### Scheme of Examination for B.Tech Degree Course Instrumentation & Control Engineering

#### Sixth Semester Examination

<table>
<thead>
<tr>
<th>S.No</th>
<th>Course Code</th>
<th>Subject</th>
<th>Teaching schedule</th>
<th>Examination schedule</th>
<th>Total</th>
<th>Duration of Exam.</th>
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<tr>
<td>1.</td>
<td>AEI-302-E</td>
<td>BIO MEDICAL INSTRUMENTATION</td>
<td>3</td>
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<td>2.</td>
<td>AEI-304-E</td>
<td>ANALYTICAL INSTRUMENTS</td>
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<td>3.</td>
<td>AEI-306-E</td>
<td>INDUSTRIAL PROCESS CONTROL</td>
<td>4</td>
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<td>4.</td>
<td>AEI-308-E</td>
<td>MICROCONTROLLER BASED INSTRUMENTATION &amp; CONTROL</td>
<td>3</td>
<td>2</td>
<td>5</td>
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<td>5.</td>
<td>AEI-310-E</td>
<td>OBJECT ORIENTED PROGRAMMING COMPUTER GRAPHICS</td>
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<td>6.</td>
<td>AEI-312-E</td>
<td>DIGITAL &amp; NON LINEAR CONTROL SYSTEM</td>
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<td>7.</td>
<td>AEI-314-E</td>
<td>Bio-Instrumention Lab</td>
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<td>Industrial Process control Lab</td>
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<td>9.</td>
<td>AEI-318-E</td>
<td>Microcontroller based Lab</td>
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<td>AEI-320-E</td>
<td>Seminar -I</td>
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**Note:** Practical Training of 6 weeks duration during summer vacation, Evaluation in V Sem.0
BIO MEDICAL INSTRUMENTATION

(AEI-302-E)

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Theory : 100

3 1
4
Sessional : 50

Time : 3H

UNIT-1

Introduction to Bio Medical instrumentation :- Physiological system of the body , origin of bio electric signal, rest and action potentials, propagation of action potential , conceptual development of biomedical instrument, electrodes for ECG , EEG & EMG .

UNIT -2

Cardiovascular measurement :- Electro cardiograph (ECG) , block diagram of ECG, Isolation amplifier , the ECG lead ECG machine vector cardiograph , apex cardiograph , phonocardiograph blood pressure measurement direct & indirect blood pressure measurement pace maker defibrillator .

UNIT-3

Modern Imaging System :- Magnetic resonance imaging (MRI) , ultrasonic imaging system A-scan, B-Scan, M-scan , X-ray imaging CT- Scan , Safety aspects of biomedical.

UNIT-4

Laser :- Solid state, liquid , gaseous & semiconductor laser, molecular & ion laser, pulsed & CW operation , Modulation, demodulation deflection of laser beams, Applications of laser to Holography metrology & Biomedical applications.

NOTE:- The question paper shall have eight questions in all organized into four sections, each section having two questions from each of the four units . The candidate shall have to attempt five questions in all, selecting at least one question from each unit.

References:

Bio Instrumentation by Cromwell

Hand book of Bio Instrumentation by R.S.Khandpur
ANALYTICAL INSTRUMENTATION

( AEI-304-E )

L  T
T

Theory : 100

3  1
4

Sessional: 50

Time: 3H

UNIT -1

Fundamentals of Analytical Instruments (Brief Detail)


Atomic absorption Spectrometers: Basic concepts of atomic absorption instrumentation atomic absorption instrumentation.


UNIT-2


UNIT-3

pH Meter: Principal of pH measurement, Electrodes for pH Measurement, pH Meter biosensors.

Industrial gas analyzer: Types of gas analysis, Paramagnetic oxygen analysis, Magnetic wind instruments, the electrochemical methods, infrared gas Analysis.

UNIT-4

NOTE: The question paper shall have eight questions in all organized into four sections, each section having two questions from each of the four units. The candidate shall have to attempt five questions in all, selecting at least one question from each unit.

References:

Handbook of Analytical Instruments by – R.S. Khandpur. TMHEDU.

Analytical Instrumentation by – Khare

**PROCESS DYNAMICS & CONTROL**

**(AEI-306-E)**

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Theory :100

4 1

5

Sessional :50

Time :3H

UNIT-1

Introduction _ Introduction to process control, Mathematical modeling of process: Multi variables non linear and distributed such as mixing process heat transfer process , distillation column , Nuclear Reactor concept of process model identification .

UNIT-2

Controllers :- Controllers types and their characteristics : Proportional Integral Derivative ON –OFF ratio , split rang feed forward cascade controls , examples of flow & level control .

UNIT -3
Controllers Realization : Proportional Integral Derivative action of Hydraulic controller Pneumatic controller and Electronic controller.

UNIT-4
Controller Tuning :

Tuning of PID controller Zeigler – Nichols methods process reaction curve Ultimate gain and period method. quarter decay ration advance method of tuning. Effect of measurement and transportation lag on process response. Effect of disturbances.

NOTE: The question paper shall have eight questions in all organized into four sections, each section having two questions from each of the four units. The candidate shall have to attempt five questions in all, selecting at least one question from each unit.

References:

- Automatic Process Control By D.P Eckmen
- Chemical Process control by Steynopoulos
- Process control by Patranabis

**MICROCONTROLLER & ITS APPLICATIONS**

(AEI-308-E)

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Theory: 100

3 2

5

Sessional: 50

Time: 3H

UNIT-1

Induction to \(\mu\) C: Evaluation of Microcontrollers. Classification of Microcontroller – On the basis of architecture instruction set, type of memory used, Embedded processor. Overview of 8051 microcontroller family.

UNIT-2

UNIT-3

8051 Addressing modes, instruction set data transfer instructions, Logical operations, Arithmetic operations, jump and call instructions, Development of different programs.

UNIT-4

Application of μC: Microcontroller based seven segment numeric displays, Microcontroller based frequency measurement, Microcontroller based pulse width measurement, Microcontroller based D/A & A/D converters and Microcontroller based LCD display.

NOTE: :- The question paper shall have eight questions in all organized into four sections, each section having two questions from each of the four units. The candidate shall have to attempt five questions in all, selecting at least one question from each unit.

References:

The 8051 Microcontroller Architecture Programming & Applications by Kenneth J. Ayala

8051 Microcontrollers and Interfacing by Mazidi.
UNIT-1


UNIT-2


**Object Oriented Themes.** Abstraction, Encapsulation, Combining Data & Behavior, Sharing, Emphasis on Object Structure, Synergy.

UNIT-3

**Evidence for Usefulness of Object Oriented Development.**

**Object Modeling.** Object and classes, Object diagrams, Attributes, Operations, & Methods, Summary of Notation for object Classes.


UNIT-4


NOTE: The question paper shall have eight questions in all organized into four sections, each section having two questions from each of the four units. The candidate shall have to attempt five questions in all, selecting at least one question from each unit.

Books Recommended:

Object oriented Programming and Design by Rambaugh.

Object oriented Programming by Bala Guruswami.

Computer Graphics by Schaum Series.
Digital and Non Linear Control System

(AEI-312-E)

UNIT 1

Discrete data System :

Introduction to feedback control system. Types of control system :- Linear vs Non linear control system . Time invariant vs time varying system . Introduction to discrete time system Computer controlled system mathematical treatment of sampling process , Sampling theorem Reconstruction from sampled signal , Transfer functioned discrete data system :- transfer function of discrete data system with cascade elements , transfer function of Z.O.H , Transfer function of closed loop discrete data system.

UNIT 2


UNIT 3


Stability test of discrete date system :- Jury’s stability criterion modified Routh’s criterion Schur Cohn criterion

UNIT 4

Non Linear Control :- Different types of non linearity properties of non linear system , limit cycle jump resonance sub harmonics , Describing functions , determination of describing function and stability analysis. Lyapunov stability analysis stability definitions , Popov’s stability criterion phase Plane Method.
Note: The question paper shall have eight questions in all organized into four sections. Each section having two questions from each of the four unit. The candidate shall have to attempt five questions in all , Selecting at least one question from each unit.

Books Recommended :- Control system by Ogata PHI Education.

Control system engineering by NAGRATH & GOPAL , New aged

Digital control system by M. Gopal TMII education.

Digital control and state variable by M.Gopal TMH education.

Modern Automatic Control system by B.C.Kuo.

**LIST OF EXPERIMENT**

**BIO MEDICAL INSTRUMENTATION LAB.**

**(AEI-314-E)**

1. To study the different type of Electrodes used in Biomedical Instrumentatation.

2. To study the photo colorimeter and its application.

3. To study ECG Machine.

4. To study different wave of ECG in its different lead configuration.

5. To study sphygmomanometer.

6. To perform the blood pressure measurement using sphygmomanometer and stethoscope.

7. To study the cardiac monitor and its control.

8. To study the hemoglobin meter.

9. To study pacemakers.
10. To study Defibrillarors.

NOTE: At least Ten Experiments to be performed at least seven expts. should be performed from above list. Remaining Three Expts. may either be performed from the above list or designed and set by the concerned institution as per the scope of syllabus.

**LIST OF EXPERIMENT**

**INDUSTRIAL PROCESS CONTROL LAB.**

*(AEI-316-E)*

NOTE: At least Ten Experiments to be performed based on different parameters (like Level, Flow, Temperature, Pressure etc.) of Hydraulic/Pneumatic Systems. Experiments may designed and set by the concerned institution as per the scope of syllabus.

**LIST OF EXPERIMENT**

**MICROCONTROLLER LAB.**

*(AEI-318-E)*

1. To Study Microcontroller kit.

2. Copy a byte in TCON to register R2 using at least four different methods .

3. Store the number 8DH in RAM Locations 30H to 34H.
4. Write a Program to add the unsigned numbers found in internal RAM locations 25H, 26H and 27H together and put the result in RAM location 31H (MSB) and 30H (LSB).

5. Write a program to subtract 2 data bytes indicated by strings. i.e. Subtract a string of 8-bit data indicated by R1 from a string of data indicated by Ro. The number of data is indicated by R2.

6. Write a Program to multiply the unsigned number in register r3 by the unsigned number of n port 2 and put the result in external RAM locations 10H (MSB) & 11H (LSB).

7. The number A6H is placed some were in external RAM between locations 0100H and 0200H. Find the address of the location and put that address in R6 (LSB) and R5 (MSB).

8. Find the address of the first two internal RAM locations between 20H and 60H, which contain consecutive numbers. If so, set the carry flag to 1, else clear the flag.

9. Write a Program to find minimum value of date on memory block 9000 to 90FF and store the result in 9100 H.

10. Write a Program to arrange the given ten numbers in ascending order.

NOTE: At least Ten Experiments to be performed at least seven Expts. should be perform from above list. Remaining Three Expts. may either be performed from the above list or designed and set by the concerned institution as per the scope of syllabus.