

[Total No. of Questions: 12]

[Total No. of Printed Pages: 2]

UNIVERSITY OF PUNE

[4364]-170

B. E. (Instrumentation & Control) Examination - 2013

Computer Techniques & Applications (2003 Course)

[Time: 3 Hours]

[Max. Marks: 100]

Instructions:

- 1 Answer any three questions from each section.
- 2 Answers to the **two sections** should be written in **separate answer-books**.
- 3 Neat diagrams must be drawn wherever necessary.
- 4 Assume suitable data, if necessary.
- 5 Use of electronic pocket calculator is allowed.

SECTION - I

- | | | | |
|-----------|---|--|----|
| Q.1 | A | Define Operating System. What are the different services provided by the operating system. | 8 |
| | B | Distinguish between:
i) Batch Operating System and Multi Programming Operating System.
ii) Time Sharing Operating System and Real Time Operating System. | 10 |
| OR | | | |
| Q.2 | A | What do you mean by deadlocked. How these deadlocks are deadlock are handled. Explain in detail | 8 |
| | B | Explain in detail:
i) Round Robin Scheduling.
ii) Priority Scheduling. | 10 |
| Q. 3 | A | Explain the difference between the segmentation and Paging. | 8 |
| | B | Write a short note on Overlays. | 8 |
| OR | | | |
| Q. 4 | A | Explain in detail the concept of File allocation system. | 8 |
| | B | Explain briefly the Demand Paging. | 8 |
| Q. 5 | A | Write a short note on systolic arrays. | 8 |
| | B | Explain the following terms in detail:
i) SIMD
ii) MIMD. | 8 |
| OR | | | |
| Q. 6 | A | Write a short note on scheduling algorithms in RTOS. | 8 |

B Explain with the help of neat diagram the Multi Processor System. 8

SECTION II

Q. 7 A Write a short note on different LAN topologies with the help of neat diagram. 10

B Explain the ISO-OSI Seven layer model 8

OR

Q. 8 A Distinguish between the Packet Switching and Circuit Switching. 8

B Write a short note on Industrial Ethernet. 10

Q. 9 A Write a short note on architecture of ARM processor. 8

B Explain in detail the features of ARM Processor 8

OR

Q. 10 A Explain in detail the different software standards. 8

B Explain the software quality concepts. 8

Q. 11 A Write a short notes on: 16

i) CASE tools.

ii) Black box testing.

OR

Q. 12 A Write short notes on: 16

i) Software Testing.

ii) Software development cycle.

UNIVERSITY OF PUNE
[4364]-166
B. E. Instrumentation & Control
Examination - 2013
Laser Application in
Instrumentation
(2008 Course)

Total No. Of Questions: 12

[Total No. Of Printed Pages: 3]

[Time: 3 Hours]

[Max. Marks: 100]

Instructions:

- (1) Answer any **three questions** from section-I and section-II.*
- (2) Answers to the **two sections** should be written in **separate books**.*
- (3) Neat diagrams must be drawn wherever necessary.*
- (4) Use of electronic pocket calculator is allowed.*
- (5) Assume suitable data, if necessary.*

SECTION-I

Q. 1. Explain in detail the process of emission and absorption of radiation. (16)

Also explain the importance of Einstein's equations in emission of radiation.

OR

Q. 2. Write short notes on (16)

- i. Laser modes
- ii. Q switching

Q. 3. A) What are different laser system features which are applicable to most commercial and industrial laser? Explain each in short. (9)

B) Estimate the efficiency of a GaAs laser operating well above threshold. The refractive index of material is 3.5 and laser cavity length is (4)

0.3mm. The loss coefficient is 800 per metre length and the internal quantum efficiency is 0.7.

C) Explain safe laser laboratory operation? (5)

OR

Q. 4. Explain the constructions and working of GaAs homojunction (16)

Semiconductor diode laser. How the laser product are classified for safety standards?

Q. 5. A) Describe how Fabry-Perot interferometer is used with small coherent length source for displacement measurement. (8)

B) What is Speckle Pattern? Describe subjective and objective speckles. (8)

OR

Q. 6. A) Describe the dynamic tracking of speckle pattern for displacement Measurement. (8)

B) What are the properties of speckle pattern? Describe each in short. (8)

SECTION-II

Q. 7. A) Explain the principle of operation of Laser velocimeter. (8)

B) What are the two options for the electronic processing of the Doppler single? Compare it. (8)

OR

Q. 8. A) Explain the frequency domain procession of Doppler signal in detail. (8)

B) Discuss the performance parameters of operations of laser velocimeter?(8)

Q. 9. What is Sagnac effect? Show how is the phase shift is proportional to the angular velocity. What are the components required for all fiber (16)

FOG configuration? Explain each in short.

OR

Q. 10. A) Show that the frequency of the sagnac signal in RLG is proportional (8)
to the angular velocity of rotation.

B) Explain in detail the closed loop configuration of Fiber Optic (8)
Gyroscope.

Q. 11. A) Write a short note on Holographic interferometer. (9)

B) What are the different emulsion used to record the holograms? (9)
Mention the characteristics of it.

OR

Q. 12. List out the application of holographic interferometer that you know. (18)
Explain any two in detail.

[Total No. of Questions: 12]

[Total No. of Printed Pages: 2]

UNIVERSITY OF PUNE

[4364]-169

B. E. (Instrumentation) Examination - 2013

Process Instrumentation-II (2003 Course)

[Time: 3 Hours]

[Max. Marks: 100]

Instructions:

- 1 Answers to the *two sections* should be written in *separate answer-books*.
- 2 Neat diagrams must be drawn wherever necessary.
- 3 Black figures to the right indicate full marks.
- 4 Assume suitable data, if necessary.
- 5 All questions are compulsory

SECTION -I

- | | | | |
|-----------|---|--|----|
| Q.1 | A | Explain Chiller plant with the help of block diagram. | 6 |
| | B | List major equipments used in chiller plant? Find out various manipulated & controlled variables used in absorption Chiller. | 10 |
| OR | | | |
| Q.2 | A | Explain Feedback & Feed forward control schemes for H.E. | 10 |
| | B | Explain control of Heat Exchanger in Cascade control strategy. | 6 |
| Q. 3 | A | Classify Chemical reactors. Also explain its various characteristics? | 9 |
| | B | Draw & explain Flow control Scheme of CSTR with two direction cascade control. | 9 |
| OR | | | |
| Q. 4 | A | Explain CSTR pH control scheme with a neat sketch. Also Enlist difficulties encountered in CSTR pH control? | 12 |
| | B | How safety of reactor is ensured explain? | 6 |
| Q. 5 | A | Enlist various disturbances encountered in Control of pumps? | 4 |
| | B | With neat sketch explain throttling control valve scheme of controlling the pump. | 12 |
| OR | | | |
| Q. 6 | A | What are different types of Compressors used in industry? Explain compressor control with neat sketch? | 8 |
| | B | Is Selective control applicable to Compressor control? Explain override control scheme of compressor. | 8 |

[Total No. of Questions: 12]

[Total No. of Printed Pages: 3]

UNIVERSITY OF PUNE

[4364]-175

B. E. (Instrumentation and control) Examination - 2013

Process Modeling And Optimization

(2003 Pattern)

[Time: 3 Hours]

[Max. Marks: 100]

Instructions:

- 1 *All questions are compulsory*
- 2 *Answers to the two sections should be written in separate answer-books.*
- 3 *Neat diagrams must be drawn wherever necessary.*
- 4 *Figures to the right indicate full marks.*
- 5 *Your answer will be valued as a whole*
- 6 *Use of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.*
- 7 *Assume suitable data, if necessary.*

SECTION -I

- | | | | |
|-----|---|--|----|
| Q.1 | A | Explain need of modeling and it's application in detail. | 8 |
| | B | What is curve fitting? Why it require? Derive the equation for Least Square fitting for linear equation. | 10 |

OR

- | | | | |
|------|---|---|----|
| Q.2 | A | Explain Mass, Component and continuity equation with examples. | 12 |
| | B | Explain Lagrange Interpolation technique for curve fitting. | 6 |
| Q. 3 | A | Derive the mathematical equations which represent the dynamics for a Jacketed CSTR in which Component A and B are flow into the tank to produce component C at reaction rate of k. The reaction is assumed to be exothermic and cooling liquid is pass through jacket to maintain the | 10 |

reaction temperature which is assumed to be perfectly mixed.

- B Derive the model for plug flow reactor producing product C from material A and B at constant rate of k. 6

OR

- Q. 4 A Develop mathematical model for Ideal binary distillation column having 8 trays. 8

- B Develop mathematical model for flash drum 8

- Q. 5 A What is system identification? What do you mean by “online” and “offline” identification explains with example. 8

- B Compare Step tasting and Direct sine wave tasting 8

OR

- Q. 6 A Explain ATV method of identification 8

- B Explain Pulse tasting method. 8

SECTION II

- Q. 7 A Explain 8

- i. Niederlinski index
- ii. Resiliency
- iii. Interaction and decoupling.

- B Define Relative Gain Array. Obtain RGA for the system whose transfer function is 10

$$G(s) = \begin{bmatrix} \frac{22.89s^{-0.2s}}{4.572s + 1} & \frac{-11.64s^{-0.4s}}{1.807s + 1} \\ \frac{4.689s^{-0.2s}}{2174s + 1} & \frac{5.8s^{-0.4s}}{1.801s + 1} \end{bmatrix}$$

OR

- Q. 8 Write short notes on 18

- A Bristol array as an index loop interaction.

B Skogestad- Morari Method

Q. 9 A Explain Continuous and discontinuous function in detail along with suitable examples 8

B Explain convexity and concavity. Explain how to determine convex and concave region. Find the convexity of following functions 10

- i. $F(x)=e^x$
- ii. $F(x)=-8x^2$
- iii. $F(x)=3x_1^2 - 6x_2^2$

OR

Q. 10 Define feasible region. Sketch an objection function and constraints and mark the feasible region for the following problem 10

1. Minimize: $f(x)=2x_1^2-2x_1x_2+2x_2^2 - 6x_1 + 6$

Subject to: $g(x)=x_1 + x_2 \leq 2$

2. Minimize: $f(x)=x_1^3 - 3x_1x_2+4$

Subject to: $g_1(x) = 5x_1 + 2x_2 \geq 18$

$$h_1(x) = -2x_1^2 + x_2^2 = 5$$

Q. 11 A Minimize $f = (x-1)^4$ using Newton's method and quasi Newton method starting at 12

i) $x = -1$, ii) $x = -0.5$, iii) $x = 0.0$

B Explain unidimensional search algorithm for optimization 6

OR

Q. 12 Minimize $F = x_1 + 2x_2 + x_3$ 16

Subject to $2x_1 + x_2 - x_3 \leq 2$

$$-2x_1 + x_2 + 5x_3 \geq -6$$

$$4x_1 + x_2 - x_3 \leq 6$$

$$x_i \geq 0, \text{ for } i=1,2,3$$

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[4364]-161
B. E.(Instrumentation & Control)Examination - 2013
PROCESS INSTRUMENTATION-I
(2003 Pattern)

[Time : 3 Hours]

[Max. Marks : 100]

Instructions :

- (1) Answer *any three* from each section.
- (2) Answers to the *two sections* should be written in *separate answer-books*.
- (3) Black figures to the right indicate full marks.
- (4) Neat diagrams must be drawn wherever necessary.
- (5) Use of logarithmic tables, slide rule, Mollier charts, electronics pocket calculator is allowed.
- (6) Assume suitable data, if necessary.

SECTION-I

- Q1 a) Explain control valve characterization. [8]
b) In an example of cooling water to heat exchanger, upstream pressure is 100 bar. Drop across the control valve is 3 bar. Drop on piping is 80 bar. Cooling water is 20tonn/hr. Select a proper valve and specify it. [8]

OR

- Q2 a) Explain the effect of Cavitation and Flashing. Explain the remedial measures to minimize it. [8]
b) State various factors considered in testing capacity of a control valve by ISA 75.02. Explain any two factors in detail. [8]

- Q3 a) Compare Interacting and non-interacting Processes. [9]
b) Explain the P + I control for a dead time dominant process. [9]

OR

- Q4 a) Derive the first order differential equation for a self regulating process. [9]
b) With the help of necessary equations, explain the steady state gain of a process. [9]
Q5 a) With a suitable application explain the working of a Ratio Control. [8]
b) What is Dual mode Control? Explain with a suitable example. [8]

OR

- Q6 a) Explain the Split Range Control with reference to its applicability. [8]
b) Explain in detail the tuning of a Cascade Controller. [8]

SECTION-II

- Q7 a) List detailed specifications of SLPC. [9]
b) List various non-linear elements. Explain any two in detail. [9]

OR

- Q8 a) Draw and explain the functional blocks of a MLPC. [9]
b) What is Scaling? Explain the various steps involved in scaling considering any suitable application. [9]

- Q9 a) Comment on 'Intelligent Control' with reference to its applicability. [8]
b) Explain the use of predictive control in improving the performance of a process. What are its disadvantages? [8]

OR

- Q10 a) What is MRAC? Explain its working with the help of a suitable block Diagram. [10]
b) Explain the advantages, disadvantages and typical applications of an Intelligent Controller. [6]

- Q11 a) Explain the terms fuzzifier and defuzzifier considering a suitable Application. [8]
b) Explain the techniques for analysis of process control performance using statistical process control. [8]

OR

- Q12 Write short notes on: [16]
- Model predictive control
 - Applications of ANN

UNIVERSITY OF PUNE
[4364]-162
B. E. (INSTRUMENTATION AND CONTROL) Examination 2013
PROJECT ENGINEERING & MANAGEMENT
(2003 Course)

[Total No. of Questions:]
[Time : 3 Hours]

[Total No. of Printed pages :3]
[Max. Marks : 100]

Instructions :

- (1) *All questions are compulsory.*
- (2) *Answers to the two Sections should be written in separate answer-books*
- (3) *Neat diagram must be drawn wherever necessary.*
- (4) *Figures to the right indicate full marks.*
- (5) *Assume suitable data, if necessary.*

SECTION I

- Q.1a) Draw ISA symbols used in P & ID Diagram. [10]
- I) Pneumatic signal line
 - II) Ultrasonic guided signal
 - III) Two way valves fail open.
 - IV) Relief valve
 - V) Pressure Reducing regulator with external tap
- b) State the Project engineering Document development procedure in chronological steps. [6]

OR

- Q.2a) Draw ISA symbols used in P & ID Diagram. [10]
- I) Shared signal from field to control Room.
 - II) Bias
 - III) High selector & High Limiter (SAMA) Symbol
 - IV) Level Regulator with mechanical linkage.
 - V) Flow Element in line
- b) Enlist & Explain different categories of the Engineering Project. [6]

- Q.3a) Draw the Pressure Control Loop. [4]
Give naming conventions for
i) The Loop [2]
ii) For the instruments as per ISA. [2]
b) Prepare an Instrument Index Sheet for the Loop Drawn in Q.No.3a [4]
c) Prepare the Specification Sheet in S-20 format for Thermocouple. [6]

OR

- Q.4a) Explain the loop wiring diagram in Project Engineering. Support [10]
your answer with two examples
b) Draw the Flow Control Loop. [4]
Give naming conventions for
i) The Loop [2]
ii) For the instruments as per ISA. [2]

- Q.5a) What are various types of Cables used in Plant Automation? [8]
Suggest suitable cables for carrying transmitter signals Justify your
selection.
b) How an Intelligent Operator Interface is designed? What are its [8]
important features?

OR

- Q.6a) Prepare BOM for the any loop drawn in Q.No3 or Q.No4 [8]
b) Explain the importance of Plant Layout & GA drawings for [8]
Instrument Project Engineering.

SECTION II

- Q.7a) What are important documents required for commissioning activity [8]
of the plant.
b) Stating the need Explain the Vendor Registration process in brief [8]

OR

- Q.8a) What are the key considerations for issue of the PO to the Supplier? [8]
b) Prepare FAT report for Control Panel. [8]
Q.9a) Prepare Typical Electrical Inspection report for the control Panel [9]
b) Write Short note on CPM & PERT? [9]

OR

- Q.10a) Draw & Explain the Control Room layout. [9]
b) Draw & explain the Installation of DP transmitter. [9]

Q.11 Write Brief Notes on [16]
i) WBS
ii) Crash Time Concept
iii) SOW
iv) Project Estimates

OR

Q.12a) Explain the following Standards in brief. [8]
i) ISA
ii) API
iii) SAMA
iv) NEMA
b) Explain 'Gant Chart' in detail. [8]

UNIVERSITY OF PUNE

[4364]-163

B. E. (Instrumentation & Control) Examination - 2013

Digital Control

(2003 Pattern)

[Total No. of Questions: 12]

[Total No. of Printed Pages :3]

[Time : 3 Hours]

[Max. Marks : 100]

Instructions:

- (1) Answer **any three** from each section.
- (2) Answers to the **two sections** should be written in **separate answer-books**.
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- (4) Neat diagrams must be drawn wherever necessary.
- (5) Use of electronics pocket calculator is allowed.
- (6) Assume suitable data, if necessary.

SECTION-I

- Q1 A The discrete time system is described by the transfer function, 10
$$G(z) = \frac{Y(z)}{R(z)} = \frac{2z-3}{(z-0.5)(z+0.3)}$$
 find the response $y(k)$ to the input,
$$r(k) = \begin{cases} 1; & k = 1 \\ 0; & k = 0, 2, 3, 4, \dots \end{cases}$$
- B Derive the mathematical model for the discrete time control 8
system.

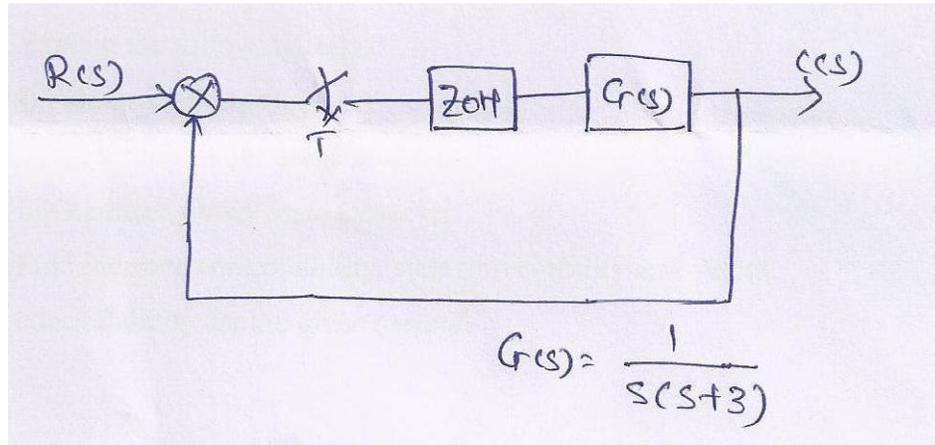
OR

- Q2 A Find the stability of the system using Jury's test if the system is 10
having characteristic equation as,
i) $F(z) = z^3 - 1.3z^2 + 0.08z + 0.24 = 0$
ii) $F(z) = z^4 - 1.368z^3 + 0.4z^2 + 0.08z + 0.0024 = 0$
- B Show that the transfer function of the zero order hold is equal to 8
unity

Q3

For the system in the figure design a dead beat controller.
Assume $T=0.5$ sec.

16



OR

- Q4 A Derive the transfer function for the digital PID controller. 10
 B What are the salient features of the dead beat controller? 6
 Q5 A Derive the state equation for the state transition matrix 4
 B Diagonalise the plant matrix for the system having the state 12

equation as,

$$x(k+1) = \begin{bmatrix} -4 & 1 & 0 \\ 0 & -3 & 1 \\ 0 & 0 & -2 \end{bmatrix} x(k) + \begin{bmatrix} 0 \\ 0 \\ 1 \end{bmatrix} u(k).$$

Find the diagonal matrix also.

OR

- Q6 A For a system with the state equation $x(k+1) = Gx(k) + Hu(k)$ 8
 where $G = \begin{bmatrix} 0 & 1 \\ -2 & -3 \end{bmatrix}$ and $x(0) = \begin{bmatrix} 0 \\ 1 \end{bmatrix}$. Find the state transition matrix using Cayley-Hamilton technique.

- B For a system with the state equation 8

$$x(k+1) = Gx(k) + Hu(k) \text{ \& } y(k) = Cx(k) \text{ where } G = \begin{bmatrix} 0 & 0 & -2 \\ 0 & 1 & 0 \\ 1 & 0 & 3 \end{bmatrix} \text{ and}$$

$$H = \begin{bmatrix} 0 \\ 1 \\ 0 \end{bmatrix}, C = [1 \ 0 \ 1].$$

Find the pulse transfer function.

SECTION-II

- Q7 A Explain the following terms: 9
 i) Full Order State Observer

- ii) Minimum Order State Observer
 iii) Reduced Order State Observer
- B Find the state controllability, state observability and output controllability for the given system. 9
- $$x(k+1) = \begin{bmatrix} 0 & 1 \\ 5 & 6 \end{bmatrix} x(k) + \begin{bmatrix} 0 \\ 1 \end{bmatrix} u(k)$$
- $$y(k) = [1 \quad 0]x(k)$$
- OR
- Q8 A Explain the duality product of the controllability and observability 6
- B Find the state feedback gain matrix for the system 12
- $$x(k+1) = Gx(k) + Hu(k) \text{ \& } y(k) = Cx(k) \text{ with}$$
- $$G = \begin{bmatrix} 0 & 0 & -6 \\ 1 & 0 & -11 \\ 0 & 1 & -6 \end{bmatrix}, H = \begin{bmatrix} 1 \\ 0 \\ 0 \end{bmatrix}, C = [0 \quad 0 \quad 1]$$
- the system is placed at the desired pole locations at $-2 \pm j4.5, -3$
- Q9 Write short notes on: 16
- i) Self Tuning Regulator.
 ii) Interaction and Decoupling
- OR**
- Q10 Write short notes on: 16
- i) Model Reference Adaptive Control.
 ii) Internal Model Controller.
- Q11 Write short note on: 16
- i) ARMA Model
 ii) ARMAX Model
- OR**
- Q12 For a system with the state equation as, $x(k+1) = Gx + Hu(k)$, find 16
 the control sequence $u(k) = -Kx(k)$ that minimize the given performance index.
- $$J = \sum_{k=0}^{\infty} [x^2(k) + u^2(k)]$$
- $$G = 0.3679$$
- $$H = 0.6321$$

UNIVERSITY OF PUNE
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B. E.(Instru & Control)Examination - 2013
BIOMEDICAL INSTRUMENTATION
(2003 Pattern)

[Total No. of Questions:12]
[Time : 3 Hours]

[Total No. of Printed Pages :2]
[Max. Marks : 100]

Instructions :

- (1) Answer **any three** from each section.
- (2) Answers to the **two sections** should be written in **separate answer-books**.
- (3) Neat diagrams must be drawn wherever necessary.
- (4) Use of logarithmic tables, slide rule, Mollier charts, electronics pocket calculator is allowed.
- (5) Assume suitable data, if necessary.

SECTION I

- Q1 a) Draw the block diagram of the biomedical instrumentation system? [8]
Classify the biomedical instrumentation.
- b) What are bioelectric potential? Mention the frequency and voltage range of ECG, EEG, EMG and ERG signals. [8]
- OR**
- Q2 a) Explain in detail surface electrodes and micro electrode. [8]
b) What are polarizable and non polarizable electrode? Draw electrical equivalent circuit of microelectrode. [8]
- Q3 a) Draw and explain typical ECG waveform, state the normal values of Amplitude and time duration of ECG waveform. [8]
b) Design QRS detector. The design must be able to give an alarm wherever QRS complex is missing. [8]
- OR**
- Q4 a) Explain various types of ECG recorders. [8]
b) With a neat block diagram, explain the working of an ECG machine. List the specification of ECG recorder. [8]
- Q5 a) Explain how the respiratory rate can be measured. [8]
b) Discuss Doppler shift ultrasonic blood flow measurement along with neat diagram. [10]

OR

- Q6 a) List and explain in detail the two direct method of blood pressure measurement. [10]
b) Discuss the principle and working of electromagnetic blood flow meters. [8]

SECTION-II

- Q7 a) Explain EEG amplitude and frequency bands [8]
b) Explain and draw 10-20 EEG electrode placement system. [8]

OR

- Q8 a) Explain the role of cones and rods in human vision. [8]
b) Explain various errors in vision and their method of correction. [8]
- Q9 a) Enlist various ophthalmic instruments and briefly explain instrument used for measurement of IOP. [8]
b) Explain various types of perimeter and their function. [8]

OR

- Q10 a) Explain the basic function of audiometer with suitable block diagram [10]
b) What is the main organ responsible for frequency discrimination in human auditory system?
- Q11 a) Write a short note on ventilators [10]
b) Design a Pneumotachometer. [8]

OR

- Q12 a) What are the various ways by which macroshocks can be induced? [8]
b) What are the techniques used to protect patients from electrical hazards? [10]

UNIVERSITY OF PUNE

[4364]-165

B. E. (Instrumentation & Control)
Examination - 2013
INSTRUMENTATION FOR
ENVIRONMENT ENGINEERING
(2003 Pattern)

[Time : 3 Hours]

[Max. Marks : 100]

Total No. of Questions : 12

[Total No. of Printed Pages :2]

SECTION I

Q1) What is an environment? Explain importance of instrumentation for Environmental Engineering. [18]

OR

Q2) a) Discuss on different Biometric Cycles. [08]

b) Enlist different sources of pollution. [10]

Q3) a) Explain Environmental toxicology and hazards. [08]

b) Explain Attitude and Bump testing. [08]

OR

Q4) a) Explain environment regulations and standards. [08]

b) Explain ISO 14001. [08]

Q5) a) Explain HVAC controls. [08]

b) Develop an Instrumentation setup for air pollution analysis. [08]

OR

Q6) Write short note on: [16]

a) Analysis of aerosols and monitoring of gaseous pollutants.

- b) Trace metal pollutions.
- c) Modern methods of air pollution analysis.

SECTION II

- Q7) a) Explain different physical examination of water. [10]
b) Explain its chemical characterization. [08]

OR

- Q8) a) Explain different Biological investigations of water. [10]
b) Explain analysis of trace metal pollutants of water. [08]
- Q9) a) List various sensors for radio activity detection. Describe working of any one system which monitors radioactivity [16]

OR

- Q10) a) What is sonic boom? Explain noise measurement technique using suitable Diagram [08]
b) Explain effect of radiation pollution on living things. [10]
- Q11) a) Explain role of micronutrients in soil. How they are analysed [08]
b) What is meant by agricultural pollution? Suggest methods to control it. [08]

OR

- Q12) Write short notes on:- [16]
a) Instrumentation setup for pollution
b) Polarographic analysis of pesticides
c) Trace elements pesticides

Total No of Questions: [12]

SEAT NO. :

[Total No. of Pages : 3]

4364-167

B.E. (Instrumentation & Control)

Advanced Control System

(2003 Pattern) (Elective - I) (Semester - I)

Time: 3 Hours

Max. Marks : 100

Instructions to the candidates:

- 1) **Answers to the two sections should be written in separate answer books.**
- 2) **Neat diagrams must be drawn wherever necessary.**
- 3) **Figures to the right side indicate full marks.**
- 4) **Solve Q1 or Q2, Q3 or Q4, Q5 or Q6 from Section -I and Q7 or Q8, Q9 or Q10, Q11 or Q12 from Section -II**
- 5) **Use of Calculator is allowed.**
- 6) **Assume Suitable data if necessary.**

SECTION I

- Q1) a) Determine the describing function of combined dead-zone and saturation nonlinearity. [12]
- b) Explain different peculiar characteristics of nonlinear systems. [06]

OR

- Q2) a) Define and classify different singular points. [08]
- b) Explain phase plane method for nonlinear system analysis [10]

- Q3) a) With reference to Lyapunov stability, explain asymptotic stability, instability, positive definiteness, negative definiteness. [08]
- b) Explain frequency domain stability criterion [08]

OR

- Q4) a) Explain Jump Resonance with a suitable example [06]
- b) A second order system is given by, $\dot{x} = A x$ where, $A = \begin{bmatrix} -1 & -2 \\ 1 & -4 \end{bmatrix}$. [10]

Determine the stability using Lyapunov's direct method

- Q5) a) Explain the MIT Rule approach for design of model reference adaptive controller. [08]
- b) Explain Model Reference Adaptive Control using Lyapunov approach for stability analysis of continuous time system. [08]

OR

- Q6) a) Explain Model Reference Adaptive Control (MRAC) system with the help of neat block diagram. [08]
- b) Compare direct and indirect MRAC systems. [08]

SECTION II

- Q7) a) Explain Self Tuning Regulator (STR) with the help of neat block schematic. [08]
- b) What is the importance of parameter estimation in self tuning regulators? Explain any one technique for the same. [08]

OR

- Q8) a) Compare implicit and explicit self tuning regulators. [08]
- b) Explain LQG self tuning regulators. [08]

- Q9) a) Explain Boiler control using adaptive mechanism. [08]
- b) Explain general purpose adaptive regulator. [08]

OR

- Q10) a) Explain temperature control of a CSTR using adaptive control technique. [08]

b) Explain in detail robustness studies in multivariable system. [08]

Q11) a) Explain the necessary conditions of optimality. [10]

b) Explain performance measures for optimal control problems. [08]

OR

Q12) a) Obtain the control law that minimizes the performance index [12]

$$J = \int_0^{\infty} (x^2 + u^2) dt, \text{ for the system}$$

$$\dot{x} = Ax + Bu \text{ with, } A = \begin{bmatrix} 0 & 1 \\ 1 & 1 \end{bmatrix} \text{ and } B = \begin{bmatrix} 0 \\ 1 \end{bmatrix}$$

b) Explain Pontryagin's principle for optimal control design. [06]

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B. E. (INSTRUMENTATION AND CONTROL) Examination 2013
BUILDING AUTOMATION-I (406264)
(2008 Course)

[Total No. of Questions:12]
[Time : 3 Hours]

[Total No. of Printed pages :2]
[Max. Marks : 100]

Instructions :

- (1) *Answers to the two Sections should be written in separate answer-books*
 - (2) *Neat diagram must be drawn wherever necessary.*
 - (3) *Figures to the right indicate full marks.*
 - (4) *Assume suitable data, if necessary.*
 - (5) *Use of logarithmic tables slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.*
-
-

SECTION-I

Q.1A) Discuss the importance of Building automation with suitable examples. [8]

B) What is fire? Explain fire modes. [10]

OR

Q.2A) Explain various stages of fire along fire detectors? [10]

B) Describe addressable fire alarm system. [8]

Q.3A) Explain NFPA guidelines for fire alarm systems. [8]

B) Discuss LHS cable along with applications. [8]

OR

Q.4A) Explain FAS loops. [8]

B) Explain dry pipe fire sprinkler system. [8]

Q.5A) What do you mean by zoning? Explain importance of zoning. [8]

B) Explain Intelligent FAS system. State its advantages. [8]

OR

- Q.6A) Explain 2-wire & 4-wire smoke detector. [8]
B) Discuss manual initiating devices. [8]

SECTION-II

- Q.7A) Explain access control systems. [10]
B) Discuss Wigand format used in reader & card technology. [8]

OR

- Q.8A) Discuss need of security system with suitable examples? [8]
B) Describe the installation process of access control systems [10]

- Q.9A) Explain typical CCTV system. [8]
B) Describe image processing in camera. [8]

OR

- Q.10A) Discuss role of Quads in video processing. [8]
B) Compare MPEG and MJPEG. [8]

- Q.11A) Discuss the importance & applications of perimeter intrusion detection [8]
system.

- B) Explain various types intrusion detection system. [8]

OR

- Q.12A) Explain with suitable block diagram, architecture of PIDS [8]
B) Explain technologies used for perimeter intrusion system. [8]

[Total No. of Questions: 12]

[Total No. of Printed Pages: 3]

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[4364]-171

B.E. (Instrumentation) Examination-2013

Industrial Automation (2003 Course)

Time: 3 Hours

Max. Marks: 100]

Instructions

- 1 Answer any three questions from each section*
- 2 Answers to the two sections should be written in separate answer-books.*
- 3 Neat diagrams must be drawn wherever necessary.*
- 4 Black figures to the right indicate full marks.*
- 5 All questions carry equal marks.*
- 6 Use of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.*
- 7 Assume suitable data, if necessary.*

SECTION I

1. (a) Compare PLC, SCADA, and DCS (8)
- (b) With an example explain the various types of automation systems. (8)

OR

2. (a) Explain the various types of production types of production system and its required automation system. (8)
- (b) Explain the role PLC in the SCADA system. (8)
3. (a) Differentiate between Modbus (ASCII) and Modbus (RTU) transmission modes. (8)
- (b) With an example explain query response cycle in Modbus. (8)

OR

4. (a) With an example explain different Action Qualifies used in SFC programming. (8)
- (b) Explain the difference between Master-Slave and Server-Client Communication. (8)
5. (a) What is Multidrop connection in HART? Explain its benefits. (8)
- (b) Explain four basic function blocks in FF. (10)

OR

6. (a) With an example explain the Foundation Fieldbus model (10)
- (b) Write a short note on Profibus-PA Protocol (8)

SECTION II

7. (a) Write a program using FBD programming method for any Ratio control loop. Write the different steps involved in the configuration of function blocks. (10)

- (b) List and explain the I/O function blocks in the DCS system. (8)

OR

8. (a) Write a program using FBD programming method for any cascade loop. Write the different steps involved in the configuration of function blocks. (10)

- (b) List and explain the Logical function blocks in the DCS system (8)

9. (a) With the help of an example explain what is Third party interface? (8)

- (b) What is alarm? Explain the how the alarms are classified and prioritized. (8)

OR

10. (a) Explain the user access management system in any DCS system (8)

- (b) Explain the four level display hierarchy (8)

11. With the help of block diagram explain what are the different stages involved in developing the automation for batch process. (16)

OR

12. What is meant by safety system architecture? (16)

What are the different safety architectures?

Which are commonly used, in industrial applications?

[Total No. of Questions: 12]

[Total No. of Printed Pages: 2]

UNIVERSITY OF PUNE

[4364]-172

B. E. (Instrumentation and Control) Examination - 2013

Advanced Biomedical Instrumentation

(2003 Course)(406268)

[Time: 3 Hours]

[Max. Marks: 100]

Instructions:

- 1 *Answers 3 questions from Section I and 3 Questions from Section II.*
- 2 *Answers to the two sections should be written in separate answer-books*
- 3 *Neat diagrams must be drawn wherever necessary.*
- 4 *Use of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.*
- 5 *Assume suitable data, if necessary.*

SECTION -I

- | | | | |
|-----------|---|--|----|
| Q.1 | A | With the help of neat diagram, explain the ventricular inhibited pacemaker. | 08 |
| | B | Explain the different types of defibrillators. | 08 |
| OR | | | |
| Q.2 | A | It is required to set up an ICU for 8 beds. Elaborate the implementation plans. | 08 |
| | B | List typical ranges of pacemaker parameters. | 08 |
| Q. 3 | A | Explain the need and working of blood cell counters. | 10 |
| | B | Explain the working of an Electrophoresis and its applications. | 08 |
| OR | | | |
| Q. 4 | A | Explain Telemedicine System. | 08 |
| | B | Distinguish between frequency division multiplex system and time division multiplex system used in the transmission of biosignals. | 10 |
| Q. 5 | A | Explain the principle of CT-scanning. How it overcomes the drawback of X-Ray imaging? | 08 |

	B	Describe the various components in X-Ray machine.	08
		OR	
Q. 6	A	Mention the different applications of X-Ray examination.	08
	B	Draw the diagram of image intensifier and explain how it helps to improve the image quality in fluoroscopy.	08
		SECTION II	
Q. 7	A	Describe various types of gantries used in CT scanner.	08
	B	Draw the diagram of ultrasound scanner and explain its working.	08
		OR	
Q. 8	A	With the help of a suitable block diagram, explain the working of rectilinear Scanner.	08
	B	Explain ultrasound Diathermy.	08
Q. 9	A	Why to use various method of imaging and list them.	08
	B	What is an Endoscope? Explain its construction with the help of neat diagram.	08
		OR	
Q. 10	A	Explain in brief various types dialysers used for Hemodialysis.	08
	B	List any four points of comparison for Hemodialysis and Peritoneal dialysis techniques.	08
Q. 11	A	Describe various Orthotic and Prosthetic devices.	08
	B	Explain different types of wheelchair and joysticks. Specify their materials and properties.	10
		OR	
Q. 12	A	What is kidney stone? Explain lithotripsy based on acoustic shock wave with plasma explosion.	08
	B	Explain Instrumentation in Hemodialysis.	10

[Total No. of Questions: 12]

[Total No. of Printed Pages: 2]

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[4364]-173

B. E. (Instrumentation) Examination - 2013

Power Plant Instrumentation (2003 Course)

[Time: 3 Hours]

[Max. Marks: 100]

Instructions:

- 1 Answers to the two sections should be written in separate answer-books.
- 2 Neat diagrams must be drawn wherever necessary.
- 3 Black figures to the right indicate full marks.
- 4 Assume suitable data, if necessary.
- 5 All questions are compulsory.

SECTION - I

- Q.1 A Discuss how Hydro electric power plant is advantageous over any other method of power generation. 08
- B Explain various ways of electricity generation. Which is most efficient way of generation? Justify your answer. 08

OR

- Q.2 A What are the factor affecting the site selection for Hydroelectric Power Plant? 06
- B Explain the following with neat sketch 10
1. Coal mill temperature control.
 2. Air/fuel ratio control using O₂ and CO₂ measurement in flue gas

- Q. 3 A Explain Turbine steam inlet control valve actuation system? 09
- B What is Swelling & Shrinking in Boiler? What are remedial measures for correct Boiler Drum Level Control? 09

OR

- Q. 4 Discuss in detail the measurement schemes of electrical parameters like;
- a. MW 04
 - b. MVAR 04
 - c. Frequency 05
 - d. Excitation voltage etc. 05

- Q. 5 A Write notes: 08
 a. Electrostatic precipitators.
 b. Pollution control measures.
- B Explain the need & principal of following measurements in Power plant. 08
 i. Smoke Density Measurement
 ii. BMS

OR

- Q. 6 A List common causes of turbine vibration? Dose it affects turbine 08
 performance? Where major losses occur and how they will be corrected?
- B Why is superheated steam used in turbine operation? What are the 08
 disadvantages of using wet steam in a turbine?

SECTION II

- Q. 7 A Draw & explain Block diagram of Gas Turbine generator. 08
 B What is a Nuclear Reactor? Describe various parts of Nuclear Reactor. 08

OR

- Q. 8 A Explain waste water treatment in Nuclear Power Plant. 08
 B How is the water turbine governed? Describe governing system for impulse 08
 & Reaction Turbine.

- Q. 9 A Explain in brief the basic architecture of DCS system used for power plant. 10
 B Explain the concept of Automation for conservation. 08

OR

- Q. 10 A Write notes on: 10
 i. Fabric Filters & Bag houses
 ii. Radiation Standard
- B What is desulfurization? What are the different processes involved in 08
 desulfurization?

- Q. 11 A Explain Combined Cycle Power Plant? 08
 B What is a Solar Collector? How many solar collectors are in use? 05
 C Write main applications of Solar Energy. 03

OR

- Q. 12 A Write short notes on 10
 i. Thermoelectric Generator
 ii. Power generation using Incinerators
- B With neat sketch explain Tidal power generation? What are the limitations 06
 of Tidal Power Plant?

[Total No. of Questions: 12]

[Total No. of Printed Pages: 3]

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[4364]-174

B.E. (Instrumentation and Control) Examination - 2013

Fiber Optic Instrumentation

(2003 Course)(406264)(3)

[Time: 3 Hours]

[Max. Marks: 100]

Instructions:

- 1 *Answer three questions from section I and three questions from section II.*
- 2 *Answers to the two sections should be written in separate answer-books.*
- 3 *Neat diagrams must be drawn wherever necessary.*
- 4 *Assume suitable data, if necessary.*
- 5 *Use of logarithmic tables, slide rule, Mollier charts, electronics pocket calculator is allowed*
- 6 *Black figures to the right indicate full marks.*

SECTION -I

- Q.1 A Using simple ray theory, describe the mechanism for the transmission of light within the optical fiber. Briefly discuss with the aid of a suitable diagram what is meant by the acceptance angle for an optical fiber. Show how this is related to the fiber numerical aperture and the refractive indices for the fiber core and cladding. [9]
- B An optical fiber has a numerical aperture of 0.20 and a cladding refractive index of 1.53. Determine: [9]
- a) The acceptance angle for the fiber in water which has a refractive index of 1.33;
 - b) The critical angle at the core-cladding interface.
- Comment on any assumptions made about the fiber.

OR

- Q.2 A Define the relative refractive index difference for an optical fiber and show how it may be related to the numerical aperture. [9]
- B Explain the following concepts in optical fiber transmission: [9]
- a) Evanescent field
 - b) Goos-Haenchen shift
 - c) Mode coupling.

- Q.3 A Briefly indicate with the aid of suitable diagrams the difference between meridional and skew ray paths in step index fibers. [8]
B Explain what is meant by a graded index optical fiber, giving an expression for the possible refractive index profile? Using simple ray theory concepts, discuss the transmission of light through the fiber. Indicate the major advantage of this type of fiber with regard to multimode propagation. [8]

OR

- Q. 4 A Describe with the aid of simple ray diagram: [8]
i) Multimode step index fiber
ii) Single-mode step index fiber
B Compare the advantages and disadvantages of these two types of fiber for use as an optical channel. [8]

- Q. 5 A Briefly describe the processes by which light can be emitted from an atom. Discuss the requirements for population inversion in order that stimulated emission may dominate over spontaneous emission. Illustrate your answer with an energy level diagram of a common nonsemiconductor laser. [8]
B Compare P-I-N diode with avalanche photodiode. [8]

OR

- Q. 6 A Describe what is meant by the fusion splicing of optical fibers. Discuss the advantages and drawbacks of this jointing technique. [8]
B Discuss the principles of operation of the two major categories of demountable optical fiber connectors. Describe in detail a common technique for achieving a butt jointed fiber connector. [8]

SECTION II

- Q. 7 What are the advantages of Intensity Modulated Optical Sensors (IMOS)? Describe following techniques of sensing which is based on intensity modulation. Also enlist different parameters, which can be sensed by using these techniques. [16]
a) evanescent field
b) coupling
c) encoding based position sensors

OR

- Q. 8 What do you understand by intrinsic and extrinsic Optical Sensors? With the aid of suitable diagrams describe one Extrinsic Optical Fiber Sensor. What are the advantages and drawbacks of Optical Fiber Sensors? [16]

- Q. 9 List out the advantages and disadvantages of Distributed Optical Fiber Sensing? Explain Optical Time Domain Reflectometer (OTDR) in Distributed Optical Fiber Sensing. [16]

OR

Q.10 Explain the role of Optical Time Domain Reflectometer (OTDR) in Distributed Optical Fiber Sensing. Also explain the principle of operation of OTDR. [16]

Q.11 Write short notes on [18]
a) Silicon laser amplifier
b) Optical amplifier
c) Integrated optics

OR

Q.12 Write short notes on [18]
a) Directional coupler
b) Beam splitter
c) Integrated optics

[Total No. of Questions: 12]

[Total No. of Printed Pages: 2]

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[4364]-176

B. E. (*Instrumentation and Control*) Examination - 2013

BUILDING AUTOMATION-II

(2003 Course)(406270)

[Time: 3 Hours]

[Max. Marks: 100]

Instructions:

- 1 Answers to the **two sections** should be written in **separate answer-books**.
- 2 Black figures to the right indicate full marks.
- 3 Neat diagrams must be drawn wherever necessary.
- 4 Use of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.
- 5 Assume suitable data, if necessary.

SECTION -I

- Q.1 A Describe various purposes of Air conditioning. 8
B List different factors affecting to Human comfort. Explain each. 10

OR

- Q.2 A Explain basic process of HVAC. 10
B Define: 8
(i)Enthalpy (ii)Dry bulb Temperature.
(iii)Wet Bulb Temperature. (iv)Dew Point Temperature.

- Q. 3 A Explain the process of Heating & cooling in HVAC. 8
B Explain typical refrigeration system used for HVAC. 8

OR

- Q. 4 A Explain one-pipe steam distribution system for steam heating. 8
B Explain unitary equipments. 8

- Q. 5 A Describe the functions of DDC with respect to HVAC. 10
B Discuss advantages and disadvantages of DDC for HVAC. 6

OR

- Q. 6 A Explain application softwares of DDC for HVAC. 8
B Explain programming language options of DDC. 8

SECTION II

- Q. 7 A Explain system operation-Alarms with BA Cnet. 8

	B	Explain system operation-Physical Access Control with BACnet.	8
		OR	
Q. 8	A	What are the objectives and services of BACnet.	8
	B	Describe larger BACnet system.	8
Q. 9	A	Explain role of ASHRAE in HVAC.	8
	B	What is the importance of energy management in BMS? Explain the concept of Green Building.	10
		OR	
Q. 10	A	What is mean by Lighting control? Explain its importance in Building Efficiency improvement.	10
	B	Draw and explain ASHRAE symbols.	8
Q. 11	A	What are the necessities of IBMS?	8
	B	Explain applications of BMS.	8
		OR	
Q. 12	A	Explain the IBMS architecture.	8
	B	Explain the verticals of BMS for: (i)Commercial complex (ii)Education complex	8