Manmohan Technical University Office of the Controller of Examinations **Exam Year: 2082, Mangsir(Model Question)**	**Exam Roll:** …… Exam Roll in words: ……	
School: SOE	Level: BE	Invigilator's Sign: …….
Program: BEEE	Year/Part: IV/I	Superintendent's Sign: ……
Subject: Advanced Instrumentation (EG701EX)		Code No. ……

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i. Answers should be given by filling the Multiple-Choice Questions' Answer Sheet.
ii. The main answer sheet can be used for rough work.

Code No. [ ]

GROUP A *(Multiple-Choice Questions)*	**[10x1=10]**	**Time: 20 Minutes**

1. Which device converts pressure into mechanical displacement?
A) Thermocouple B) Bourdon Tube
C) **RTD** D) LVDT

2. Which of the following adjustments is usually adjusted first in an instrument requiring calibration?
(A) Deadband (B) Span
(C) Hysteresis (D) **Zero**

3. What is the main advantage of using nondispersive infrared (NDIR) analyzers?
A) High sensitivity to oxygen B) Selective detection of gases like CO_2
C) **Low cost** D) Real-time calibration

4.Which of the following is a benefit of using SO_2 analyzers in industrial processes?
A) Enhancing product flavor B) Reducing energy consumption
C) Preventing corrosion in equipment D) **Increasing water purity**

5. Which standard defines the Safety Life Cycle in functional safety?
A) ISO 14001 **B) IEC 61508**
C) IEEE 802.3 D) ISO 9001

6. What is the primary role of a Safety Instrumented Function (SIF)?
A) Increase production efficiency B) **Detect hazardous conditions and bring the process to a safe state**
C) Reduce maintenance costs D) Improve product quality

7. Compliance with instrumentation standards primarily helps in:
A) Reducing taxes B) Improving employee morale
C) Increasing advertising reach D) **Meeting legal and regulatory requirements**

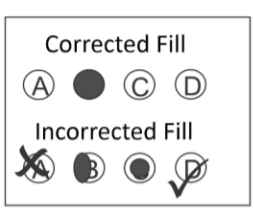
8. Performance standards in instrumentation focus on:
A) **How well the instrument performs under specified conditions** B) The cost of manufacturing instruments
C) The marketing of instruments D) The training of operators

9. What is the primary purpose of a cable routing diagram?
A) To show the cost of cables
B) To illustrate the physical path and connections of cables
C) To display the training schedule of operators
D) To indicate the color coding of wires only
Answer B

10 What is the main purpose of a control room layout diagram?
A) To show operator seating arrangements only
B) **To represent the arrangement of racks, consoles, and equipment**
C) To display the company's organizational chart
D) To indicate cable color codes

Multiple Choice Questions' Answer Sheet

Marks Secured: _____
In Words: _____
Examiner's Sign: _____ Date: _____
Scrutinizer's Marks: _____
In Words: _____
Scrutinizer's Sign: _____ Date: _____



1.	Ⓐ	Ⓑ	Ⓒ	Ⓓ	6.	Ⓐ	Ⓑ	Ⓒ	Ⓓ
2.	Ⓐ	Ⓑ	Ⓒ	Ⓓ	7.	Ⓐ	Ⓑ	Ⓒ	Ⓓ
3.	Ⓐ	Ⓑ	Ⓒ	Ⓓ	8.	Ⓐ	Ⓑ	Ⓒ	Ⓓ
4.	Ⓐ	Ⓑ	Ⓒ	Ⓓ	9.	Ⓐ	Ⓑ	Ⓒ	Ⓓ
5.	Ⓐ	Ⓑ	Ⓒ	Ⓓ	10.	Ⓐ	Ⓑ	Ⓒ	Ⓓ

Manmohan Technical University
Office of the Controller of Examinations
Exam Year: 2082, Mangsir(Model Question

School: SOE	Level: BE	Time: 3 Hours
Program: BEEE	Year/Part: IV/I	Full Marks: 50
Subject: **Advanced Instrumentation (EG701EX)**		

- ✓ *Candidates are required to give their answers in their own words as far as practicable.*
- ✓ *The figures in the margin indicate **Full Marks**.*
- ✓ *Assume suitable data if necessary.*

GROUP A *(Multiple-Choice Questions in separate paper)* **[10×1=10]**

GROUP B ***(****Short Answer Questions - **Attempt Any Eight)*** **[8×2=16]**

1. Describe the Applications of Instrumentation Systems.

2. How do the Zirconia Sensors are effective for oxgen sensor?

3. Explain the operational principles and detection mechanism of ionization-based smoke detectors.

4. Discuss the working methodology of light scattering dust monitors and their application in particulate measurement.

5. Critically analyze the distinction between engineering codes and standards, highlighting their respective roles in regulatory compliance and design practices.

6. Evaluate the strategic functions of a control room within a process plant, emphasizing its role in operational safety and efficiency.

7. What is the significance of a General Arrangement (GA) drawing in multidisciplinary engineering projects, and how does it facilitate spatial coordination?

8. Construct a block diagram representing the safety life cycle as per functional safety standards, and briefly describe each phase.

9. Enumerate the Safety Integrity Levels (SIL) defined in IEC 61508 and explain their relevance in risk reduction and system reliability.

GROUP C ***(Long** Answer Questions - **Attempt Any Six)*** **[6×4=24]**

1. Critically evaluate the multidimensional criteria—technical, environmental, and economic—that govern the selection of sensors in complex instrumentation systems. How do these criteria influence system performance and reliability across diverse industrial applications?

2. Provide a comprehensive analysis of Non-Dispersive Infrared (NDIR) sensor technology, detailing its underlying physical principles, spectral selectivity, calibration challenges, and limitations in high-interference environments.

3. Deconstruct the architecture of a gas-liquid chromatography system by identifying and explaining the function of each core component. Support your explanation with a labeled schematic and discuss how design variations impact separation efficiency and resolution.

4. Examine the scope and structure of IEC 61508 in the context of functional safety for electrical/electronic/programmable electronic systems. How does the standard facilitate risk reduction through lifecycle management and SIL assignment?

5. Analyze the construction and application of risk matrices in industrial safety management. Compare multiple matrix models and discuss their effectiveness in quantifying risk severity and likelihood, including limitations in dynamic or high-complexity systems.

6. Using detailed examples, illustrate how Piping and Instrumentation Diagrams (P&IDs) serve as critical tools in fault diagnosis, HAZOP studies, and regulatory compliance. How do they enhance interdisciplinary communication and system integrity throughout the engineering lifecycle?

7. Discuss the methodology for assigning loop numbers in instrumentation diagrams and explain how these diagrams represent signal flow between transmitters, controllers, I/O modules, and final control elements. Evaluate the role of loop diagrams in facilitating accurate installation, calibration, and predictive maintenance, using representative examples such as temperature control, pressure regulation, and flow monitoring loops.

THE END