
  - (a) Analyze employee travel patterns
  - (b) Visualize the relationships and dependencies between different tasks
  - (c) Track inventory levels in real-time
  - (d) Design the company website
2. Computer-aided facility layout (CAFL) software allows for CO1 U
  - (a) Managing employee social media accounts
  - (b) Testing and simulating different layout options
  - (c) Generating marketing materials for the company
  - (d) Scheduling employee vacation days
3. CRAFT (Computerized Relative Allocation of Facilities Technique) software is used for CO1 U
  - (a) Detailed equipment layout within work areas
  - (b) Block layout of departments and major work areas
  - (c) Simulating material flow and production processes
  - (d) Employee scheduling and task assignment

4. VIP-PLANOPT (Virtual Interactive Planning & Optimization) software allows for CO1 U
  - (a) Generating 2D layouts only
  - (b) Designing and simulating 3D facility layouts
  - (c) Calculating production costs based on layout
  - (d) Automating the hiring process for employees
  
5. What type of storage system is used in warehouses to retrieve materials automatically CO1 U
  - (a) Manual Stacking
  - (b) Conveyors
  - (c) Automated Storage and Retrieval System (AS/RS)
  - (d) Forklifts
  
6. Which of the following is a principle of material handling CO1 U
  - (a) Automation Principle
  - (b) Space Principle
  - (c) Cost Principle
  - (d) Time Principle
  
7. What is the purpose of an accident investigation in workplace safety management CO1 U
  - (a) To find fault
  - (b) To prevent recurrence
  - (c) To reduce the company's costs
  - (d) To reprimand employees
  
8. What is the main objective of occupational health programs in a factory CO1 U
  - (a) To improve productivity
  - (b) To prevent work-related illnesses and accidents
  - (c) To reduce working hours
  - (d) To provide entertainment for workers
  
9. How should compressed gas cylinders be stored CO1 U
  - (a) Horizontally and chained
  - (b) Upright and secured
  - (c) In direct sunlight
  - (d) In damp areas
  
10. Hydrocarbons are typically stored in which type of container CO1 U
  - (a) Plastic bags
  - (b) Open containers
  - (c) Sealed metal drums
  - (d) Wooden crates

PART – B (5 x 2= 10Marks)

11. Describe the purpose of using an Activity Relationship Chart (ARC) in facility layout planning. CO1 U
12. Describe two key considerations for fire safety in facility layout design CO1 U
13. Explain the 'Block Layout' approach in facility layout design CO1 U
14. What are the steps involved in accident investigation CO1 U
15. Why is proper labeling important for hazardous substances like hydrocarbons CO1 U

PART – C (5 x 16= 80Marks)

16. (a) Describe the key aspects of process and material flow analysis. Explain how this analysis influences decisions in facility layout design. CO1 U (16)  

Or

(b) Describe the types of data that are critical for making informed layout decisions. Explain how this data impacts the design and operation of the facility. CO1- U (16)
17. (a) Identify the challenges in traditional facility layout approaches and plan an alternative solution using hybrid algorithms for a more efficient layout. CO2- App (16)  

Or

(b) Choose an appropriate improvement algorithm to develop a facility layout plan that addresses workflow bottlenecks and optimizes department placement. CO2- App (16)
18. (a) Utilize generic modeling tools to build a flexible layout for a multi-row manufacturing facility, ensuring the smooth flow of materials between departments. CO3- App (16)  

Or

(b) Identify critical factors affecting the design of a material-handling system and solve for the optimal layout using a suitable algorithm. CO3- App (16)
19. (a) Identify the risks in handling hazardous substances and develop preventive measures that comply with safety regulations in the workplace CO4- App (16)  

Or

(b) Choose the best occupational health practices and utilize them to construct a safety plan that prevents common industrial hygiene issues in a factory setting CO4- App (16)

20. (a) Apply the correct safety measures when operating forklifts in a crowded warehouse. Discuss how operator training, traffic management, and environmental factors can prevent accidents during forklift operations. CO5- App (16)

Or

- (b) Propose safety protocols and training programs to ensure compliance with hazard control measures. CO5- App (16)