

**COLLEGE OF ENGINEERING AND TECHNOLOGY**

**SCHOOL OF BIOENGINEERING, DEPARTMENT OF CHEMICAL ENGINEERING**

**B. Tech. Open Elective**

**ACADEMIC YEAR 2023-24 – ODD SEMESTER**

**Continuous Learning Assessment III Set 4**

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| Reg. No. | R | A |  |  |  |  |  |  |  |  |  |  |  |  |  |

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| Course Code: **18CHO104T** | Course Title: **PROCESS PLANT SAFETY** | | |
| Sem & Year: V & III year | Date: **07/11/2023** | Duration: 100 Minutes | Max. Marks: 50 |

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|  | **Course Outcomes (COs)** | **Program Outcomes (POs)** | | | | | | | | | | | | | **PSOs** | | |
|  |  | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 1 | | 2 | 3 |
| **CO4** | *Understand the various concepts of Hazard identification techniques* | 2 | 3 | *-* | 2 | *-* | *-* | *-* | *-* | *-* | *-* | *-* | *-* | 3 | | 1 | - |
| **CO5** | *Understand the various aspects of Occupational Health hazards, Safety legislation* | 1 | - | 2 | *-* | *-* | *-* | *-* | *-* | *-* | *-* | *-* | *1* | 3 | | - | 2 |

**Part A Answer the Following 10×1 Marks = 10 Marks**

|  |  |  |  |  |  |  |
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| **Q. No.** | **Questions** | **Marks** | **CO** | **BL** | **PO/PSO** | **Marks Scored** |
| **1.** | Which of the following special purpose footwear should you wear to avoid a buildup of static electricity?   1. Safety toe shoes 2. **Electrically conductive shoes** 3. Foundry shoes 4. Metatarsal guards | 1 | 5 | L2 | 3,2 |  |
| 2. | --------------- hard hat protects you from 20000 volts electric current   1. Class A 2. **Class B** 3. Class C 4. Bump caps | 1 | 5 | L1 | 3,2 |  |
| **3.** | Which of the following types of gloves should you wear when working with chemicals?   1. **Butyl rubber gloves** 2. Fabric gloves 3. Leather gloves 4. Butyl and leather gloves | 1 | 5 | L2 | 3,2 |  |
| **4.** |  | 1 | 5 | L1 | 3,2 |  |
| **5.** | To emerge from Bhopal gas tragedy --------------- is enacted?  a) Factories act b) **environmental protection act**  c) Indian boiler’s act d) Mine’s act | 1 | 5 | L1 | 3,2 |  |
| **6.** | Which is the way of determining risks and dangers in workplace?   1. Hazard analysis b**) risk assessment** c) fault tree analysis d) human error analysis | 1 | 4 | L2 | 1,3 |  |
| **7.** | -------- method is used to evaluate the potential risks from a process and also to assess the potential loss is assessed   1. Fault tree analysis 2. HAZOP study   c) **Dow fire and explosion index**  d) Risk assessment | 1 | 4 | L1 | 1,3 |  |
| **8.** | The guide word ‘NO or NOT’ in hazop study means   1. Quantitative increase 2. Quantitative decrease 3. **Complete negation of the intentions** 4. Complete substitution | 1 | 4 | L2 | 1,3 |  |
| **9.** | If the fire and explosion index within 97-127 range, then the degree of hazard is   1. Light b) Moderate **c) Intermediate** d) Heavy | 1 | 4 | L1 | 1,3 |  |
| **10.** | Calculate the risk from the risk table:   |  |  |  |  | | --- | --- | --- | --- | | Hazard | Likelihood | Severity | Risk | | A | 5 | 6 | ? |  1. 20 b)15 c) 11 **d) 30** | 1 | 4 | L2 | 1,3 |  |

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| **Q.No.** | **1** | **2** | **3** | **4** | **5** | **6** | **7** | **8** | **9** | **10** |
| **Ans.** |  |  |  |  |  |  |  |  |  |  |



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| Reg. No. | R | A |  |  |  |  |  |  |  |  |  |  |  |  |  |

**Part B Answer the following 4 x 4 Marks = 16 Marks**

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| **Q. No.** | **Questions** |
| **11.** | Explain a note on Preliminary Hazard analysis (PHA).   * Conducted to identify potential hazards and prioritize them according to the :   1. probability of an accident or injury being caused by the hazard.   2. severity of injury, illness or property damage that could result if the hazard caused an accident.   3. PHA can serves 2 purposes :   4. it can expedite bringing the new system on line, but at a substantially reduced risk of injuring workers.   5. it can serve as a guide for a future detailed analysis.   6. Experience and related expertise are important factors in conducting a preliminary review. |
| **12.** | What is HAZOP? Discuss its basic principles.   * A hazard and operability study is a procedure for the systematic, critical, examination of the operability of a process * When applied to a process design or an operating plant, it indicates potential hazards that may arise from deviations from the intended design conditions * A formal operability study is the systematic study of the design, vessel by vessel and line by line using ‘ **guide words**’ to help generate thoughts about the way deviations from the intended operating conditions can cause hazardous situations   P_20181007_202236.jpg |
| **13.** | Discuss on any two acts enacted for safety and health. |
| **14.** | What is an occupational hazard? Explain on any one type. |

**Part C Answer the Following 2 x 12 Marks = 24 Marks**

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| **Q. No.** | **Questions** |
| **15a.** | Describe the procedure of Fault tree analysis by constructing a fault tree.   * Fault tree is the logical model of the relationship of the undesired event to more basic events. * The top event of the Fault tree is the undesired event. * The middle events are intermediate events * The basic events are at the bottom. * The logic relationship of events are shown by logic symbols or gates.   Procedure:     * Define the primary failure to be analyzed in other words identify the undesirable top event * Identify first level contributors which are just below the top level using the available technical information * Link these contributors to top level event by using logical gates (AND, OR gates), and also see the relationship, so that it will help to identify the appropriate logical gate * Identify the second level contributors and link to top by using logical gates. * Identify minimal cut set * Repeat the same steps till the basic causes * Finally complete and evaluate the FTA * Calculate probability of lowest level elements occurrence and also measure the probabilities from bottom up |
|  | **OR** |
| **15b.** | Describe the Failure mode and Effects analysis procedure.  **FMEA Procedure**   1. Determine failure mode for each process input. 2. For each failure mode, determine effects – Select a severity level for each effect. 3. Identify potential causes of each failure mode – Select an   occurrence level for each cause.   1. List current controls for each cause – Select a detection for each cause. 2. Calculate the Risk Priority Number (RPN). 3. Develop recommended action , assign responsible person and take actions. 4. Assign the predicted Severity, Occurrence and Detection levels and compare RPNs   **Risk Priority number (rpn)**   * Severity× Occurrence × Detection = RPN * 1000 is maximum and 75\* is considered OK!!! * Severity (S)   + Importance of the effects on customer requirements.   + 1 = Not sever, 10 = very sever * Occurrence (O)   + Frequency with which a given cause occurs and creates failure modes.   + 1 = NOT Likely, 10 = Very Likely * Detection (D)   + The ability of the current control scheme to detect then prevent a given causes.   1 = Easy to Detect, 10 = Not easy to Detect  **Rating Scales**   * There are a wide variety of scoring anchors. * Two types of scales are 1-5 or 1-10. * The 1-5 scale makes it easier for the teams to decide on scores. * The 1-10 scale may allow for better precision in estimates and a   wide variation in scores.   * Zero(0) Ranking not allowed for RPN Rating Scales. |
| **16a.** | Discuss the following for Eye and face protection:   * Potential hazards * Control of hazards * Care and maintenance * List of PPEs   **Eye and Face Protection (Explain it all)**  Types of eye/face hazards   * Impact * Heat * Chemicals * Dust * Light and/or Radiation   **TYPES OF EYES AND FACE PROTECTIVE EQUIPMENT**   * Safety Glass * Goggles * Face Shields * Welding Helmets * Absorptive Lenses   **Elimination or Control of Hazards**   * Machine Guards   + Many types of machines such as lathes, grinders, and sanders are equipped with guards, shields and screens * Work Area Barriers   + Operations such as sanding, grinding, welding, and lathe operations produce dust, vapors, and flying particles. * **Ventilation**   + Ventilation, along with damping systems, can significantly reduce the amount of airborne particles that could be hazardous to your eyes |
|  | **OR** |
| **16b.** | Explain a brief role on respiratory protective equipment. |

**% of CO attainment is above 75% - Level 3 % of CO attainment is 60% -75% - Level 2**

**% of CO attainment is 50% -60% - Level 1 % of CO attainment is below 50% - Level 0**

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|  | **Quality** | **Marks Scored** | **% of Marks** | **Attainment** |
| **CO4** | **L1 = 2 Marks** |  |  |  |
| **L2 = 11 Marks** |
| **L3 = 24 Marks** |
| **CO5** | **L1 = 7 Marks** |
| **L2 = 30 Marks** |
| POs/PSOs: | **1,2,3** | | | |



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| Reg. No. | R | A |  |  |  |  |  |  |  |  |  |  |  |  |  |

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| Sem & Year: V & III year | Date: 07/11/2023 | Duration: 5 Minutes | Max. Marks: 5 |

**Continuous Learning Assessment IV**

**Match the following (Quiz component) (5x1 = 5 marks)**

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| **1.** | Factories act | **a.** | Logical diagram |
| **2.** | Gas mask | **b.** | Health and safety |
| **3.** | Fault tree analysis | **c.** | PID diagram |
| **4.** | Poor illumination | **d.** | Filters 0.1 - 2 % concentration |
| **5.** | HAZOP | **e.** | Lacrimation |

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| **Q.No.** | **1** | **2** | **3** | **4** | **5** |
| **Ans** |  |  |  |  |  |