C 20587 (Pages : 3) Name.....

Reg. No.....

SIXTH SEMESTER U.G. DEGREE EXAMINATION, MARCH 2022

(CBCSS–UG)

Electronics

ELE 6B 16 (C)—CONTROL SYSTEMS

(2019 Admissions)

Time : Two Hours Maximum : 60 Marks

Section A

Answer atleast **eight** *questions.*
Each question carries 3 *marks.*
All questions can be attended.
Overall ceiling 24.

1. Draw the block diagram of closed loop control system.
2. Find the inverse Lapalace transform, $F(s) = 1/(s(s+1))$.
3. What are the basic elements used for modelling mechanical rotational system ?
4. What do you mean by poles and zeros of a transfer function ?
5. Define transfer function of a system.
6. Write the analogous electrical elements in force current analogy for the elements of mechanical translational system.
7. What do you mean by static error constants ? Write equations for *three* constants.
8. Draw a unit step input signal and the response of a first order system to unit step input signal.
9. What do you mean by gain crossover frequency and phase crossover frequency ?
10. Differentiate between type and order of a transfer function.
11. What is Nyquist stability criterion ?
12. Define initial value theorem and final value theorem.

(8 × 3 = 24 marks)

Turn over

Section B

Answer atleast **five** *questions.*
Each question carries 5 *marks.*
All questions can be attended.
Overall ceiling 25.

13. A series circuit consisting of resistance R ohms and an inductance of L henry is connected to a dc supply of E volts. Derive an expression for the steady state value of current flowing in the Circuit.

14. Represent the following set of equations by a signal flow graph and determine the overall gain relating to x_5 and x_1 :

$x_2 = ax_1 + fx_2$
$x_3 = bx_2 + ex_4$
$x_4 = cx_3 + hx_5$
$x_5 = dx_1 + gx_2$.

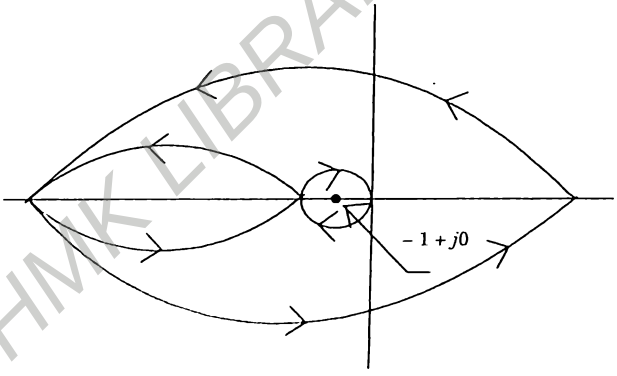
15. The open loop transfer function of a unity feedback control system is given by $G(s) = 25/[s(s + 5)]$; a unit step is applied at the input Calculate the : (a) Natural frequency of oscillation ; (b) Damped frequency of oscillation ; (c) Damping factor and (d) Maximum overshoot.

16. Explain the working of a PI Controller.

17. Construct the Routh array and determine the stability of the system whose characteristic equation is $s^6 + 2s^5 + 8s^4 + 12s^3 + 20s^2 + 16s + 16 = 0$.

18. What are the steps involved in constructing root locus plot ?

19. Check the stability of the system whose Nyquist plot is shown below



Number of open loop poles in right half s plane = 0

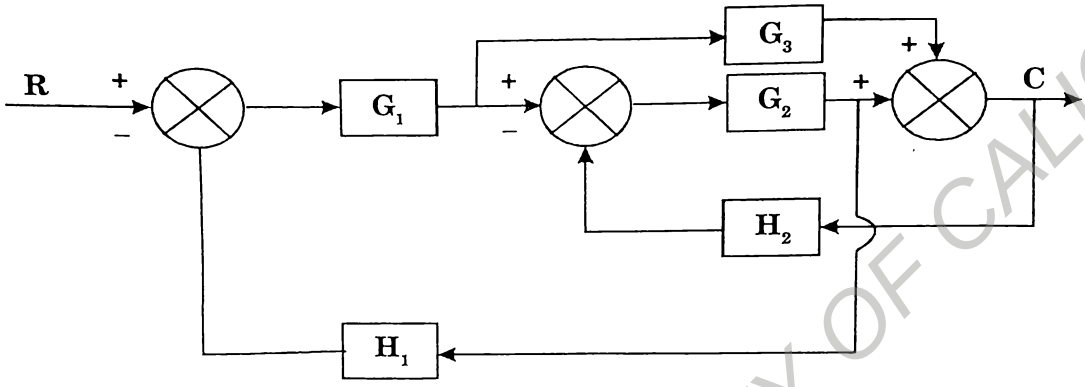
(5 × 5 = 25 marks)

Section C

Answer any **one** *questions.*

Each question carries 11 *marks.*

20. Using block diagram reduction method, find the overall transfer function :



21. Derive the expression for the time domain response of a second order control system subjected to a unit step input function.

(1 × 11 = 11 marks)

C 20586 (Pages : 2) Name.....

Reg. No.....

SIXTH SEMESTER U.G. DEGREE EXAMINATION, MARCH 2022

(CBCSS—UG)

Electronics

ELE 6B 16 (b)—INDUSTRIAL ELECTRONICS

(2019 Admissions)

Time : Two Hours Maximum : 60 Marks

Section A

Answer at least **eight** *questions.*
Each question carries 3 *marks.*
All questions can be attended.
Overall Ceiling 24.

1. What is a TRIAC ?
2. List the different Commutation Techniques of SCR.
3. What is a UJT ?
4. Draw the circuit diagram of a Single Phase Full Wave Controlled Rectifier with Resistive Load.
5. Draw the Circuit Diagram of a Three Phase Half Wave Rectifier with Resistive Load.
6. What are the main applications of Polyphase Rectifiers ?
7. Draw the basic circuit of a Chopper.
8. What is a Voltage Commuted Chopper ?
9. What is a parallel Inverter ?
10. Give any two applications of Induction Heating.
11. Draw the Block Diagram of an SMPS.
12. What is an Uninterrupted Power Supply ?

(8 × 3 = 24 marks)

Turn over

Section B

Answer at least **five** *questions.*
Each question carries 5 *marks.*
All questions can be attended.
Overall Ceiling 25.

13. Explain the working of a DIAC.
14. Explain the working of a Power MOSFET.
15. Explain any one Forced Commutation Circuit in detail.
16. With suitable diagrams, explain a Three Phase Full Cotrolled Bridge Rectifier with Resistive Load.
17. Explain the working principle of a load commuted DC Chopper .
18. With a neat sketch, explain a Single Phase McMurray Half Bridge Inverter.
19. Explain an Uninterrupted Supply with suitable diagram.

(5 × 5 = 25 marks)

Section C

Answer any **one** *question.*
The question carries 11 *marks.*

20. How Forced Commutation Circuits are classified ? Explain Class B technique in detail.
21. Explain the main characteristics of an SCR.

(1 × 11 = 11 marks)

C 20585 (Pages : 2) Name.....

Reg. No.....

SIXTH SEMESTER U.G. DEGREE EXAMINATION, MARCH 2022

(CBCSS—UG)

Electronics

ELE 6B 16 (a)—OPTICAL COMMUNICATION

(2019 Admissions)

Time : Two Hours Maximum : 60 Marks

Section A

Answer at least **eight** *questions.*
Each question carries 3 *marks.*
All questions can be attended.
Overall Ceiling 24.

1. Write the important advantages of optical communication.
2. The relative refractive index difference for an optical fiber is 1 %. Determine the critical angle at the core-cladding interface if the core refractive index is 1.46.
3. What is the significance of mode field diameter ?
4. Draw the block diagram of a simple point to point transmission link.
5. What are the merits of LED as a light source ?
6. What do you mean by microscopic and macroscopic bending losses ?
7. What is Intra Modal Dispersion ? What are the causes of intra modal dispersion ?
8. Explain the concept of intensity modulation ?
9. List the factors that cause intrinsic joint losses in an optical fiber.
10. What are the characteristic requirements of an optical source ?
11. What is dark current in a photodiode ?
12. Differentiate between spontaneous and stimulated emission.

(8 × 3 = 24 marks)

Turn over

Section B

Answer at least **five** *questions.*
Each question carries 5 *marks.*
All questions can be attended.
Overall Ceiling 25.

13. Distinguish between single mode fiber and multimode fiber with suitable diagram.

14. Explain the terms numerical aperture and acceptance angle.

15. What is material dispersion ? Why material dispersion is almost zero in the regions around 1310 nm for various doped silica fibers ?

16. Describe the linear and nonlinear scattering losses in an optical fiber.

17. With diagram explain the concept of three port optical coupler.

18. Explain the various steps involved in the splicing procedure.

19. Draw diagram and explain briefly about distributed feedback laser.

(5 × 5 = 25 marks)

Section C

Answer any **one** *question.*
The question carries 11 *marks.*

20. What are step index fiber and graded index fiber ? Using figures explain how light propagates through step index and graded index fibers.

21. What are optical amplifiers ? Explain the working of any *two* types.

(1 × 11 = 11 marks)

C 20584 (Pages : 2) Name.....

Reg. No.....

SIXTH SEMESTER U.G. DEGREE EXAMINATION, MARCH 2022

(CBCSS–UG)

Electronics

ELE 6B 15—MICROWAVE THEORY AND TECHNIQUES

(2019 Admissions)

Time : Two Hours and a Half Maximum : 80 Marks

Section A

Answer atleast **ten** *questions.*
Each question carries 3 *marks.*
All questions can be attended.
Overall ceiling 30.

1. Explain the names and frequencies of microwave bands.
2. Explain the physical interpretation of group velocity of a waveguide.
3. Define cut-off wavelength of a rectangular wave guide.
4. Explain TM mode.
5. What is a Rat race ?
6. What is an isolator ?
7. What is a point contact diode ?
8. What is transit time effect ?
9. Give the relation between reflection coefficient and VSWR.
10. Explain microwave bends and corners.
11. What are microwave attenuators ?
12. What is mode jumping in a magnetron ?
13. Briefly explain multicavity Klystron.

14. What do you mean by Smith chart ?

15. Briefly explain TWT.

(10 × 3 = 30 marks)

Section B

Answer atleast **five** *questions.*
Each question carries 6 *marks.*
All questions can be attended.
Overall ceiling 30.

16. Discuss the various advantages of microwaves.

17. Explain IMPATT diode and its operation.

18. What are standing waves ? Explain.

19. Explain the working principle of Schottky barrier diode.

20. List the similarities and differences between a hollow wave guides and transmission lines in terms of propagation of electromagnetic waves.

21. Explain stub matching techniques used with transmission lines.

22. Draw the construction details of a multi-cavity klystron amplifier. Explain its working principle and applications.

23. With the aid of a suitable diagrams explain Travelling Wave Tube and its operation.

(5 × 6 = 30 marks)

Section C

Answer any **two** *questions.*
Each question carries 10 *marks.*

24. Draw the structure of a two-hole wave guide directional coupler and explain its working and applications.

25. With necessary diagrams explain the construction and working of a reflex Klystron oscillator.

26. Explain the working of Crossed-Field Amplifier.

27. Differentiate between circulators and isolators.

(2 × 10 = 20 marks)

C 20583 (Pages : 2) Name.....

Reg. No.....

SIXTH SEMESTER U.G. DEGREE EXAMINATION, MARCH 2022

(CBCSS–UG)

Electronics

ELE 6B 14—PRINCIPLES OF DIGITAL SIGNAL PROCESSING

(2019 Admissions)

Time : Two Hours and a Half Maximum : 80 Marks

Section A

Answer at least **ten** *questions.*
Each question carries 3 *marks.*
All questions can be attended.
Overall Ceiling 30.

1. Sketch the impulse function.
2. What is meant by a periodic signal ? Explain with an example.
3. What is the difference between Odd and Even signals ?
4. What is ROC ? What is its significance ?
5. Determine the Z-Transform of $x(n - n_0)$.
6. What is a causal system ? Give an example.
7. Determine the Z-Transform of impulse function.
8. What is the significance of impulse response of a system ?
9. Explain Time Invariant and Time Variant systems .
10. Find the Z-Transform of unit step function.
11. Define IIR and FIR systems.
12. Define the Transfer Function of LTI system.
13. List any four properties of DFT.
14. What is the relation between digital and analog frequency in impulse invariant transformation ?
15. Compare digital and analog filters.

(10 × 3 = 30 marks)

Turn over

Section B

Answer at least **five** *questions.*
Each question carries 6 *marks.*
All questions can be attended.
Overall Ceiling 30.

16. What are different methods of representing discrete time signals ? Explain.

17. Explain energy and power signals with examples.

18. Sketch the signals $x(-n)$, $x(2n)$, $2x(n)$ and $x(n+2)$, if $x(n) = \{3, -1, 2, 1, 4, -2, 1\}$.

19. State and prove the Convolution Theorem in Z-Transform.

20. Realize the given IIR filter in Direct Form I

$y(n) = 2y(n-1) - 3y(n-1) + 3y\{n-3) + x(n) + x(n+1)$.

21. Determine the response of the system whose input $x(n)$ and impulse response $h(n)$ are given by

$x(n) = \{\uparrow 1, 2, 3, 1\}$ and $h(n) = \{\uparrow 1, 2, 1, -1\}$.

22. Perform circular convolution of two sequences $x_1(n) = \{\uparrow 2,1, 2,1\}$ and $x_2(n) = \{\uparrow 1, 2, 3,4\}$.

23. For the analog transfer function, $H(S) = 2/(s^2 + 3s + 2)$ determine $H(z)$ using bilinear transformation at T = 1 second.

(5 × 6 = 30 marks)

Section C

Answer any **two** *questions.*
Each question carries 10 *marks.*

24. Check the time – invariance, causality and linearity of the following systems,

(i) $y(x) = x(n) + 3x(n+5)$; (ii) $y(n) = e^{x(n)}$.

25. Apply the Bilinear Transformation to the following systems and find H (z) for T = 1sec. (i) $Ha(s) = 2 / [(s+1)(s+3)]$; (ii) $Ha(s) = 2s / (s^2 + 2s + 1)$.

26. Compute the 8- point DFT using DIF- FFT of the sequence $x(n) = \{1, 0, -2, 0, 1, 0, 1, 2\}$. Draw the butterfly diagram.

27. Realize the IIR system described by the equation $y(n) = -3/8\, y(n-1) + 3/32\, y(n-2) + 1/64\, y(n-3) + x(n) + 3x(n-1) + 2x(n-2)$ in Direct Form I, Direct Form II and cascade Form.

(2 × 10 = 20 marks)

C 20582 (Pages : 2) Name.....

Reg. No.....

SIXTH SEMESTER U.G. DEGREE EXAMINATION, MARCH 2022

(CBCSS–UG)

Electronics

ELE 6B 13—COMMUNICATION SYSTEM

(2019 Admissions)

Time : Two Hours and a Half Maximum : 80 Marks

Section A

Answer atleast **ten** *questions.*
Each question carries 3 *marks.*
All questions can be attended.
Overall ceiling 30.

1. Define modulation in communication systems.
2. Write the expression for peak amplitude of an AM wave.
3. Mention the two basic ways by which amplitude modulated circuits generate AM signal.
4. Define percentage modulation in FM.
5. What are the advantages of FM over AM ?
6. What is phase modulation ?
7. What do you mean by frequency deviation in FM ?
8. Define selectivity of a radio receiver.
9. What is forward AGC ?
10. What is critical frequency ?
11. What are sky waves ?
12. What is PAM ?
13. What is multiplexing ? Why is it needed ?

14. Define Amplitude shift keying.

15. What is DPSK ? What is its advantage ?

(10 × 3 = 30 marks)

Section B

Answer atleast **five** *questions.*
Each question carries 6 *marks.*
All questions can be attended.
Overall ceiling 30.

16. Define the modulation index of amplitude modulation.

17. What is the difference between AM and DSBSC wave ?

18. Derive the formulae for the instantaneous value of an FM voltage and define the modulation index.

19. Describe a de-emphasis network.

20. Explain how constant intermediate frequency is achieved in the super-heterodyne receiver.

21. Explain the propagation of ground waves.

22. Explain the generation of PCM signal.

23. Briefly explain the generation of ASK signal.

(5 × 6 = 30 marks)

Section C

Answer any **two** *questions.*
Each question carries 10 *marks.*

24. Describe the generation of SSB wave using third method.

25. Describe the direct method of generating FM.

26. Describe briefly the strata of the ionosphere and their effects on sky wave propagation.

27. Describe the demodulation of PAM, PWM and PPM signals.

(2 × 10 = 20 marks)

C 20137 (Pages : 2) Name.....

Reg. No.....

SIXTH SEMESTER (CUCBCSS-UG) DEGREE EXAMINATION, MARCH 2022

Electronics

ELE 6B 13 (C)—MICROWAVE THEORY AND TECHNIQUES

(2014 to 2018 Admissions)

Time : Three Hours Maximum : 80 Marks

Part A

Answer **all** *questions.*
Each carries 1 *mark.*

1. The dominant TE mode is ————.
2. As a result of reflection from a plane conducting wall, electromagnetic waves acquire an apparent velocity greater than the velocity of light in space. This is called the ————.
3. ———— is an example of distributed parameter network.
4. The real part of the propagation constant is known as ————.
5. ———— is a non-conductor with magnetic properties.
6. ———— is a single cavity klystron tube that operates as on oscillator by using a reflector electrode afier the cavity.
7. ———— is used in magnetrons to prevent mode jumping.
8. A PIN diode consists of ———— number of semiconductor layers.
9. When a reverse bias voltage exceeding the breakdown voltage is applied to an IMPATT diode, it results in ————.
10. In a tunnel diode ———— is available between peak and valley points.

(10 × 1 = 10 marks)

Part B

Answer any **five** *questions.*
Each question carries 2 *marks.*

11. Define cut off wavelength of a rectangular waveguide.
12. What are TM Modes ?

Turn over

13. Define a lossless transmission line.

14. What is the coupling factor of a directional coupler ?

15. What is the effect of transit time in conventional microwave tubes ?

16. Give the drawbacks of klystron amplifier.

17. What are the key phenomenon taking placein TRAPATT diode ?

(5 × 2 = 10 marks)

Part C

Answer any **six** *questions.*
Each question carries 5 *marks.*

18. Give the microwave frequency band with designations.

19. Distinguish between TE and TM modes.

20. With the help of appropriate diagram, explain the working of an isolator.

21. Explain with necessary diagram, lumped element circuit model of transmission line.

22. Explain how bunching of electrons takes place in a reflex klyston.

23. What is a slow wave structure ? Why does the TWT need such a structure ?

24. Explain the operation of PIN diodes.

25. What are varactor diodes ? Explain its construction and operation with diagrams.

(6 × 5 = 30 marks)

Part D

Answer any **two** *questions.*
Each question carries 15 *marks.*

26. An rectangular waveeuide is filled by dielectric material of $\epsilon_x = 9$ and has dimensions 7 × 3.5 cm. It operates in the dominant TE mode. (i) Determine the cut off frequency ; (ii) Find the phase velocity in the guide at a frequency of 2 GHz and (iii) Find the guided wave length at 2 GHz.

27. Write short nots on : (a) Cavity Resonators and (b) Waveguide Tees.

28. Explain how π mode oscillations are generated and sustained in the cavity magnetron, with suitable sketches.

29. Explain the principle, characteristics and operation of Gunn diodes with diagrams.

(2 × 15 = 30 marks)

C 20136 (Pages : 2) Name.....

Reg. No.....

SIXTH SEMESTER (CUCBCSS—UG) DEGREE EXAMINATION, MARCH 2022

Electronics

ELE 6B 13 (B)—EMBEDDED SYSTEM

(2014 to 2018 Admissions)

Time : Three Hours Maximum : 80 Marks

Part A

Answer **all** *questions.*

1. Define Embedded systems.
2. What are the address systems supported by ARM systems ?
3. How many clock cycles are confined by each machine cycle of PIC ?
4. An alternate function of pin P3.4 in 8051 is ————.
5. RISC stands for ————.
6. Give an example of 8 bit microcontroller.
7. The total amount of external code memory that can be interfaced to 8051 is ————.
8. RS232 is a ———— interface.
9. Which are the two lines used in I2C ?
10. What is the library of map view in Android ?

(10 × 1 = 10 marks)

Part B

Answer any **five** *questions.*

11. What is meant by real time embedded system ?
12. Write short notes on embedded Operating System.
13. What is the use of RTC in embedded systems ?
14. What are the advantages of flash memory ?
15. Write short notes on RS232 standard.
16. Explain the SPI communication standard.
17. Explain the function of data type sfr16.

(5 × 2 = 10 marks)

Turn over

Part C

Answer any **six** *questions.*

18. Explain soft real time embedded system.
19. What are the components of embedded systems ?
20. Briefly explain PIC microcontroller.
21. Write a Keil C program to interface an LCD.
22. Explain the following data types in Keil C.
    (a) Unsigned char.
    (b) Sbit.
23. What are the advantages of EEPROM memory ?
24. Explain the function of the serial port in the microcontroller used in embedded systems.
25. What are the features of android OS ?

(6 × 5 = 30 marks)

Part D

Answer any **two** *questions.*

26. With the help of necessary diagrams explain the architecture basic ARM core.
27. Explain the different ports of 8051 and also the program memory of 8051.
28. (a) Compare I2C, SPI protocol with respect to speed and hardware implementation.
    (b) Explain USB.
29. Perform the case study of traffic light controller using embedded system.

(2 × 15 = 30 marks)

C 20135 (Pages : 2) Name.....

Reg. No.....

SIXTH SEMESTER U.G. DEGREE EXAMINATION, MARCH 2022

(CUCBCSS–UG)

Electronics

ELE 6B 13 (A)—PRINCIPLES OF VLSI

(2014 to 2018 Admissions)

Time : Three Hours Maximum : 80 Marks

Section A (Very Short Answer Type One word)

Answer **all** *questions.*

1. Very large scale integration has ———— number of logic gates
2. Name the substrate used in the fabrication of monolithic IC.
3. Name the IC family in which the passive devices and interconnections on the insulating substrate with active devices wire wound.
4. The major type of material used in thick film substrates.
5. In thick film IC fabrication conductors, resistors and dielectrics are applied in ———— form by screen printing.
6. Which technique is used to pattern silicon oxide on substrate material ?
7. Name the process of adding impurities with an electric charge accelerated to high energy and shot into wafer surface.
8. ———— refers to the method of depositing a mono crystalline film on a mono crystalline substrate.
9. What is the relationship between the threshold voltage and drain bias voltage in a long channel MOSFET ?
10. Name the computer language used to describe the structure and behaviour of electronic circuits.

(10 × 1 = 10 marks)

Section B (Short Answer Type questions)

Answer any **five** *questions.*
Not to exceed **one** *paragraph.*

11. What are the scale of integration of ICs ?
12. What are monolithic ICs ?
13. List any *four* properties of thick film conductors.

Turn over

14. Write a short note on thin film integrated circuit.
15. Define epitaxial growth in IC fabrication.
16. Define the terms time to breakdown and charge to breakdown.
17. Discuss the behaviour of short channel MOSFET.

(5 × 2 = 10 marks)

Section C (Short essay type questions)

Answer any **six** *questions.*
Not to exceed 120 *words.*

18. How are ICs different from discrete circuits ?
19. Explain the general classification integrated circuits.
20. Write a short note on hybrid ICs.
21. Write a short note on thick film dielectrics
22. Compare diffusion and ion implantation method.
23. Explain chemical vapour deposition method (CVD) in monolithic IC fabrication.
24. Discuss the drain characteristics of long channel MOSFET.
25. Discuss the characteristics of a typical *n-p-n* diode using Gummel plot.

(6 × 5 = 30 marks)

Section D (Long Essay)

Answer any **two** *questions.*

26. Explain in detail the features of thick film IC family. Discuss both advantages and limitations of IC technology.
27. Write short notes on :
    (a) Thick film conductors.
    (b) Thick film resistors.
    (c) Thick film substrates.
28. Write short notes on :
    (a) Monolithic capacitors.
    (b) Monolithic resistors.
    (c) Oxidation process in monolithic IC fabrication.
29. Explain the design of collector region in modern bipolar devices.

(2 × 15 = 30 marks)

C 20134 **(Pages : 3)** **Name**.....

Reg. No.....

SIXTH SEMESTER (CUCBCSS–UG) DEGREE EXAMINATION, MARCH 2022

Electronics

ELE 6B 12—CONTROL SYSTEMS

(2014 to 2018 Admissions)

Time : Three Hours Maximum : 80 Marks

Part A

Answer **all** *questions.*
Each question carries 1 *mark.*

1. Based on the presence of feedback, control systems may be classified as ———— and ————.
2. Traffic light system is an example of ———— loop system.
3. Servomotors are used to convert electrical signals into ————. (linear motion, angular motion, none of these)
4. Laplace transform of $\delta(t)$ is ————.
5. Transfer function is not defined for ———— systems.
6. For a system to be stable the necessary condition is that the open loop poles should lie in the ———— of the S-plane.
7. An example of testing signal is ————.
8. For a critically damped system, ξ = ————.
9. Gain margin and phase margin must be ————. (zero, negative, positive) for a stable system.
10. The lead network acts as a ————. (high pass, low pass, band pass) filter.

(10 × 1 = 10 marks)

Part B

Answer any **five** *questions.*
Each question carries 2 *marks.*

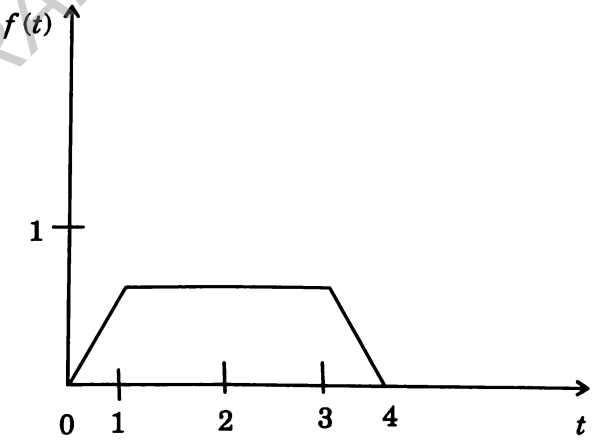
11. What do you mean by feedback ?
12. Name the energy storage elements in electrical systems.
13. Define transfer function.
14. State the final value theorem.
15. Define steady state error.
16. What do you mean by type of a system ?
17. Define Gain margin and Phase margin of a system.

(5 × 2 = 10 marks)

Part C

Answer any **six** *questions.*
Each question carries 5 *marks.*

18. Compare open loop and closed loop control systems.
19. Explain a simple feedback control system.
20. Find the Laplace transform of the following signal :



21. Explain the Mason's gain formula in signal flow graph.

22. Plot the poles and zeroes for the transfer function given :

$$G(s) = \frac{s(s^2 + 8s + 15)}{2s^2 - 6s + 10}.$$

23. Explain : (i) Static position error constant ; (ii) Static velocity error constant and (iii) Static acceleration error constant.

24. Determine the stability of the system given by the characteristic equation :

$s_4 + 2s^3 + 10s^2 + 20s + 5 = 0.$

25. Draw the polar plot of the transfer function given by :

$$G(s) = \frac{1}{(1+s)(1+2s)}.$$

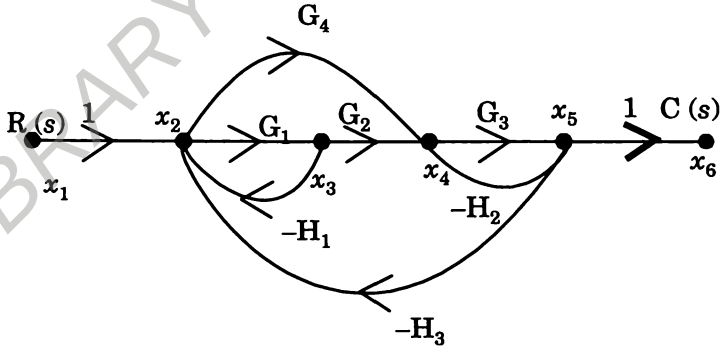
(6 × 5 = 30 marks)

Part D

Answer any **two** *questions.*
Each question carries 15 *marks.*

26. Explain the various properties in Laplace Transform.

27. Find the overall gain of the system given by the signal flow graph shown below :



28. Derive the expression for the time response of a second order system excited by a unit step input.

29. Discuss the response associated with P, PI, PD and PID controllers

(2 × 15 = 30 marks)

C 20133 (Pages : 2) Name.....

Reg. No.....

SIXTH SEMESTER (CUCBCSS–UG) DEGREE EXAMINATION, MARCH 2022

Electronics

ELE 6B 11—PRINCIPLES OF DIGITAL SIGNAL PROCESSING

(2014 to 2018 Admissions)

Time : Three Hours Maximum : 80 Marks

Part A

Answer **all** *questions.*
Each question carries 1 *mark.*

1. A random signal has ———— (no uncertainty, uncertainty, partial uncertainty, none of these)
2. A ———— system obeys the principle of superposition.
3. Signals that are discrete in time and quantized in amplitude are called as ———— signals.
4. A signal is a power signal if
   (a) $E = 0, P = 0$. (b) $E = \infty, P =$ finite.
   (c) $E =$ finite, $P =$ finite. (d) $E =$ finite, $P = \infty$.
5. A system is said to be stable if every ———— input produces a bounded output.
6. The Laplace transform of te^{-at} is ———— .
7. The set of z-values for which the Z-transform converges is called the ———— .
8. The twiddle factor is defined as ———— .
9. The general system function of an FIR system is ———— .
10. For radix-2 FFT, N must be a power of ———— .

(10 × 1 = 10 marks)

Part B

Answer any **five** *questions.*
Each question carries 2 *marks.*

11. Define periodicity of a discrete-time signal.
12. Define a dynamic system.
13. What is an FIR system ?
14. Define Laplace transform and Z-transform.
15. Find the DTFT of the sequence $x(n) = \{1, 0, 3, -2\}$.

Turn over

16. What are the basic elements used to construct the block diagram of a discrete time system ?

17. Give any two applications of DFT.

(5 × 2 = 10 marks)

Part C

Answer any **six** *questions.*
Each question carries 5 marks.

18. Find even and odd components of the following signal :

$x(n) = \left\{3, -2, \overset{4}{\uparrow}, 5\right\}$.

19. Check whether the system is (i) linear or not ; (ii) stable or unstable.

$y(n) = 2x(n+1) + \left[x(n-1)\right]^2$.

20. State and prove the initial value and final value theorem.

21. Find the inverse Z-transform of the sequence : (a) $X(z) = \frac{z}{3z^2 - 4z + 1}$; (b) $X(x) = \frac{z}{(z-0.25)(z-0.5)}$.

22. Find the circular convolution following signals :

$x(n) = \{0, 2., -4, 6\}$; $h(n) = \{2, -2, 1, -1\}$.

23. Explain the properties of DFT.

24. Obtain the direct form-I realization of :

$$y(n) = -\frac{13}{12}y(n-1) - \frac{9}{24}y(n-2) - \frac{1}{24}y(n-) + x(n) + 4x(n-1) + 3x(n-2).$$

25. Find the DFT of the following sequence using DIT FFT : $x\,(n) = \{2, 0, 0, 1\}$.

(6 × 5 = 30 marks)

Part D

Answer any **two** *questions.*
Each question carries 15 *marks.*

26. Explain the methods in computing the circular convolution. How linear convolution can be computed from circular convolution ?

27. State and prove the properties of Laplace transform.

28. Explain how DFT can be computed using DIF-FFT algorithm. Compute the FFT of the sequence given using DIF-FFT algorithm. $x\,(n) = n + 1$, where N = 8.

29. Draw the butterfly diagram for 16-point DIT FFT.

(2 × 15 = 30 marks)

C 20132 (Pages : 2) Name.....

Reg. No.....

SIXTH SEMESTER (CUCBCSS—UG) DEGREE EXAMINATION, MARCH 2022

Electronics

ELE 6B 10—COMMUNICATION SYSTEMS

(2014 to 2018 Admissions)

Time : Three Hours Maximum : 80 Marks

Part A

Answer **all** *questions.*
Each question carries 1 *mark.*

1. The peak amplitude of an amplitude modulated wave is ————.
2. The expression for total power in AM wave is ————.
3. The SSB wave will have ———— or ————.
4. The modulation index of FM wave is defined as ————.
5. The boosting of the higher modulating frequencies in accordance with a prearranged curve is known as ————.
6. Modulation is done in ————.
7. The IF frequency of standard broadcast AM receiver is ————.
8. Frequencies in the UHF range normally propagate by means of ————.
9. ———— involves varying the amplitude of pulse train according to instantaneous variations of message signals.
10. The set of modulation techniques tor shifting the digital message from the baseband to passband are termed as ————.

(10 × 1 = 10 marks)

Part B

Answer any **five** *questions.*
Each question carries 2 *marks.*

11. Mention the different components of AM wave.
12. Define modulation index of amplitude modulation.
13. Find the carrier and modulating frequencies of the PM represented by the voltage equation $v = 12 \sin (8 \times 10^8 t + 5 \cos 1250 t)$.
14. What is AGC ?
15. What do you mean by selectivity of a receiver ?

Turn over

16. What is Sampling Theorem ?

17. Define ASK.

(5 × 2 = 10 marks)

Part C

Answer any **six** *questions.*
Each question carries 5 *marks.*

18. Explain the generation of AM signal using analog multiplier.

19. A 400 W carrier is simultaneously modulated by two audio wave with modulation index of 55% and 65%. What is the total side band power radiated ?

20. Distinguish between narrow band FM and wideband FM.

21. What are the advantages of an RF section in a superheterodyne receiver ?

22. Explain the operation of a ratio detector.

23. Explain the different layers of ionosphere.

24. With block diagrams, explain coherent detection of FSK.

25. Explain TDM with neat diagrams.

(6 × 5 = 30 marks)

Part D

Answer any **two** *questions.*
Each question carries 15 *marks.*

26. Describe the DSBSC wave generation process using balanced modulators.

27. Explain the indirect method of FM generation.

28. Explain the different types of propagation of electro-magnetic waves in free space.

29. Describe tire generation and demodulation of PAM, PWM and PPM signals.

(2 × 15 = 30 marks)