

SUBJECT CODE NO:- K-17
FACULTY OF ENGINEERING AND TECHNOLOGY
B.E. (Inst.) Examination Oct/Nov 2016
Digital Control System
(Revised)

[Time:Three Hours]

[Max.Marks:80]

Please check whether you have got the right question paper.

N.B

- i) Q.No.1 and Q.No.6 are compulsory.
- ii) Attempt any two questions from each section.
- iii) Assume suitable data if necessary.

SECTION A

- Q.1 Answer any five : 10
- a) What is FOH?
 - b) Define: State space; state vector.
 - c) List different state space representation method of discrete time system.
 - d) Draw the block diagram of data distribution system.
 - e) List the elements involved in digital control system.
 - f) Draw the dynamic response of the system.
- Q.2 08
- a) What is stability analysis of digital control system? Explain Jury's stability test for the same.
 - b) Derive the expression of pulse transfer function of closed loop digital control system. 07
- Q.3 15
- Write state and output equations of controllable; observable diagonal and Jordon canonical form. Obtain state space representation of the following pulse transfer function system in all canonical forms.
- $$\frac{Y(z)}{U(z)} = \frac{z^{-1} + 2z^{-2}}{1 + 4z^{-1} + 3z^{-2}}$$
- Q.4 08
- a) Discuss different types of signals involved in Digital Control System.
 - b) Obtain the closed-loop PTF of the system as show in fig. (a) 07

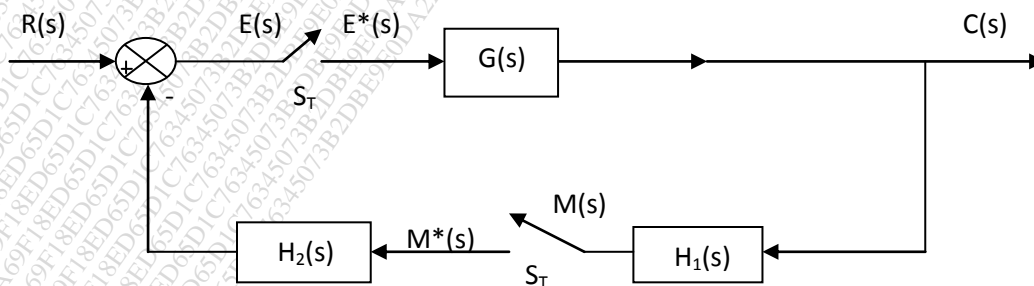


Fig. (a)

- Q.5 Write short notes on (any three) 15
- Phase lag compensation design.
 - Compensator design using root locus.
 - Importance of z -transform in DCS.
 - Solutions of state equations.

SECTION B

- Q.6 Answer any five. 10
- Define operability
 - What is State observe?
 - What is ringing in control system?
 - What is dead beat performance?
 - What is dead time compensation?
 - What is minimum order state observe?

- Q.7 08
07
- Discuss design steps for state observe.
 - Give mapping between S, z and W plane.

- Q.8 08
07
- Define the necessary condition for complete state controllability.
 - The control system defined by

$$\begin{bmatrix} x_1(k+1) \\ x_2(k+1) \end{bmatrix} = \begin{bmatrix} 0 & 1 \\ -0.16 & -1 \end{bmatrix} \begin{bmatrix} x_1(k) \\ x_2(k) \end{bmatrix} + \begin{bmatrix} 1 \\ 0.5 \end{bmatrix} u(k) \quad \begin{bmatrix} x_1(0) \\ x_2(0) \end{bmatrix} = \begin{bmatrix} 1 \\ -1 \end{bmatrix}$$

Is completely state controllable. Determine a sequence of control signal $u(0)$ and $u(1)$ such that the state $X(2)$ becomes

$$\begin{bmatrix} x_1(2) \\ x_2(2) \end{bmatrix} = \begin{bmatrix} -1 \\ 2 \end{bmatrix}$$

- Q.9 a) Design detail controller with suitable assumptions for 08

$$G_p(s) = \frac{e^{-2s}}{s+1} \quad \text{with } T = 1 \text{ sec. And ZOH.}$$

- b) Design dead beat controller for 07

$$G_p(s) = \frac{10e^{-3s}}{s+2} \quad \text{With ZOH; } T = 1 \text{ sec.}$$

- Q.10 Write short note on. 15

- Dynamic matrix control algorithm
- Adaptive control.
- Effect of dead time on system performance.

SUBJECT CODE NO:- K-46
FACULTY OF ENGINEERING AND TECHNOLOGY
B.E. (Instru) Examination Oct/Nov 2016
Project Engineering and Management
(Revised)

[Time:Three Hours]**[Max.Marks:80]**

Please check whether you have got the right question paper.

N.B

- i) Attempt three questions from each section.
 ii) Q.No.1 from section A and Q.No.6 from section B are compulsory.

Section A

- Q.1 Attempt any five. 10
- What is the role of automation?
 - Define: instrumentation audit.
 - Define SRS.
 - What is project s-curve?
 - What are the project constraints?
 - Define: p & ID.
 - What do you mean by URS?
- Q.2 Discuss inter-departmental and interorganizational interactions 15
- Q.3
- Explain types of control panels briefly. 08
 - Describe the types of plant-layout. 07
- Q.4
- What do you mean by instrument- index sheet? Prepare this document for a temperature control loop. 08
 - Explain cable scheduling. 07
- Q.5 Describe the instrumentation standards used in process industry. 15

Section B

- Q.6 Attempt any five. 10
- What is procurement?
 - Define: Bidding.
 - List out the responsibilities of a project manager.
 - Define: SAT.
 - What do you mean by pricing process?
 - Define: Contract.
 - What is bar chart?
- Q.7
- Explain the management function: Project directing. 08
 - Discuss: Project authority. 07
- Q.8
- Explain the cost-breakdown structure with the help of an example. 08
 - Explain how the performance trial is carried out? 07
- Q.9
- Explain project scheduling with the help of an example. 08
 - Write a note on : sow(statement of work) 07
- Q.10 Write short notes on. 15
- Project specifications.
 - CPM

SUBJECT CODE NO:- K-78
FACULTY OF ENGINEERING AND TECHNOLOGY
B.E. (Instru) Examination Oct/Nov 2016
Instrument System Design
(Revised)

[Time:Three Hours]

[Max. Marks:80]

Please check whether you have got the right question paper.

N.B

- i) Answer three questions from each section.
- ii) Q.No.1 from section A & Q.No.6 from section B are compulsory.

Section A

- | | | |
|-----|--|----|
| Q.1 | Answer any five | 10 |
| | <ul style="list-style-type: none"> a) List out all components of an instrumentation system. b) What do you mean by calibration? c) Differentiate between Aluminium cable & copper cable. d) State the importance of shielding. e) Explain sources of static change on instrument. f) Define reliability. g) What do you mean by <ul style="list-style-type: none"> 1) NEMA 2) DIN h) Differentiate between product & prototype. | |
| Q.2 | a) Draw detail block diagram of microprocessor based instrument also state its advantages & disadvantages. | 08 |
| | b) A LPF has an i/p S/N ratio of 20. The i/p voltage as 3mv. Calculate the noise voltage. | 07 |
| Q.3 | a) Compare co-axial cable with twisted pair cable. Example their characteristics & techniques used to minimise noise. | 08 |
| | b) Discuss in detail PCB design guidelines. | 07 |
| Q.4 | a) Explain effort of glow & arc discharges on instrument performance. | 08 |
| | b) What do you mean by EMC? Explain in detail equipment development scale with emission & susceptibility. | 07 |
| Q.5 | Write notes on | |
| | a) NEMA | 08 |
| | b) Enclosure design and standards | 07 |

Section B

Q.6	Answer any five	10
	<ul style="list-style-type: none"> a) Define the term 'MTTF'. b) Explain need of reliability engineering c) What so you meant by availability? d) Explain Index protection. e) Discuss function of opto-isolator & its application. f) Define the term 'MTTR'. g) Differentiate between common mode signal & differentiate mode signal. h) State the need of shielding. 	
Q.7	<ul style="list-style-type: none"> a) Explain Redundancy & stand by systems in reliability. b) Explain in detail signals multipoint ground. 	08 07
Q.8	<ul style="list-style-type: none"> a) Discuss significance of electromagnetic interference. b) Explain in detail guarding technique. 	08 07
Q.9	<ul style="list-style-type: none"> a) State & explain in brief design rules for digital circuit PCB. b) Draw & explain 'bath tub curve' 	08 07
Q.10	Write note on	
	<ul style="list-style-type: none"> a) Noise sources b) Single layer & multi layer PCB 	08 07

SUBJECT CODE NO:- K-138
FACULTY OF ENGINEERING AND TECHNOLOGY
B.E.(Instru) Examination Oct/Nov 2016
Automotive Instrumentation [Elective-II]
(Revised)

[Time: Three Hours]**[Max. Marks:80]**

Please check whether you have got the right question paper.

N.B

- i) Answer three questions from each section.
 ii) Q. No.1 from Section A & Q. No. 6 from Section are compulsory.

Section A

Q.1	Answer any two.	10
	a) Explain Braking system in detail.	
	b) Discuss significance of oxygen sensor.	
	c) Explain significance of temperature sensor.	
Q.2	a) Explain ECU with the help of neat block diagram.	08
	b) Draw a neat block diagram of automotive system & explain.	07
Q.3	a) Discuss in detail Electronic suspension control system.	08
	b) Explain Anti-Lock braking system.	07
Q.4	a) Explain Hall Effect position sensor.	08
	b) Explain Ignition system with the help of neat circuit diagram.	07
Q.5	a) Explain solenoid with the help of fuel injector application.	08
	b) Explain an Algorithm for engine control system.	07

Section – B

Q.6	Answer any two	10
	a) Discuss significance of remote key's entry	
	b) Explain electromagnetic compatibility	
	c) Explain electric Instrument cluster	
Q.7	a) Explain body control module with the help of block diagram.	08
	b) Discuss CAN protocol in detail.	07
Q.8	a) Explain flex Ray protocol in detail.	08
	b) Differential between Lin protocol & OBD-II protocol.	07
Q.9	a) Explain Adaptive cruise control system.	08
	b) Explain EGF for Exhaust emission control.	07
Q.10	Write note on	08
	a) Four stroke petrol engine	07
	b) Crank angle position sensor	

SUBJECT CODE NO:- K-191
FACULTY OF ENGINEERING AND TECHNOLOGY
B.E.(INSTRU) Examination Oct/Nov 2016
Modern Control Theory
(Revised)

[Time:Three Hours]**[Max. Marks:80]**

Please check whether you have got the right question paper.

N.B

- i) Attempt three questions from each section.
- ii) Q.No.1 from section A & Q. No. 6 from section B are compulsory.
- iii) Assume suitable data if necessary.

Section A

- | | | |
|-----|---|----------|
| Q.1 | Attempt any five
a) What is nonlinear control?
b) List out advantages of state space analysis
c) What as rank of matrix? State properties.
d) What is LQR controller?
e) Define Eigen vector.
f) Define observability? | 10 |
| Q.2 | a) Compute e^{At} for $A = \begin{bmatrix} 0 & 1 \\ -2 & -3 \end{bmatrix}$
b) Obtain state model from
$\frac{y(s)}{U(s)} = \frac{s+6}{s^2+5s+6}$ | 08
07 |
| Q.3 | a) Obtain Eigen values & Eigen vectors
$A = \begin{bmatrix} 4 & 1 & -2 \\ 1 & 0 & 2 \\ 1 & 1 & 3 \end{bmatrix}$
b) Obtain transformation matrix
$\lambda = M^{-1}AM \text{ for } A = \begin{bmatrix} 0 & 0 & 1 \\ -2 & -3 & 0 \\ 0 & 2 & -3 \end{bmatrix}$ | 08
07 |
| Q.4 | a) Design full state observer for
$A = \begin{bmatrix} -1 & 1 \\ 1 & -2 \end{bmatrix}; C = [1 \ 0].$
If $s_1 = -5; s_2 = -5$
b) State & prove cayley Hamilton theorem | 08
07 |
| Q.5 | Write notes on
a) Design of servo system
b) Controllability & observability
c) STM properties. | 15 |

Section- B

Q.6	Attempt any five	10
	a) What is phase trajectory?	
	b) What is ON-Off & Dead zone non linearity?	
	c) Define Lyapunov stability?	
	d) What is uncertainty	
	e) What is jump resonance?	
	f) Differentiate between linear & nonlinear system.	
Q.7	a) What is singular point? Explain different types?	08
	b) What is Isocline method? Explain.	07
Q.8	a) What is robust control? Explain uncertainty with example & robust controller.	08
	b) Compare modern & conventional control system?	07
Q.9	a) What is phase plane Analysis? Explain.	08
	b) List out common physical non linearity & Explain.	07
Q.10	Write notes on	15
	a) Lyapunov stability	
	b) LQR design	
	c) Effect of measurement noise.	

SUBJECT CODE NO:- K-349
FACULTY OF ENGINEERING AND TECHNOLOGY
B.E.(Instru) Examination Oct/Nov 2016
Elective-I: Advanced Control System
(Revised)

[Time: Three Hours]

[Max. Marks:80]

Please check whether you have got the right question paper.

N.B

- 1) Solve three questions from each section.
- 2) Q.No.1 from section A & Q.No.6 from section B are compulsory.

Section A

- | | | |
|-----|--|----------|
| Q.1 | Attempt <u>any five</u> | 10 |
| | <ol style="list-style-type: none"> a) What is non liner control? b) Define stability. c) What is jump resonance? d) What is LQR? State design steps? e) What is backlash? f) What is ON-off & dead zone non linearity? | |
| Q.2 | <ol style="list-style-type: none"> a) State prove Caley Hamilton theorem. b) Give the classification of non-linearities & explain each in detail. | 08
07 |
| Q.3 | <ol style="list-style-type: none"> a) Explain jump resonance frequency response criterion. b) Describe the mathematical description for MRAC. | 08
07 |
| Q.4 | <ol style="list-style-type: none"> a) What is singular point, explain different types. b) Check the observability for
 $A = \begin{bmatrix} 2 & 0 & 0 \\ 0 & 2 & 0 \\ 0 & 3 & 1 \end{bmatrix} \quad C = [1 \ 1 \ 1]$ | 08
07 |
| Q.5 | <p>Write notes on</p> <ol style="list-style-type: none"> a) Pole placement design. b) Eigen values & Eigen vectors. | 08
07 |

Section B

- | | | |
|-----|--|----|
| Q.6 | Attempt <u>any five</u> | 10 |
| | <ol style="list-style-type: none"> a) Give the classification of non-linearities. b) Explain any two physical non-linearities in detail. c) State the importance of LQR. d) What is phase portrait? e) What is Lyapunov stability? f) What do you mean by uncertainty? | |

Q.7	a) Explain the concept of Lyapunov stability. b) Explain minimum degree pole placement method.	08 07
Q.8	Explain direct & indirect sect tuning regenerator with their simple algorithm	15
Q.9	a) What is robust controller explain uncertainty with example & robust controller. b) Determine K for $A = \begin{bmatrix} -1 & 1 \\ 0 & 2 \end{bmatrix}$, $B = \begin{bmatrix} 1 \\ 0 \end{bmatrix}$ with Q=I & R=1	08 07
Q.10	Write notes on a) Implicit & explicit STR b) Multivariable system	08 07

SUBJECT CODE NO:- K-350
FACULTY OF ENGINEERING AND TECHNOLOGY
B.E.(Instru) Examination Oct/Nov 2016
Elective-I: Robotics
(Revised)

[Time: Three Hours]**[Max. Marks:80]**

Please check whether you have got the right question paper.

N.B	1) Solve <u>any three questions</u> from each section. 2) Assume suitable data whenever necessary. 3) Figures to right indicate full marks.	
Section A		
Q.1	a) Explain work volume & D.O.F. for robot. b) Define 'Robot' & explain the components of robot.	07 06
Q.2	a) Explain homogenous transformation in detail with an example. b) Explain position sensors in brief.	08 05
Q.3	a) Explain forward & Inverse kinematics with suitable examples. b) Explain 'RCC' device in detail.	07 06
Q.4	a) Explain robot applications advantages & disadvantages. b) What do you understand by robot position & orientation?	07 06
Q.5	Write short note on (<u>any three</u>) a) History of robots b) Accuracy and repeatability c) D-H representation d) Touch & tactile sensors e) Sensor characteristics	14
Section B		
Q.6	a) Explain the different actuators used in robotics. b) What are the general considerations in trajectory planning?	07 06
Q.7	Differentiate between joint space trajectory planning & Cartesian space trajectory planning with suitable example.	13
Q.8	a) What are the general considerations in trajectory planning? b) What is the difference between path & trajectory?	07 06
Q.9	a) Explain magneto-strictive actuator. b) Explain sensing & digitizing in detail.	07 06
Q.10	Write short note on (<u>any three</u>) a) Image processing & analysis b) Higher order trajectory c) Robotic assembly sensors d) Microprocessor control of electric motor e) Application of machine vision system	14

SUBJECT CODE NO:- K-224
FACULTY OF ENGINEERING AND TECHNOLOGY
B.E.(INSTRU) Examination Oct/Nov 2016
Process Modelling & Optimization
(Revised)

[Time:Three Hours]

[Max. Marks:80]

N.B Please check whether you have got the right question paper.

- N.B
- i) Question no.1 & 6 are compulsory.
 - ii) Answer any three questions from each section.
 - iii) Assume suitable data if necessary.
 - iv) Figure to the right indicates full marks.

Section A

- | | | |
|-----|--|----------|
| Q.1 | Solve any five | 10 |
| | <ul style="list-style-type: none"> a) State energy balance equation b) State significance of sign change in Newton –Raphson's method. c) What is interpolation? d) Define : <ul style="list-style-type: none"> a) Dynamic process b) Controlled variable e) State formula for fourth order Runge-Kutta along with K_1 to K_4 and X_{n+1} f) Define enthalpy. | |
| Q.2 | <ul style="list-style-type: none"> a) Explain temperature control in isothermal reactor. b) Determine the real roots of $f(x)$ of the equation,
 $f(x) = x \cdot e^x - 2$
 Correct upto 3 decimal point by using Newton-Raphson's method | 07
08 |
| Q.3 | Explain modelling of batch distillation. | 15 |
| Q.4 | <ul style="list-style-type: none"> a) Explain explicit convergence method in brief. b) Explain modelling of gravity flow tank. | 07
08 |
| Q.5 | Write a short note on (any three) <ul style="list-style-type: none"> a) On-line identification b) Time value of money. c) Curve fitting d) Least square method. | 15 |

Section B

- | | | |
|-----|---|----|
| Q.6 | Answer any five | 10 |
| | <ul style="list-style-type: none"> a) State Gibbs-Duhein b) State two differences between step testing and sine wave testing. c) What is degeneracy d) Define optimization e) What is an objective function and constraints? f) What is Fibonacci series? | |

Q.7	a) Explain time domain 'Eyeball' fitting of step test data. b) Explain method of least squares.	08 07
Q.8	a) Explain Newton-Raphson's method. b) Explain how to build a model.	08 07
Q.9	a) Explain general procedure for solving optimization problem. b) Explain reduced gradient optimization technique.	07 08
Q.10	Write short notes of any three a) Dynamic programming b) Quadratic programming problem c) Sine wave testing d) Fitting function to empirical data.	15

SUBJECT CODE NO:- K-255
FACULTY OF ENGINEERING AND TECHNOLOGY
B.E.(INSTRU) Examination Oct/Nov 2016
Operating System and Networking
(Revised)

[Time: Three Hours]

[Max. Marks:80]

Please check whether you have got the right question paper.

- N.B
- i. Q.1 & Q.6 are compulsory.
 - ii. Answer three questions from each section.

Section A

- Q.1 Answer any two 10
- a. What are different flow control algorithms used in computer network?
 - b. Explain sliding window protocol with neat sketches only.
 - c. What do you mean by framing? Explain its importance.
- Q.2
- a) What do you understand by computer network? Explain different types (classification) of computer network. 08
 - b) Explain different types of network topologies with neat sketch diagram. Mention advantages and disadvantages of each topology. 07
- Q.3
- a) What are different types of transmission media used for building computer network? Mention their advantages, disadvantages and specification. 08
 - b) Explain meaning of switched network. Discuss in detail circuit switched, packet switched, and message switched network. 07
- Q.4
- a) What are different flow control algorithms used in computer network. Explain each in detail. 08
 - b) Compare GO back to N algorithm with simplex stop and wait protocol. 07
- Q.5 Write short note on any three. 15
- a. E –mail.
 - b. FTP.
 - c. Embedded OS.
 - d. Cryptography.

Section B

- Q.6 Answer any two 10
- a. Discuss and explain process.
 - b. Explain concurrent process.
 - c. Define and explain inter process interference.
 - d. Explain process protection and security.
- Q.7
- a) Explain different functions of operating system with suitable example. Explain deadlock and starvation. 08
 - b) Discuss importance of RTOS (real time operating system), its real life application. 07
- Q.8
- a) Explain file management system in a typical operating system. 08
 - b) Discuss memory management technique in operating system. 07
- Q.9
- a) Compare Linux operating system with other operating system with examples. 08
 - b) What is meant by Real time scheduling, explain with example. 07
- Q.10 Write short note on any three. 15
- a. Circuit switched network.
 - b. Flow control.
 - c. Congestion control.
 - d. Routing table.

SUBJECT CODE NO:- K-287
FACULTY OF ENGINEERING AND TECHNOLOGY
B.E.(Instru) Examination Oct/Nov 2016
Biomedical Instrumentation
(Revised)

[Time: Three Hours]

[Max. Marks:80]

Please check whether you have got the right question paper.

- N.B
- i) Q.No.1 and Q.No.6 are compulsory.
 - ii) Solve any three questions from each section.
 - iii) Figures of the right indicate full marks.

SECTION A

- | | | |
|-----|---|-----------------------------|
| Q.1 | Solve any five | 10 |
| | <ul style="list-style-type: none">i. Define Depolarization and Repolarisationii. Define EMGiii. Define Afferent nerves and Efferent nervesiv. Define cerebrum and cerebellumv. Define pulmonary artery and pulmonary veinvi. What is half-cell potential?vii. Compare polarisable and non-polarisable electrodeviii. Mention the four values present in human heart. | |
| Q.2 | <ul style="list-style-type: none">a) Explain the man-machine interface system with neat block diagram.b) Explain different types of body surface electrodes. | <div>07</div> <div>08</div> |
| Q.3 | <ul style="list-style-type: none">a) Explain the 10-20 electrode placement system used in EEG.b) Explain the EEG standard waveforms. | <div>08</div> <div>07</div> |
| Q.4 | <ul style="list-style-type: none">a) Explain in detail, ELG lead system.b) Explain the ELG signal amplifier and processing. | <div>08</div> <div>07</div> |
| Q.5 | Write a short note on any three : <ul style="list-style-type: none">a. Biomedical transducesb. Internal electrodesc. EMG systemd. Vector cardiograph. | 15 |

SECTION B

Q.6	Answer any five : i. What is catheter? ii. What is phonocardiogram? iii. What is ophthalmology? iv. What is konometer? v. What is inflammation? vi. What is systolic & diastolic? vii. What is endocardiac & myocardiac? viii. What is ceramic material?	10
Q.7	a) Explain magnetic blood flow measurement. b) Compare internal and external defibrillators.	08 07
Q.8	a) Explain the autonomy and physiology of human ear. b) Explain different problems associated with eye.	08 07
Q.9	a) Explain the properties of biomaterials. b) Explain the concept of composite biomaterials and its applications.	07 08
Q.10	Write a short note on any three. a. Heart lung machine b. Pacemaker c. Audiometer d. Biomaterials.	15