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5E5021

Roll No. 13 055

Total No of Pages: 3

5E5021

B. Tech. V Sem. (Back) Exam., Nov.-Dec.-2016
Electronic Instrumentation & Control Engineering
5EI1A Signals & Systems
Common with EC

Time: 3 Hours

Maximum Marks: 80
Min. Passing Marks Main: 26
Min. Passing Marks Back: 24

Instructions to Candidates:

*Attempt any **five questions**, selecting **one question** from **each unit**. All questions carry **equal** marks. Schematic diagrams must be shown wherever necessary. Any data you feel missing suitably be assumed and stated clearly.*

Units of quantities used/calculated must be stated clearly.

Use of following supporting material is permitted during examination.

(Mentioned in form No.205)

1. NIL

2. NIL

UNIT – I

Q.1 (a) Test the periodicity of the signal - [5]

$y(t) = \cos\left(t + \frac{\pi}{3}\right)$

(b) show that: [5]

$\delta[n] = u[n] - u[n-1]$

where $\delta[n]$ is unit impulse and $u[n]$ is unit step function

(c) Find, whether the given signal is periodic or not - [6]

$x[n] = \sin\left(\frac{n}{5}\right)$

OR

Q.1 Discuss the following with one suitable example: [4×4=16]

(a) Stable system

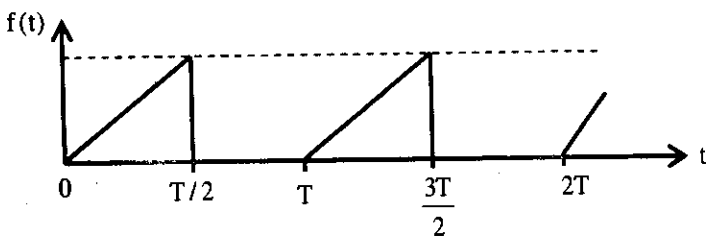
(b) Time variant system

(c) Causal system

(d) Linear system

UNIT – II

Q.2 Obtain the trigonometric Fourier series for the waveform shown below - [16]



For $0 \le wt \le \pi$, $f(t) = \frac{A}{\pi}$ .wt , and

$\pi \le wt \le 2\pi$, $f(t) = 0$

OR

Q.2 (a) Determine the DTFS coefficients of the given signal [8]

$x[n] = 5+4 \sin \frac{\pi}{3}n + 3 \cos \frac{2\pi}{3}n + 6 \sin \frac{4\pi}{3}n$

(b) Discuss Even Ssymmetry and Odd Symmetry by drawing waveforms and writing mathematical functions for both of the cases. [4+4=8]

UNIT – III

Q.3 (a) Determine the signal x(t) corresponding to the Fourier transform: [8]

$$X(jw) = \frac{1}{(jw)^2 + 7(jw) + 12}$$

(b) Discuss Differentiation in frequency domain for the time domain signal x(t). [8]

OR

Q.3 (a) A signal x [n] has its DTFT given by - [8]

$$X(e^{jw}) = \frac{1}{1 - a\,e^{-jw}}$$

Find the DTFT of - (i) x [n+3] (ii) x [3x+1]

(b) Discuss differentiation in frequency domain for the discrete signal x [n]. [8]

UNIT – IV

Q.4 Determine the signal x(t) having Laplace transform

$x(s)\frac{s+2}{(s+3)(s+4)}$,with -

(a) Re {s} < - 4 [5]

(b) Re {s} > -3, and [5]

(c) Re {s} lying between -3 and - 4 [6]

OR

Q.4 Prove the following z – transform properties, when $x[n] \leftrightarrow x[z]$ are transform pairs-

(a) $x[n-k] \leftrightarrow z^{-k}.\, x[z]$ [4]

(b) $a^n.\, x[n] \leftrightarrow x(\frac{z}{a})$ [4]

(c) $x[-n] \leftrightarrow x(z^{-1})$ [4]

(d) $n\, x[n] \leftrightarrow -z\frac{d\{x(z)\}}{dz}$ [4]

UNIT – V

Q.5 (a) Discuss low pass sampling theorem using suitable mathematical expression. [8]

(b) Discuss reconstruction of signal from its sampled version. [8]

OR

Q.5 (a) Determine the minimum sampling frequency to be used to sample the signal $x(t) = 100 . \sin c^2 100t$, if the signal x (t) is to be recovered from the samples without any distortion. [8]

(b) The signal $x(t) = 12 \cos(800\pi t) . \cos^2(1800\pi t)$ is ideally sampled at 4600 samples/sec. What is the minimum allowable sampling frequency? [8]

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5E5022

Roll No. _____ Total No of Pages: 3

5E5022

B. Tech. V Sem. (Main/Back) Exam., Nov.-Dec.-2016
Electronics & Communication Engineering
5EC2A Linear Integrated Circuits
Common with EC

Time: 3 Hours

Maximum Marks: 80
Min. Passing Marks Main: 26
Min. Passing Marks Back: 24

Instructions to Candidates:

*Attempt any **five questions,** selecting **one question** from **each unit.** All questions carry **equal** marks. Schematic diagrams must be shown wherever necessary. Any data you feel missing suitably be assumed and stated clearly.*

Units of quantities used/calculated must be stated clearly.

Use of following supporting material is permitted during examination.

(Mentioned in form No.205)

1. NIL _____ 2. NIL _____

UNIT – I

Q.1 (a) Define and explain the following OP-AMP parameters - [8]

(i) CMRR

(ii) Bias current

(ii) Slew rate

(iv) Input offset voltage

(b) With a circuit diagram, explain how dc level shifting operation is performed. Why is it needed in OP-AMP? [8]

OR

Q.1 Draw and explain the working of JFET differential Amplifier. Also draw and explain curve between I_D and differential input voltage. Also prove that $A_{dm} = -g_m R_D$. [16]

UNIT – II

Q.2 (a) Draw the circuits of Ideal Integrator and Lossy Integrator. Also draw and explain their frequency response. [8]

(b) Design a triangular wave generator using a comparator circuit with integrator to generate a triangular wave of frequency $5KH_Z$. Assume the peak to peak output voltage is 5V and saturation voltage are ± 14V. [8]

OR

Q.2 (a) Draw the circuit diagram of Wien bridge oscillator and find expression for frequency of oscillation. [8]

(b) Explain the working of voltage to frequency converter (V/F). [8]

UNIT – III

Q.3 (a) What are switched capacitor networks? Why do you need switched capacitor filters when you have conventional filters? [8]

(b) Design a phase shift oscillator using OP-AMP 741 for $F_0 = 200$ Hz. [8]

OR

Q.3 (a) Design a second order Butter Worth low pass filter having upper cut off frequency 1 KHz. [8]

(b) Draw the circuit diagram of Twin-T notch narrow band Reject Filter and derive expression for cut-off frequencies. [8]

UNIT – IV

Q.4 (a) Write a brief note on Schmitt Trigger. Also compare its performance with Zero Crossing detector. [8]

(b) What are various operating modes of 555 IC? Also explain the working principle of free running multi vibrator. [8]

OR

Q.4 (a) Write short note on Three Terminal Voltage Regulators. [8]

(b) Explain the working and application of Four Quadrant Multiplier. [8]

UNIT – V

Q.5 (a) Explain the application of PLL as- [4x4=16]

(i) FM detector

(ii) FSK demodulator

(iii) Frequency translator

(iv) Phase shifter

OR

Q.5 Write short note on following :-

(a) LOCK Range and CAPTURE Range of PLL [8]

(b) Block diagram and operation of PLL. [8]

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Roll No. _____ Total No of Pages: 4

5E5023

B. Tech. V Sem. (Main/Back) Exam., Nov.-Dec.-2016
Electronics & Communication Engineering
5EC3A Tele Communication Engineering

Time: 3 Hours

Maximum Marks: 80
Min. Passing Marks Main: 26
Min. Passing Marks Back: 24

Instructions to Candidates:

*Attempt any **five questions,** selecting **one question** from **each unit.** All questions carry **equal** marks. Schematic diagrams must be shown wherever necessary. Any data you feel missing suitably be assumed and stated clearly.*

Units of quantities used/calculated must be stated clearly.

Use of following supporting material is permitted during examination. (Mentioned in form No. 205)

1. NIL

2. NIL

UNIT – I

Q.1 (a) Describe the types of losses that may occur with high frequency transmission line. [8]

(b) Calculate the characteristics impendence, propagation coefficient and velocity of wave propagation at a frequency of 400 kHz of a uniform transmission line which has the following constant L = 0.5 mH/mile, c = 0.08 μf/mile. Resistance and leakance negligible. [8]

OR

Q.1 (a) Derive and explain input impedance of open and short circuited lines. [8]

(b) A transmission line has a characteristics impedance of 70Ω. The length of line is 200m. Find input impedance at a frequency of 1 MHz if the line is.

(i) Short circuited at far end [4]

(ii) Open circuited [4]

UNIT – II

Q.2 (a) Draw the double stub matching Network arrangement and write the merits over the single stub matching network arrangement. [8]

(b) A lossless transmission line with characteristic impedance 75Ω and of electric length 0.3λ is terminated with load impedance of (40 + j 20)Ω. Determine the reflection coefficient of load, SWR of line and input impedance of the line. [8]

OR

Q.2 (a) Derive the relationship between standing wave ratio and reflection co – efficient. [6]

(b) An open wire R.F. transmission line (loss free) has a $Z_0 = 600\Omega$ is connected to resistive load of 100Ω. Find the position and length of short circuited stub, if frequency is 150 MHz. [10]

UNIT – III

Q.3 (a) Write short notes on: [5×2=10]

(i) Image and characteristic impedance of four terminal Networks.

(ii) Characteristic impedance and propagation constant of lattice network.

(b) Design m – derived T and π section of low pass filter having a design impedance of 600Ω, a cut off frequency of 2000 Hz and frequency of infinite attenuation $f_\infty = 2100H_z$. [6]

OR

Q.3 (a) What are constant k filters? What are the major drawbacks and how are they over come using m – derived and composite filters. [8]

(b) Calculate the element values for a symmetrical π attenuator to be inserted between 300 ohm impedances to provide 25dB attenuations. [8]

UNIT – IV

Q.4 (a) Draw the block diagram of a Modern telephone instruments and explain its working. Also explain two wire and four wire transmission. [12]

(b) Explain the Echo suppressors cancellers and cross talk. [4]

OR

Q.4 (a) A four wire circuit has an overall loss of 1dB and the balance return loss at each is 6dB find the signing point, stability margin and attenuation of talker and listener echo. [12]

(b) Compare TDM and FDM, suggest which multiplexing system being used in general and why. [4]

UNIT – V

Q.5 (a) Explain the working principal of modern fax machine. [8]

(b) Distinguish between:

(i) Trunking and grading [4]

(ii) Pure chance and full traffic [4]

OR

Q.5 (a) Explain EPABX and SPC digital telephone exchange. [8]

(b) The drum diameter of a facsimile machine is 70.4mm and the scanning pitch is 0.2mm per scan. The drum rotates at 120mm. The signal frequency modulates a sub – carrier and only the first pair of side band need be taken into account. Calculate the band width of the SCFM system [8]

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5E5024

B. Tech. V Sem. (Main/Back) Exam., Nov.-Dec.-2016
Electronics & Communication Engineering
5EC4A Analog Communication

Time: 3 Hours

Maximum Marks: 80
Min. Passing Marks Main: 26
Min. Passing Marks Back: 24

Instructions to Candidates:

*Attempt any **five questions**, selecting **one question** from **each unit**. All questions carry **equal** marks. Schematic diagrams must be shown wherever necessary. Any data you feel missing suitably be assumed and stated clearly.*

Units of quantities used/calculated must be stated clearly.

Use of following supporting material is permitted during examination.

(Mentioned in form No.205)

1. NIL 2. NIL

UNIT – I

Q.1 A satellite receiving system consists of a low noise amplifier (LNA) that has a gain of 47 dB and a noise temperature of 120 K, a cable with a loss of 6.5 dB and the main receiver with a noise factor of 7 dB. Calculate the equivalent noise temperature of the overall system referred to the input for the following system connections. [16]

(i) LNA → Cable → Receiver

(ii) Cable → LNA → Receiver

OR

Q.1 (a) Explain the shot noise and white noise in detail. What is partition noise? [8]

(b) A parallel tuned circuit has a capacitor of 1500 pf and is tuned to 2 MHz. It has a Q factor of 90. What is the r. m. s. noise voltage across the tuned circuit at a temperature of 27°C, if the voltage is measured over a bandwidth of 10 KHz? [8]

UNIT – II

Q.2 (a) Consider the wave obtained by adding a non coherent carrier Ac cos (w_c t+ ϕ) to the DSB – SC wave, m(t) cos w_c t, where m(t) is the message waveform. This waveform is applied to an ideal envelope detector. Find the resulting detector output. Evaluate the output for - [12]

(i) $\phi = 0$ (ii) $\phi \neq 0$, and

[m (t)] << Ac/2.

(b) State the applications of SSB – transmission. [4]

OR

Q.2 (a) Sketch the typical spectrum of the VSB signal that is given as input to the video detector of a T. V. Receiver. [5]

(b) Briefly explain the method of generation of SSB – SC signals with phasing method. [7]

(c) An AM signal is given by - [4]

$X_c(t) = [30 + 9 \cos 2000 \pi t + 12 \cos 3000 \pi (t)] \times \cos 2\pi \times 10^5 t$

(i) Determine the effective modulation index.

(ii) Determine the carrier power and total side band power.

UNIT – III

Q.3 (a) With a neat block diagram, briefly explain the principle of working of a super-hetrodyne FM broadcast receiver. Why is a limiter stage used? [10]

(b) A message signal x (t) = 100 sin c 2000 t frequency modulates a carrier signal $c(t) = 200 \cos 2\pi \times 10^8$ t with a modulation index of S - [6]

(i) What is the peak frequency deviation?

(ii) What is the average power of the modulated signal?

(iii) What is the bandwidth of this modulated signal?

OR

Q.3 (a) With the help of a neat block diagram, explain the indirect method of generation of WB FM signal. [8]

(b) Briefly explain, How a PLL is useful in detecting FM signals? [4]

(c) The carrier signal $c(t) = 200 \cos 2\pi \times 10^8$ t is phase modulated by the message signal $x(t) = 2 \cos 2\pi \times 10^3$ t, and the peak phase deviation is $\pi 15$. What is the B. W of P.M. signal? [4]

UNIT – IV

Q.4 (a) Derive an expression for the improvement in the destination SNR obtained by the use of pre emphasis and de emphasis in an FM system. [12]

(b) What is meant by the threshold effect in FM receiver? [4]

OR

Q.4 (a) An AM transmitter is used to send a message signal with $\overline{x^2} = 0.5$ and a bandwidth of 5MHz over a channel which introduces additive white noise with a power spectral density of 10^{-12} W/Hz. The modulation index is 1. If the channel introduces a loss of 100 dB and if the average transmitted power is 200 w, find the destination signal to noise ratio. [8]

(b) Derive an expression for the destination SNR of a DSB – SC system in terms of that of a baseband system. [8]

UNIT – V

Q.5 (a) Explain how a PAM signal may be generated? How it can be demodulated? [8]

(b) Fifteen voice signals, each band limited to 4 KHz, are sampled at a rate that allows us to provide a guard band of 1.5 KHz to facilitate reconstruction. The samples are transmitted using PAM with AM of continuous wave i.e. PAM/AM, the duty cycle being 0.25. Calculate the required transmission B.W. [8]

OR

Q.5 (a) Briefly explain following: [8]

(i) Aliasing

(ii) Aperture effect

(iii) Zero order hold.

(b) Describe with the help of neat sketches and waveforms any two methods of generation of PDM/ PWM. [8]

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Roll No. _____ Total No of Pages: 3

5E5025

B. Tech. V Sem. (Main/Back) Exam., Nov.-Dec.-2016
Electronics And Communication Engineering
5EC5A Microwave Engineering - I

Time: 3 Hours

Maximum Marks: 80
Min. Passing Marks Main: 26
Min. Passing Marks Back: 24

Instructions to Candidates:

*Attempt any **five questions,** selecting **one question** from **each unit.** All questions carry **equal** marks. Schematic diagrams must be shown wherever necessary. Any data you feel missing suitably be assumed and stated clearly.*

Units of quantities used/calculated must be stated clearly.

Use of following supporting material is permitted during examination.

(Mentioned in form No.205)

1. NIL 2. NIL

UNIT – I

Q.1 (a) What is the significance of poynting vector and complex poynting vector? [6]

(b) A rectangular air-filled copper waveguide with a 0.9 inch ×0.4 inch cross section and 12 inch length is operated at 9.2 GHz with a dominant mode. Find - [10]

(a) Cut-off frequency,

(b) Guide wavelength

(c) Phase velocity

(d) Characteristics impedance

(e) The loss

OR

Q.1 (a) How a slot line differs from a microstrip line. [4]

(b) Draw the structures with field lines of parallel coupled strip lines and explain even and odd mode excitations. [6]

(c) A coplanar strip line carries an average power of 250 mw and a peak current of 100 mA. Determine the characteristics impedance of the coplanar strip line. [6]

UNIT – II

Q.2 The S-parameters of a two – port network are given by -

$S_{11} = 0.2\angle 0°$, $S_{22} = 0.1\angle 0°$, $S_{12} = 0.6\angle 90°$, $S_{21} = 0.6\angle 90°$

(a) Prove that the network is reciprocal but not lossless. [8]

(b) Find the return loss at port 1 when port 2 is short-circuited. [8]

OR

Q.2 A series reactance z = j x is connected between two lines with different characteristics impedances z_1 and z_2. Find the S-matrix of the junction. [16]

UNIT – III

Q.3 (a) Draw the H plane tee and explain with S-parameters matrix. [6]

(b) A 20 MW signal is fed into one of collinear port 1 of a loss less H plane T- junction. Calculate the power delivered through each port when other ports are terminative in matched load. [10]

OR

Q.3 (a) Draw the low pass and band pass filter using strip line and microstrip lines. [8]

(b) Draw the microstrip and stripline coupler. Explain their parameters. [8]

UNIT – IV

Q.4 (a) Explain the power (microwave) measurement. [8]

(b) The signal power at the input of a device is 10 MW. The signal power at the output of the same device is 0.20 MW. Calculate the insertion loss in dB of this component. [8]

OR

Q.4 (a) Explain the measurement of S-parameters. [8]

(b) A coaxial slotted line is used to measure VSWR of the load at 2 GHz by double minima method. If the distance between the positions of twice minimum power is 0.5 cm, find the value of VSWR on the line and the magnitude of the voltage reflection coefficient. [8]

UNIT – V

Q.5 (a) Explain the properties of substrate and their selection criterion ,for MIC application. [8]

(b) Explain the photolithography process. [8]

OR

Q.5 (a) Describe the Microwave Monolithic Integrated Circuit (MMIC) technology and their application. [8]

(b) Compare the MIC, MMIC, and hybrid integrated circuit technology [8]

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5E5026

Roll No. _____

5E5026

B. Tech. V Sem. (Main/Back) Exam., Nov.-Dec.-2016
Electronics & Communication Engineering
5EC6.1A Biomedical Instrumentation

Time: 3 Hours **Maximum Marks: 80**

Min. Passing Marks Main: 26

Min. Passing Marks Back: 24

Instructions to Candidates:

*Attempt any **five questions,** selecting **one question from each unit.** All questions carry **equal** marks. Schematic diagrams must **be shown wherever necessary.** Any data you feel missing suitably be assumed and stated clearly.*

Units of quantities used/calculated must be stated clearly.

Use of following supporting material is permitted during examination.

(Mentioned in form No.205)

1. NIL 2. NIL

UNIT – I

Q.1 (a) What is meant by pulmonary and systemic blood circulation? Draw and explain the working of cardiovascular system. [2+6=8]

(b) Explain the various types of electrodes used for measurement of bio potentials. Draw and explain electrode equivalent diagram. [4+4=8]

OR

Q.1 (a) Discuss the generation of bio-potentials in human body. List the primary bio-potentials present in the human body. [5+3=8]

(b) What is the working principle of strain gauges? Discuss its application in medical instrumentation. [5+3=8]

UNIT – II

Q.2 (a) What is cardiac axis? Explain the Einthoven triangle and significance of various leads. [3+5=8]

(b) Explain the working principle of blood pressure measurement. Also draw & explain blood pressure waveform during systole and diastole. [4+4=8]

OR

Q.2 (a) What are different EEG sleep patterns? Explain the recording of EEG waveform by 10-20 electrode system. [3+5=8]

(b) Explain the following- [4+4=8]

(i) Echocardiograph

(ii) Plethysmograph

UNIT – III

Q.3 (a) Discuss the application of spectrophotometer in medical instrumentation. [8]

(b) List the isotopes used in medical imaging. Discuss the working of Gamma camera with suitable diagram. [3+5=8]

OR

Q.3 (a) Discuss the working principle of chromatographs. List their application in clinical laboratory. [5+3=8]

(b) What do you mean by NMR signal? Explain the working principle of Magnetic Resonance Imaging technique. [3+5=8]

UNIT – IV

Q.4 (a) Discuss the role of instrumentation in intensive care units with suitable diagrams. [8]

(b) Explain the working of different types of pace makers with suitable diagram. [8]

OR

Q.4 (a) What are various physiological effects of electric current on human body and how they can be avoided? [8]

(b) Explain the working principle of heart lung machine. Discuss the role of instrumentation in it. [6+2=8]

UNIT – V

Q.5 (a) List the various ECG abnormal patterns and explain. [8]

(b) Discuss the real time computer application in medical instrumentation. [8]

OR

Q.5 (a) Explain the clinical applications of EMG and ERG signals. [8]

(b) Explain the following- [4+4=8]

(i) Data acquisition and processing.

(ii) Remote data recording and management.

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5E5033

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5E5033

B. Tech. V Sem. (Main/Back) Exam., Nov.-Dec.-2016
Electronic Instrumentation & Control Engineering
5EI3A Control System - II

Time: 3 Hours

Maximum Marks: 80
Min. Passing Marks Main: 26
Min. Passing Marks Back: 24

Instructions to Candidates:

*Attempt any **five questions,** selecting **one question** from **each unit.** All questions carry **equal** marks. Schematic diagrams must be shown wherever necessary. Any data you feel missing suitably be assumed and stated clearly.*

Units of quantities used/calculated must be stated clearly.

Use of following supporting material is permitted during examination. (Mentioned in form No. 205)

1. NIL 2. NIL

UNIT – I

Q.1 (a) Consider the system in state variable form-

$\dot{x} = Ax + Bu$

$y = Cx + Du$

with $A = \begin{bmatrix} 3 & 2 \\ 3 & 4 \end{bmatrix}$, $B = \begin{bmatrix} 1 \\ -1 \end{bmatrix}$, $C = [1 \quad 0]$, $D = [0]$

(i) Compute the transfer function [3]

(ii) Determine the poles & zeros of the system [2]

(iii) If possible, represent the system as a first-order system. [3]

(b) Consider a system modeled via the third-order differential equation [8]

$\dddot{x}(t) + 3\ddot{x}(t) + 3\dot{x}(t) + x(t) = \dddot{u}(t) + 2\ddot{u}(t) + 4\dot{u}(t) + u(t)$

Develop a state variable representation and obtain a block diagram of the system assuming the output is x (t) & the input is u (t)

OR

Q.1 (a) Explain state-space modeling of inverted pendulum control. [8]

(b) Consider the following system [8]

$\dddot{y} + 6\ddot{y} + 11\dot{y} + 6y = 6u$

Obtain a state space representation of this system in a diagonal canonical form.

UNIT – II

Q.2 Consider the following state equation and output equation - [16]

$$\begin{bmatrix}\dot{x}_1\\ \dot{x}_2\\ \dot{x}_3\end{bmatrix} = \begin{bmatrix}-6 & 1 & 0\\ -11 & 0 & 1\\ -6 & 0 & 0\end{bmatrix}\begin{bmatrix}x_1\\ x_2\\ x_3\end{bmatrix} + \begin{bmatrix}2\\ 6\\ 2\end{bmatrix} u$$

$$y = \begin{bmatrix}1 & 0 & 0\end{bmatrix}\begin{bmatrix}x_1\\ x_2\\ x_3\end{bmatrix}$$

Show that the state equation can be transformed into the following form by use of a proper transformation matrix-

$$\begin{bmatrix}\dot{z}_1\\ \dot{z}_2\\ \dot{z}_3\end{bmatrix} = \begin{bmatrix}0 & 0 & -6\\ 1 & 0 & -11\\ 0 & 1 & -6\end{bmatrix}\begin{bmatrix}z_1\\ z_2\\ z_3\end{bmatrix} + \begin{bmatrix}1\\ 0\\ 0\end{bmatrix} u$$

Then obtain the output y in terms of z_1, z_2 & z_3.

OR

Q.2 If an n×n matrix A has n distinct eigenvalues, then the minimal polynomial of A is identical to the characteristic polynomial. Also, if the multiple eigenvalues of A are linked in a Jordan chain, the minimal polynomial and the characteristic polynomial are identical. If however the multiple eigenvalues of A are not linked in a Jordan chain, the minimal polynomial is of lower degree than the characteristic polynomial. Verify the foregoing statements about the minimal polynomial when multiple eigenvalues are involved. [16]

$$A = \begin{bmatrix}2 & 1 & 4\\ 0 & 2 & 0\\ 0 & 3 & 1\end{bmatrix} \quad B = \begin{bmatrix}2 & 0 & 0\\ 0 & 2 & 0\\ 0 & 3 & 1\end{bmatrix}$$

UNIT – III

Q.3 (a) Consider the system described by the state equation - [8]

$$\frac{dx(t)}{dt} = Ax(t) + Bu(t)$$

where $A = \begin{bmatrix} 0 & 1 \\ -1 & a \end{bmatrix}$, $B = \begin{bmatrix} 1 \\ b \end{bmatrix}$

Find the region in the a – b plane such that the system is completely controllable.

(b) Consider the system defined by - [8]

$$\begin{bmatrix} \dot{x}_1 \\ \dot{x}_2 \end{bmatrix} = \begin{bmatrix} 0 & 1 \\ 0 & 2 \end{bmatrix} \begin{bmatrix} x_1 \\ x_2 \end{bmatrix} + \begin{bmatrix} 1 \\ 0 \end{bmatrix} u$$

Show that this system cannot be stabilized by the state feedback u = - kx, whatever matrix k is chosen.

OR

Q.3 Consider the following state – space equation of a system -

$$\begin{bmatrix} \dot{x}_1 \\ \dot{x}_2 \\ \dot{x}_3 \end{bmatrix} = \begin{bmatrix} -1 & -2 & -2 \\ 0 & -1 & 1 \\ 1 & 0 & -1 \end{bmatrix} \begin{bmatrix} x_1 \\ x_2 \\ x_3 \end{bmatrix} + \begin{bmatrix} 2 \\ 0 \\ 1 \end{bmatrix} u$$

Design a state feedback controller so that:

(a) Setting time is less then 5 sec (1% setting time) [8]

(b) Overshoot is less than 10% [8]

UNIT – IV

Q.4 Consider the system represented in state variable form - [16]

$$\dot{x} = Ax + Bu \ , \ y = Cx + Du$$

Where $A = \begin{bmatrix} 1 & 2 \\ -6 & -12 \end{bmatrix}$, $B = \begin{bmatrix} -5 \\ 1 \end{bmatrix}$, $C = [4 \quad -3]$ & $D = [0]$

Verify that the system is observable & controllable. If so, design a full state feedback law and an observer by placing the closed loop system poles at $s_{1,2} = -1 \pm j$ and the observer poles at $s_{1,2} = -12$.

OR

Q.4 Design reduced order (minimum-order) observers for the plant. Assume that the derived closed loop poles for the pole-placement part are located at - [16]

$s = -2 + j2\sqrt{3}$, $s = -2\ j2\sqrt{3}$. Assume also that the desired observer poles are located at $s = -8$ for the minimum order observer. Find the response to the initial conditions specified below

$x_1(o) = 1,\ x_2(o) = 0,\ e_1(o) = 1$

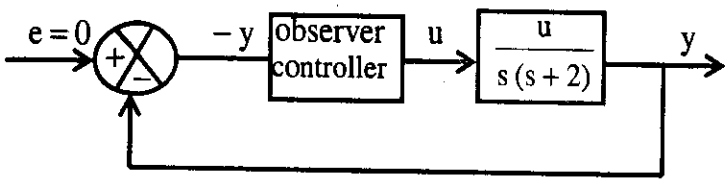

fig. Regulator system

UNIT – V

Q.5 For a continuous –time plant model, an engineer obtained the following continuous-time controller:

$$c(s) = \frac{2s+1}{s+\alpha}$$

Where $\alpha \in R$ is a timing factor

(a) The engineer implements the controller on a μp using the Euler backward emulation approach. What is the resulting C (z) for a generic sampling time T. [6]

(b) What is the range of timing factor α to produce an asymptotically stable discrete time controller (ASDTC). [5]

(c) What is the condition on α to have an asymptotically stable continuous time controller & ASDTC. [5]

OR

Q.5 (a) Describe the discrete time transfer function of the following continuous time plant: [6]

$$P(s) = \frac{1}{s^2+3s+2}$$

Use a ZOH element & assume the sampling time T to be known.

(b) Determine the state-space representation of the above system (discredited system). [6]

(c) Access the stability of the discrete time system. [4]

5E5034

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5E5034

B. Tech. V Sem. (Main/Back) Exam., Nov.-Dec.-2016
Electronic Instrumentation & Control Engineering
5EI4A Electronic Measurement & Instrumentation

Time: 3 Hours **Maximum Marks: 80**

Min. Passing Marks Main: 26

Min. Passing Marks Back: 24

Instructions to Candidates:

*Attempt any **five questions, selecting one question from each unit.** All questions carry **equal** marks. Schematic diagrams must be shown wherever necessary. Any data you feel missing suitably be assumed and stated clearly.*

Units of quantities used/calculated must be stated clearly.

Use of following supporting material is permitted during examination. (Mentioned in form No. 205)

1. NIL 2. NIL

UNIT – I

Q.1 (a) What do you mean by distortion? What are the various types of distortion? Explain the block diagram of distortion meter. [8]

(b) What do you mean by sweep errors? Explain the working of sweep frequency generators. [8]

OR

Q.1 (a) Draw and explain the block diagram of heterodyne type wave analyzer with merits & demerits. [8]

(b) Explain the working of frequency selective wave analyzer with suitable block diagram & applications. [8]

UNIT – II

Q.2 (a) Explain the basic diagram and applications of D/A converters with merits & demerits. [8]

(b) Discuss about the sampling theory & its applications. [8]

OR

Q.2 (a) Explain the following converters:- [8]

(i) F/V converters

(ii) A/D converters

(b) What are the utility of data acquisition systems? Explain its working with neat sketch. [8]

UNIT – III

Q.3 Explain the following with merits, demerits & applications:-

(a) Vector impedance meter. [8]

(b) Hall effect transducers. [8]

OR

Q.3 Explain the following with merits, demerits & applications:-

(a) Digital storage oscilloscope. [8]

(b) Ramp type digital voltmeter (DVM) [8]

UNIT – IV

Q.4 Explain the following errors:-

(a) Trigger level error. [8]

(b) Time base error. [8]

OR

Q.4 (a) What do you mean by order of events? Explain the interval between events with suitable examples. [8]

(b) Discuss about the various measurement techniques for low and high frequency measurements. [8]

UNIT – V

Q.5 Write short notes on the following:-

(a) PWM telemetry. [8]

(b) Process instrument calibration techniques. [8]

OR

Q.5 (a) What are the various types and procedure of maintenance of process instruments? Explain the procedure for calibration of plant instruments and master instruments. [8]

(b) What are the primary reference standards? Explain the validation of standards laboratories. [8]

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5E5035

Roll No. _____ Total No of Pages: 2

5E5035

B. Tech. V Sem. (Main/Back) Exam., Nov.-Dec.-2016
Electronic Instrumentation & Control Engineering
5EI5A Microprocessors

Time: 3 Hours

Maximum Marks: 80
Min. Passing Marks Main: 26
Min. Passing Marks Back: 24

Instructions to Candidates:

*Attempt any **five questions**, selecting **one question** from **each unit**. All questions carry **equal** marks. Schematic diagrams must be shown wherever necessary. Any data you feel missing suitably be assumed and stated clearly.*

Units of quantities used/calculated must be stated clearly.

Use of following supporting material is permitted during examination. (Mentioned in form No. 205)

1. NIL 2. NIL

UNIT – I

Q.1 Define following regarding 8085: [2×8=16]

(a) Program counter
(b) Stack pointer
(c) General Purpose programmable register
(d) HOLD and HLDA pin
(e) Control and status pin
(f) Flags
(g) PSW
(h) Serial input output signals

OR

Q.1 (a) Explain the various types of buses along with their function regarding 8085 microprocessor. [8]

(b) Explain why demultiplexed $AD_0 - AD_7$ buses are required? [8]

UNIT – II

Q.2 Explain the following instructions using suitable examples - [4x4=16]
(a) XCHG
(b) DAD
(c) LHLD
(d) XT HL

OR

Q.2 (a) Explain various addressing modes of 8085 using suitable examples. [8]
(b) Explain the rotate instructions in 8085 up. [8]

UNIT – III

Q.3 What are various inputs and outputs available in 8085? Explain them. Distinguish between maskable and non maskable interrupts. [16]

OR

Q.3 (a) Explain the instructions rotated to interrupts. [8]
(b) Explain the SIM and RIM instructions and illustrate how to use them for 8085 interrupts. [8]

UNIT – IV

Q.4 Write a short note on:
(a) 8259 Chip [8]
(b) Programmable interval timer 8253 [8]

OR

Q.4 Write a short note on:
(a) 8257 Chip [8]
(b) 8255 [8]

UNIT – V

Q.5 Explain following:
(a) Various functions used in 8086 [8]
(b) Difference between 8085 and 8086. [8]

OR

Q.5 Explain the following:
(a) Addressing modes of 8086. [8]
(b) Explain the following instructions in 8086 with suitable examples. [8]
(i) DIV (ii) MUL

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5E5036

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5E5036

B. Tech. V Sem. (Main/Back) Exam., Nov.-Dec.-2016
Electronic Instrumentation & Control Engineering
5EI6.1A Optimization Techniques

Time: 3 Hours

Maximum Marks: 80
Min. Passing Marks Main: 26
Min. Passing Marks Back: 24

Instructions to Candidates:

*Attempt any **five questions,** selecting **one question** from **each unit.** All questions carry **equal** marks. Schematic diagrams must be shown wherever necessary. Any data you feel missing suitably be assumed and stated clearly.*

Units of quantities used/calculated must be stated clearly.

Use of following supporting material is permitted during examination. (Mentioned in form No. 205)

1. NIL 2. NIL

UNIT – I

Q.1 (a) A firm manufacturing two types of electric items A and B , can make a profit of Rs. 20 per unit of A and Rs. 30 per unit of B. Each unit of A requires 3 motors and 2 transformers and each unit of B requires 2 motors and 4 transformers. The total supply of these per month is restricted to 210 motors and 300 transformers. Type B is an export model requiring a voltage stabilizer which has a supply restricted to 65 units per month. Formulate the linear programming problem for maximum profit and solve it graphically. [8]

(b) Using Big-M method solve the following LPP - [8]

Minimize $Z = 10x_1 + 3x_2$

Subject to $x_1 + 2x_2 \geq 3$

$x_1 + 4x_2 \geq 4$

$x_1, x_2 \geq 0$

OR

Q.1 (a) Solve the following by simplex method - [8]

Max. $Z = 4x_1 + 5x_2$

S. to $x_1 + x_2 \leq 3$

$3x_1 + 4x_2 \leq 10$

$x_1, x_2 \geq 0$

(b) Use the dual simplex method to solve the following LPP - [8]

Minimize. $Z = 4x_1 + 2x_2$

S. to $x_1 + 2x_2 \geq 2$

$3x_1 + x_2 \geq 3$

$4x_1 + 3x_2 \geq 6$

$x_1, x_2 \geq 0$

UNIT – II

Q.2 Use revised simplex method to solve the following LPP - [16]

Max. $Z = 5x_1 + 3x_2$

S. to $4x_1 + 5x_2 \geq 10$

$5x_1 + 2x_2 \leq 10$

$3x_1 + 8x_2 \leq 12$

and $x_1, x_2 \geq 0$

OR

Q.2 (a) Solve the following assignment problem - [8]

	I	II	III	IV	V
1	11	17	8	16	20
2	9	7	12	6	15
3	13	16	15	12	16
4	21	24	17	28	26
5	14	10	12	11	13

(b) Solve the following by Vogel's approximation method (VAM) and test its optimality by MODI method. [8]

	I	II	III	IV	Supply↓
A	4	6	8	13	50
B	13	11	10	8	70
C	14	4	10	13	30
D	9	11	13	8	50
Demand	25	35	105	20	200 / 185

UNIT – III

Q.3 (a) Construct a network for the following, numbering the events also - [6]

Activity	A	B	C	D	E	F	G	H	I	J	K
Immediate Predecessor	-	-	-	A	C	B, D	B, D	E, F	A	G, H	E, F

(b) A project schedule has the following characteristics - [10]

Activity	1-2	1-3	2-4	3-4	3-5	4-9	5-6	5-7	6-8	7-8	8-10	9-10
Time (days)	4	1	1	1	6	5	4	8	1	2	5	7

(i) Construct a network diagram.
(ii) Compute the earliest event time and latest event time.
(iii) Determine the critical path and total project duration.
(iv) Compute total float and free float for each activity.

OR

Q.3 A project has a following time estimate - [16]

Activity	Estimated duration (days)		
	Optimistic	Most likely	Pessimistic
(1,2)	1	1	7
(1,3)	1	4	7
(1,4)	2	2	8
(2,5)	1	1	1
(3,5)	2	5	14
(4,6)	2	5	8
(5,6)	3	6	15

(a) Draw the project network.
(b) Find the expected duration and variance of each activity
(c) Find the early and late occurrence times for each event and the expected project length.
(d) Calculate the variance and standard deviations of project length.
(e) What is the probability that project will be occupied -
  (i) 4 days earlier than expected
  (ii) Not more than 4 days later than expected
  (iii) If the project due date is 19 days, what is the probability of meeting the due date.

UNIT – IV

Q.4 (a) Minimize $f(x_1, x_2) = x_1 - x_2 + 2x_1^2 + 2x_1 x_2 + x_2^2$

From the starting point $X_1 = \begin{pmatrix} 0 \\ 0 \end{pmatrix}$ using Powell's method. [8]

(b) Minimize $f(x_1, x_2) = 2x_1^2 - 2x_1 x_2 + 5x_2^2 - 6x_1 + 6x_2 + 5$

By Newton's method starting from $\begin{pmatrix} 0 \\ 0 \end{pmatrix}$ [8]

OR

Q.4 (a) Minimize $f(x_1, x_2) = x_1^2 + x_2^2 - 2x_1 - 3x_2 + 3$ [8]

Subject to $g(x_1, x_2) = x_1 + 2x_2 - 4 \leq 0$

with the starting point $X_1 = \begin{pmatrix} 0 \\ 0 \end{pmatrix}$, Take $\epsilon_1 = 0.001$, $\epsilon_2 = 0.001$ and $\epsilon_3 = 0.01$

(b) Solve the problem - [8]

Minimize $f(x) = (x_1 - 1)^2 + (x_2 - 5)^2$

Subject to $-x_1^2 + x_2 \leq 4$

$-(x_1 - x_2)^2 + x_2 \leq 3$

using interior penalty function method.

UNIT – V

Q.5 Find the value of y_1, y_2 and y_3 so as to - [16]

Maximize y_1, y_2, y_3

S.t. $y_1 + y_2 + y_3 = 5$

and $y_1, y_2, y_3 \geq 0$

OR

Q.5 Solve the the following LPP using dynamic programming techniques. [16]

Max $Z = 8x_1 + 7x_2$

S.t. $2x_1 + x_2 \leq 8$

$5x_1 + 2x_2 \leq 15$

and $x_1, x_2 \geq 0$

5E3115

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5E3115

B. Tech. V Sem. (Back) Exam., Nov.-Dec.-2016
Electronics Instrumentation & Control Engineering
5EI3 (O) Modern Control System

Time: 3 Hours

Maximum Marks: 80
Min. Passing Marks Main: 26
Min. Passing Marks Back: 24

Instructions to Candidates:

*Attempt any **five questions,** selecting **one question** from **each unit.** All questions carry **equal** marks. Schematic diagrams must be shown wherever necessary. Any data you feel missing suitably be assumed and stated clearly.*

Units of quantities used/calculated must be stated clearly.

Use of following supporting material is permitted during examination. (Mentioned in form No. 205)

1. NIL 2. NIL

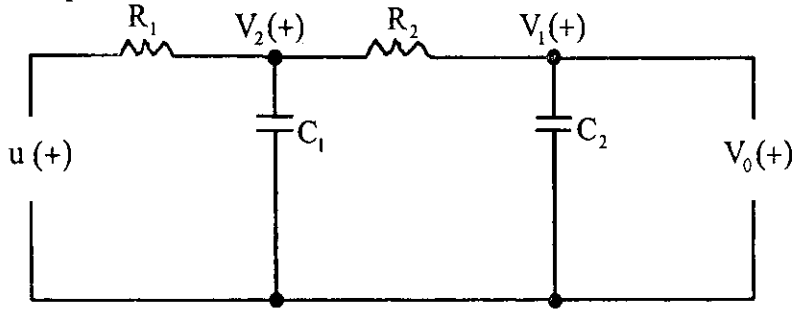
UNIT – I

Q.1 (a) By help of suitable example explain modern vs conventional control theory. [8]

(b) Explain state, also explain state variable & state vector. [8]

OR

(a) For the system shown in fig, choose state variable as V_1 (t) & V_2(t) and write down state equation – [8]



(b) By help of suitable example explain state – space equation for mechanical & Electrical system? [8]

UNIT – II

Q.2 (a) Explain the following transfer function in state model [8]

$$\frac{y(s)}{y(s)} = \frac{1}{s^3 + 6s^2 + 11s + 6}$$

(b) Construct the state model too a system characterized by the differential equation $\dddot{y} + 6\ddot{y} + 11\dot{y} + 6y = u$ also pine the block dig representation of state model. [8]

OR

Q.2 (a) Construal the state model in Jordon's canonical form for a system whose transfer junction is given by $\frac{y(s)}{u(s)} = \frac{10}{(s+1)^2(s+2)}$ [8]

(b) Obtain the transfer function if state model is given by [8]

$$\begin{bmatrix} \dot{x}_1 \\ \dot{x}_2 \end{bmatrix} = \begin{bmatrix} 0 & 1 \\ -2 & -3 \end{bmatrix} \begin{bmatrix} x_1 \\ x_2 \end{bmatrix} + \begin{bmatrix} 0 \\ 1 \end{bmatrix} 4$$

$$y = \begin{bmatrix} 1 & 0 \end{bmatrix} \begin{bmatrix} x_1 \\ x_2 \end{bmatrix}$$

UNIT – III

Q.3 (a) Define Eigen values & Eigen vectors with its importance and afflictions in control system? [8]

(b) A system characterized by the transfer functions $\frac{y(s)}{u(s)} = \frac{2}{(s^3 + 6s^2 + 11s + 6)}$ test the controllability and observability of system. [8]

OR

Q.3 (a) Explain state transition matrix, also explain properties of state transition matrix. [8]

(b) For generalized system derive the Ackerman's formula? [8]

UNIT – IV

Q.4 (a) Explain the phenemine of Digital control system also explain sampled data control system. [8]

(b) Using the Routh Hurwitz Criterion, det. the stability of the closed loop system Det. the number of roots of each equation that are in the right half of s – plane

$s^6 + 2s^5 + 8s^4 + 15s^3 = 20s^2 + 16s + 16 = 0$ [8]

OR

Q.4 (a) Explain Z – transform and its need also solve Z – transform following function

$f(k) = k + \sin 2k;\ k \geq 0$ [8]

(b) Explain the phenomina of Block diagram analysis of sampled data system? [8]

UNIT – V

Q.5 Explain the following concepts –

(a) Digital PID controller [8]

(b) Design on 2 – plane [8]

OR

Q.5 Write short note on:

(a) Design of w – plane [8]

(b) Position Servo. [8]
