G 1386 (Pages : 2) Reg. No.....

Name.....

B.TECH. DEGREE EXAMINATION, MAY 2012

Fourth Semester

Branch : Electronics and Communication/Applied Electronics and Instrumentation/ Electronics and Instrumentation Engineering

COMMUNICATION ENGINEERING—I (LAS)

(Improvement/Supplementary—2004 admission onwards)

Time : Three Hours Maximum : 100 Marks

Part A

Answer **all** *questions briefly.*
Each question carries 4 *marks.*

1. Define and compare the modulation indices of AM and FM.
2. What is overmodulation distortion ? How it can be prevented ?
3. What are the advantages of the phase modulators rather than the direct frequency modulator ? Explain.
4. Describe the process of pre-emphasis. How does it improve communication performance in presence of noise ?
5. What is image frequency ? What are its significance in a superheterodyne receiver ?
6. Explain the principle of delayed AGC.
7. What are the merits and demerits of SSB compared to DSB ?
8. Why VSB is used in TV system ? What are its demerits ?
9. Explain the protective systems used in power line communication.
10. State and describe the four standard tones used in landline telephony.

(10 × 4 = 40 marks)

Part B

Answer any **one** *full question from each module.*
Each full question carries 12 *marks.*

Module 1

11. (a) Derive the relationship betwen the output power of an AM transmitter and the depth of modulation and plot this as a graph for values of the modulation index from its minimum to maximum values.

(6 marks)

(b) A 100 W carrier (sine wave) is simultaneously modulated by two audiowaves of frequencies 1 kHz and 1.5 kHz with modulation percentages of 65 % and 85 % respectively. What is the total sideband power radiated ? (6 marks)

Or

Turn over

12. (a) In an FM system if m_f is doubled by halving the modulating frequency, what will be the effect on the maximum deviation ?

(4 marks)

(b) What kind of modulation is represented by $v = 10 \sin (10^8 t + 3 \sin 10^3 t)$? Calculate the carrier and modulating frequencies, modulation index and the power dissipated a 100 Ω resistor.

(8 marks)

Module 2

13. With transistorised circuit diagram and necessary waveforms, describe the working of (i) low level ; (ii) high level AM generators.

Or

14. Draw the complete block diagram of the Armstrong frequency modulation system and explain the functions of the mixer and multipliers shown. In what circumstances can we dispense with the mixer.

Module 3

15. Define and explain sensitivity, selectivity and image frequency. If all the frequencies that must be rejected by a superheterodyne receiver, why is the image frequency so important. What is the image frequency and how does it arise ? If the image frequency rejection of a receiver is insufficient, what steps could be taken to improve it ?

Or

16. With neat circuits, explain how, and for what reasons, the ratio detector is derived from the phase discriminator, listing the properties and advantages of each circuit.

Module 4

17. Use a neat circuit diagram to help in an explanation of how a balanced modulator is able to demodulate SSB signals.

Or

18. Explain the principle of a pilot carrier SSB system. With a neat block diagram, describe the working of such a receiver.

Module 5

19. What is the cause of sidetone in a subscriber's telephone ? Describe with the aid of a simple sketch, the means of reducing sidetone. Why is the reduction of sidetone often considered desirable ?

Or

20. With a neat diagram, explain the principle of working of the powerline carrier communication network ? What are its merits and demerits ?

(5 × 12 = 60 marks)

G 1396 (Pages : 2) Reg. No.....

Name.....

B.TECH. DEGREE EXAMINATION, MAY 2012

Fourth Semester

Branch : Electronics and Communication/Applied Electronics and Instrumentation/ Electronics and Instrumentation Engineering

ELECTRONIC CIRCUITS—II (LAS)

(Improvement/Supplementary—2004 admission onwards)

Time : Three Hours Maximum : 100 Marks

Part A

Answer **all** *questions briefly.*
Each question carries 4 *marks.*

1. List and briefly explain any *four* properties of multistage amplifier compared to the single stage.
2. Define four hybrid parameters of CC configuration giving their typical values.
3. Compare the properties of voltage and current shunt negative feedback amplifiers.
4. Draw the circuit of a dual input balanced output different amplifier using BJT and explain how it amplifies a difference voltage.
5. Explain how oscillations are initiated in a Weinbridge oscillator, without giving any signal input.
6. An RC phase shift oscillator assembled used BJT has the following circuit parameters :—

   V_{CC} = 10 V, R_C = 51 K, R_E = 1 K, R_1 = 91 K, R_2 = 15 K, $C_{c1} = C_{c2}$ = 10 μF, C_E = 220 μF, C = 47 pF, R = 220 K.

   Calculate the frequency of oscillation.
7. Compare and contrast the base and collector triggering methods used in a bistable multivibrator.
8. With necessary waveforms, describe how a bistable multivibrator can be used to divide a given signal frequency.
9. What is harmonic distortion ? What are its reasons ? How it can be minimised ?
10. Draw the circuit of a class D amplifier and sketch the output corresponding to a sinusoidal input.

(10 × 4 = 40 marks)

Part B

Answer any **one** *full question from each module.*
Each full question carries 12 *marks.*

Module 1

11. Draw the circuit of a two-stage RC coupled CE amplifier and design the same for a voltage gain of 800. Obtain the input resistance of your circuit.

Or

Turn over

12. (a) Draw the *r*-parameter equivalent circuit for a CE transistor and derive the parameters in terms of *h*-parameters.

(6 marks)

(b) Sektch the circuit of a double tuned BJT amplifier and explain its application with the help of its frequency response.

(6 marks)

Module 2

13. With a detailed complete block diagram, explain feedback in an amplifier. Draw the block schematics of the our different types of negative feedback topologies and identify the basic gains in each case.

Or

14. Draw the Darlington pair amplifier and derive expressions for its A_i, A_v, R_i and R_o.

Module 3

15. List the factors which affect the frequency stability of an oscillator. Describe how a crystal oscillator performs high stability in its output frequency. Give necessary circuit diagrams.

Or

16. With neat circuit diagrams, explain how oscillations are produced and sustained in a Colpitts oscillator. Derive the conditions for the oscillation.

Module 4

17. With neat circuit diagrams and waveforms, explain the operations of collector coupled and emitter coupled monostable multivibrators. Bring out the differences between them.

Or

18. Draw the circuit of a BJT Schmitt trigger for LTP = 2 V and UTP = 3.5 V. Design and explain with necessary waveforms.

Module 5

19. With neat circuit diagrams, describe the working of (i) RC coupled ;(ii) transformer coupled class A power amplifier and derive expresions for their power efficiencies.

Or

20. With neat block diagrams, describe the linearization principle in (i) Miller ; (ii) Bootstrap sweep generators. Draw the BJT circuits corresponding to the above and explain with necessary equations, how they are implemented in the above circuits.

($5 \times 12 = 60$ marks)

G 1414 (Pages : 2) Reg. No.....

Name.....

B.TECH. DEGREE EXAMINATION, MAY 2012

Fourth Semester

Branch : Electronics and Communication / Applied Electronics and Instrumentation/ Electronics and Instrumentation Engineering

RELIABILITY AND HUMANITIES (LAS)

(Improvement/Supplementary—2004 Admission onwards)

Time : Three Hours Maximum : 100 Marks

Answer **all** *questions.*
Each question carries 20 *marks.*

1. (a) What are the basic elements of reliability ?

   (b) Distinguish between MTBF and MTTF.

   (c) Define failure rate. The MTBF of a motor is 500 hours. What is the failure rate expressed in (i) % failures per 10^6 hours ; (ii) % failures per 10^3 hours ; (iii) % failures per hour.

   (5 + 6 + 9 = 20 marks)

Or

2. (a) Write notes on :

   (i) Quality and reliability.

   (ii) Cost of reliability.

   (iii) Failure rate.

   (iv) Maintenance and reliability.

   (b) Explain the cost of reliability and optimum reliability.

   (c) Find out the least value of "θ' that will yield a desired reliability of 0.975 for a specified service period of 7500 hours. Assume a uniform failure rate.

   (8 + 6 + 6 = 20 marks)

3. (a) An electrical system consists of 5 components A, B, C, D, E. The equipment has to operate for 2,000 hours. The failure rates for the 5 subassemblies are 35, 30, 20, 15, 10 failures/10^6 hours respectively. What is the probability of survival of this equipment ?

   (b) With a sketch explain the bath tub curve in failure using an example.

   (10 + 10 = 20 marks)

Or

Turn over

4. (a) Describe the linearly increasing hazard model and Weibull model in failure analysis.

   (b) It is expected that the average time to repair a failure on a certain product will be 3 hours. Assuming the repair time to be exponentially distributed, find out the probability that a failure will be repaired in 4 hours or less.

   (c) How will you determine the reliability of an assembly, when the components are connected in series ?

(7 + 6 + 7 = 20 marks)

5. (a) Describe the quality aspects of planning for manufacturing.

   (b) How do you relate quality and reliability ?

(10 + 10 = 20 marks)

Or

6. (a) State the objectives and limitations of trial lots in manufacturing planning for quality.

   (b) Describe quality assurance.

   (c) What are the basic concepts of sequencing ?

(7 + 6 + 7 = 20 marks)

7. (a) Explain the method of constructing $\bar{X}$ and R charts.

   (b) How will you classify defects ?

(10 + 10 = 20 marks)

Or

8. (a) Distinguish between *p* chart and *c* chart.

   (b) Show how the assignable causes of variation are identified on $\bar{X}$ and R charts ?

(10 + 10 = 20 marks)

9. (a) Explain any two wage systems.

   (b) Explain the variables influencing the performance of an employee in an industry.

(10 + 10 = 20 marks)

Or

10. (a) Explain the Abraham Maslow's theory of motivation.

    (b) Write notes on Industrial discipline.

(12 + 8 = 20 marks)

[5 × 20 = 100 marks]

G 1834 (Pages : 2) Reg. No.....

Name.....

B.TECH. DEGREE EXAMINATION, MAY 2012

Fourth Semester

EN 010 402—PRINCIPLES OF MANAGEMENT

(Regular—2010 Admissions)

(Common to AI, AU, EC, EI, IC, IT, ME, PO and PE)

Time : Three Hours Maximum : 100 Marks

Part A

Answer **all** *questions.*
Each question carries 3 *marks.*

1. Define Motivation and its significance in management.
2. Define Industrial fatigue. What are the reasons ?
3. What is the scope of production management ?
4. State the objectives of financial management.
5. Distinguish between Selling concept and Marketing concept.

(5 × 3 = 15 marks)

Part B

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

6. List different organisational structures. Explain any *one* of them in detail.
7. Explain the objectives of quality circles.
8. What is meant by network ? Mention various types of networks used in project management.
9. What are the elements of cost ? Explain.
10. What are the different kinds of pricing ? Explain.
11. Explain different methods of costing with appropriate examples.
12. What are overhead ? What are the basis for allocation of overheads ?

(5 × 5 = 25 marks)

Part C

Answer any **one** *question from each module.*
Each question carries 12 *marks.*

Module I

13. (a) What do you mean by delegation of authority ? Differentiate between delegation and decentralization.

    (b) Define Planning. Explain the major types of plans.

Or

14. Define span of control. What are the types of span of control ? Explain the factors determining the span of control.

Module II

15. Describe the method of recruitment and selection of persons in an industry.

Or

16. What is industrial dispute ? Describe the different methods of settling industrial disputes.

Module III

17. A project consists of 9 jobs with the following precedence relations and time estimates :

Job	:	A	B	C	D	E	F	G	H	I
Predecessor	:	—	—	A, B	A, B	B	D, E	C, F	D, E	G, H
Time (days)	:	15	10	10	10	5	5	20	10	15

(a) Draw the Project network.

(b) Identify the Critical path.

Or

18. Explain various types of data analysing methods and suggest a suitable method for a batch process industry.

Module IV

19. What are fixed capital and working capital and explain various factors affecting working capital ?

Or

20. Explain the different methods of raising finance by an enterprise.

Module V

21. Explain channels of distribution and the factors influencing it.

Or

22. Explain the concept of advertising. Describe its functions. What are the different types of advertising ?

(5 × 12 = 60 marks)

G 1848 (Pages : 2) Reg. No.....

Name.....

B.TECH. DEGREE EXAMINATION, MAY 2012

Fourth Semester

AI 010 404/EC 010 404/EI 010 404/IC 010 404—DIGITAL ELECTRONICS (AI, EC, EI, IC)

(Regular—2010 Admissions)

Time : Three Hours Maximum : 100 Marks

Answer **all** *questions.*

Part A

Each question carries 3 *marks.*

1. What is meant by universal gate ? Why do they get this name ?
2. What are the advantages and disadvantages of ECL technology ?
3. What is meant by parity checker ?
4. Write the applications of Flip Flops.
5. What is the difference between Static and Dynamic Hazard ?

(5 × 3 = 15 marks)

Part B

Each question carries 5 *marks.*

6. Explain about Hamming Code.
7. Explain the following in brief :
   (a) Fain in
   (b) Fan out.
8. Explain how seven segment displays with common anode can be driven efficiently using MUX's.
9. Explain with an example how an asynchronous counter is designed.
10. What is difference between PAL and PLA ?

(5 × 5 = 25 marks)

Part C

Each full question carries 12 *marks.*

11. Write notes on the following :
    (a) BCD.
    (b) Excess 3 Code.

(6 + 6 = 12 marks)

Or

12. Write notes on the following :
    (a) SOP (Sum of Products)
    (b) POS (Product of Sums).

(6 + 6 = 12 marks)

Turn over

13. Write the characteristics and advantages of TTL and CMOS. (6 + 6 = 12 marks)

Or

14. Explain about ECL. (12 marks)

15. (a) What are the advantages of realizing logic functions using MUX. (6 marks)

(b) Show how a 1 to 16 demultiplexer can be realized using 3 to 8 decoders. (6 marks)

Or

16. Draw the circuit diagrams of J/K, D, T Flip Flop. Write the Truth tables. (12 marks)

17. (a) What should be the number to be loaded into the input of a 8 bit programmable modulus synchronous counter to realize a mod 60 counter ? (6 marks)

(b) What is the number of FF's required to realize a mod 8 ring counter ? Explain how it can be used as a decoder. (6 marks)

Or

18. (a) Show how a mod 256 counter can be realized using mod 16 synchronous counters. (6 marks)

(b) Draw the circuit diagram of 4 bit up/down synchronous counter. (6 marks)

19. Explain about the internal architecture of a CPLD. (12 marks)

Or

20. Briefly explain the following :

(a) ASIC Full Custom. (6 marks)

(b) ASIC Semi Custom. (6 marks)

[5 × 12 = 60 marks]

G 1862 (Pages : 2) Reg. No.....

Name.....

B.TECH. DEGREE EXAMINATION, MAY 2012

Fourth Semester

Branch : Electronic and Communication Engineering

EC 010 405—ANALOG COMMUNICATION (EC)

(Regular—2010 Admissions)

Time : Three Hours Maximum : 100 Marks

Part A

Answer **all** *questions.*
Each question carries 3 *marks.*

1. Define Modulation Index. Write its significance.
2. State the advantages and applications of synchronous detection.
3. What is AGC ? Explain in brief.
4. State Baye's theorem.
5. Define : (a) Johnson Noise ; (b) Noise Figure.

(5 × 3 = 15 marks)

Part B

Answer **all** *questions.*
Each question carries 5 *marks.*

6. Explain the VSB and ISB with neat sketches.
7. What is the principle of balanced modulator ?
8. Define and explain :
   (a) low level. (b) high level modulation.
9. Enumerate the properties of conditional distribution.
10. Define and explain Noise temperature.

(5 × 5 = 25 marks)

Part C

Answer **all** *questions.*
Each question carries 12 *marks.*

Module 1

11. Compare the properties of AM and FM . Obtain the mathematical representation of AM.

Or

12. Draw a neat block diagram of a typical communication system. Explain its working.

Turn over

Module 2

13. Explain the principle of working of square law detector and Ring modulator with diagrams.

Or

14. Tabulate the differences between a TRF receiver and superheterodyne Receiver.

Module 3

15. (a) Explain the properties of a distribution function. (6 marks)

(b) A random variable X is Gaussian with $a_x = 0$ and $\sigma_x = 1$. What is the probability that $|x| > 2$? (6 marks)

Or

16. A Random variable has a probability density

$$f_x(X) = \begin{cases} (514)\left(1 - x^4\right) & 0 < X \leq 1 \\ 0 & \text{elsewhere in } x. \end{cases}$$

Find $E[X]$, $E[4X + 2]$ and $E[X^2]$. Explain the steps.

Module 4

17. Explain the phase-shift method of SSB – SC generation with a neat diagram.

Or

18. Explain the functions of FM stereo transmitter and Receiver with neat diagrams.

Module 5

19. Define and explain Noise. Also explain the types of noise.

Or

20. Define and explain :
    (a) SNR.
    (b) Noise BW.
    (c) AWGN.
    (d) Noise equivalent power.
    (e) Noise for Cascaded stages.

[5 × 12 = 60 marks]

G 1868 (Pages : 2) Reg. No.....

Name.....

B.TECH. DEGREE EXAMINATION, MAY 2012

Fourth Semester

Branch : Applied Electronics and Instrumentation/Electronics and Communication Engineering

AI 010 406/EC 010 406—ANALOG CIRCUITS—II (AI, EC)

(Regular—2010 Admissions)

Time : Three Hours Maximum : 100 Marks

Part A

Answer **all** *questions.*
Each question carries 3 *marks.*

1. What is impact ionization ?
2. What is meant by slew rate ?
3. Write down the applications of the Op-Amp.
4. Write down the comparator advantages and disadvantages.
5. Draw the circuit diagram for 555 Timer Astable Multivibrator.

(5 × 3 = 15 marks)

Part B

Each question carries 5 *marks.*

6. What is Large signal and small signal Analysis of differential amplifier ? Derive the expression for ideal characteristics of Op-Amplifier [I/P Resistance, Voltage gain, CMRR, Output Resistance]
7. Explain in detail with the frequency compensation of an Op-Amp.
8. Explain in detail about waveform generator [Triangular, Square Wave].
9. Design and Explain Bi-quadratic Low pass filter by choosing non-inverting gain configuration.
10. What is Data converter and explain ADC and DAC ?

(5 × 5 = 25 marks)

Part C

Each full question carries 12 *marks.*

11. Derive the Expression for ideal Op-Amp parameters. (12 marks)

Or

12. What is current source and voltage source Reference in single-stage amplifier and derive the necessary Expression ?

(12 marks)

13. Explain internal circuitry of 741–Op-Amp with necessary Expression. (12 marks)

Or

Turn over

14. Explain–Two–Stage CMOS Op-Amp operation. (12 marks)

15. Explain in detail about :

    (a) Differential amplifier. (6 marks)

    (b) Instrumentation amplifier. (6 marks)

Or

16. Derive the Expression for V-I and I-V convertor by adopting Inverting Op-Amp is a key element. (12 marks)

17. What is :

    (a) Low pass filter,

    (b) High pass filter,

    (c) Band pass filter,

    (d) Band elimination filter and its significance ? (12 marks)

Or

18. What is Biquadratic filter and explain how it derivate from 1st order filters. (12 marks)

19. What is flash ADC and explain in detail about delta sigma ADC ? (12 marks)

Or

20. Explain VCO working principle and how its significantly escape from capture range to Locking Range. (12 marks)

[5 × 12 = 60 marks]

Module V

19. (a) From the definition of z-transform find the z-transform of $x(n)=\sinh(w_0 n)$ for $n \geq 0$. (3 marks)

(b) For the Discrete Time system described by the following difference equation, determines

(i) the unit sample response sequence $h(n)$; (3 marks)

(ii) the step response sequence $g(n)$; and (3 marks)

(iii) whether it is BIBO stable ?

$y(n)=0.6y(n-1)-0.08y(n-2)+x(n)$. (3 marks)

Or

20. Find the z-transform $X(z)$ and sketch the pole-zero plots with the ROC for each of the following sequences, if they converge

(a) $x(n)=\left(\frac{1}{2}\right)^n u(n)+\left(\frac{1}{3}\right)^n u(n)$. (4 marks)

(b) $x(n)=\left(\frac{1}{3}\right)^n u(n)+\left(\frac{1}{2}\right)^n u(-n-1)$. (4 marks)

(c) $x(n)=\left(\frac{1}{2}\right)^n u(n)+\left(\frac{1}{3}\right)^n u(-n-1)$. (4 marks)

[5 × 12 = 60 marks]

G 1839 (Pages : 4) Reg. No.....

Name.....

B.TECH. DEGREE EXAMINATION, MAY 2012

Fourth Semester

Branch : Applied Electronics and Instrumentation/Electronics and Communication/Electronics and Instrumentation

AI 010 403/EC 010 403/EI 010 403—SIGNALS AND SYSTEMS (AI, EC, EI)

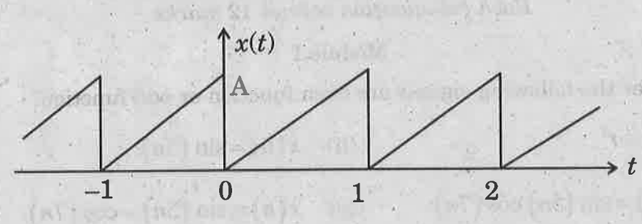
(Regular—2010 Admissions)

Time : Three Hours Maximum : 100 Marks

Part A

Answer **all** *questions briefly.*
Each question carries 3 *marks.*

1. If $x(n)=e^{an}$, determine whether the signal is periodic or not, if yes, find the period.
2. Find the Fourier Transform of a one-sided exponential function.
3. Find the Fourier series of the following sweep voltage :



4. The signal $x(t)=10\cos(150\pi t)$ is ideally sampled at a frequency $f_s=200$ samples per second. Sketch the spectrum of $x_\delta(t)$.
5. Find the z-transform of $n\delta(n-3)$.

(5 × 3 = 15 marks)

Part B

Answer **all** *questions.*
Each question carries 5 *marks.*

6. Determine whether the discrete time signal $x(n)=u(n)$ is power signal or energy signal or neither ?
7. Find the Fourier Transform of a periodic signal $x(t)=\cos(w_0 t)$.

Turn over

8. Determine the DTFT of a signum function $\operatorname{sgn}(n)=\begin{cases}1, & n>0\\ 0, & n=0\\ -1, & n<0\end{cases}$.

9. The signal $x(t)=2\cos(200\pi t)+6\cos(180\pi t)$ is ideally sampled at a frequency of 150 samples per second. The sampled version $x_\delta(t)$ is passed through a unit gain ideal low-pass filter with a cut-off frequency of 110 Hz. What frequency components will be present in the output of the filter ? Write down an expression for its output signal.

10. Find the inverse z-transform of $\frac{(z+4)}{(z^2-4z+3)}$ by using partial fraction method.

(5 × 5 = 25 marks)

Part C

Answer any **one** *full question from each module.*
Each full question carries 12 marks.

Module I

11. (a) Test whether the following signals are even function or odd function.

(i) $x(t)=t^2$. (ii) $x(n)=\sin(5n)$.

(iii) $x(n)=\sin(5n)\cos(7n)$. (iv) $x(n)=\sin(5n)-\cos(7n)$.

(4 × 2 = 8 marks)

(b) Find the even and odd components of $x(t)=e^{jt}$. (4 marks)

Or

12. (a) Convolute the following two continuous time signals $x_1(t)=e^{-2t}u(t)$ and $x_2(t)=x(t+2)$. (6 marks)

(b) The impulse response of a discrete LTI system is given by $h(n)=a^n u(n)$. Determine if this system is causal and BIBO stable ? (6 marks)

Module II

13. (a) A continuous system is described by $\frac{d^2y(t)}{dt^2}+5\frac{dy(t)}{dt}+6y(t)=\frac{-dx(t)}{dt}$. Determine its frequency response. (8 marks)

(b) Prove the frequency shift property of Fourier Transform. (4 marks)

Or

14. The impulse response of a continuous time system is $h(t)=\frac{1}{RC}e^{(-t/RC)}u(t)$.

Find the frequency response and plot the magnitude and phase plots. (12 marks)

Module III

15. (a) Use the Fourier Transform to find the output of the system whose impulse response $h(n)=\left(\frac{1}{3}\right)^n u(n)$ and the input to the system is $x(n)=\left(\frac{1}{2}\right)^n u(n)$. (5 marks)

(b) Find the DTFT of $x(n)=\left(\frac{1}{2}\right)^n u(n)$ and plot its magnitude and phase spectrum. (7 marks)

Or

16. (a) Find the DTFT of $x(n)=1, \quad |n|\le M$
$=0, \quad |n|>M$.
Plot the magnitude and phase spectra. (8 marks)

(b) State and prove the convolution and modulation properties of Fourier Series. (4 marks)

Module IV

17. (a) Given the specification for a Butterworth filter $\alpha_p=1\,dB, \alpha_s=30\,dB, \Omega_p=200$ rad/sec, $\Omega_s=600$ rad/sec. Determine the order of the filter. (3 marks)

(b) For the Butterworth filter, prove that

$$\Omega_c=\frac{\Omega_p}{\left(10^{(0.1\alpha_p)}-1\right)^{\left(\frac{1}{2N}\right)}}=\frac{\Omega_s}{\left(10^{(0.1\alpha_s)}-1\right)^{\left(\frac{1}{2N}\right)}}.$$ (9 marks)

Or

18. (a) Explain reconstruction of a sampled signal in time and frequency domain. (4 marks)

(b) Find the transfer function $H(s)$ for a high-pass Chebyshev filter to satisfy the specifications: $G_s\le -22dB$, $G_p\ge -1\,dB$, $W_s=10$ and $W_p=20$. (8 marks)

Turn over

G 1372 (Pages : 3) Reg. No.....ECE

Name.....

B.TECH. DEGREE EXAMINATION, MAY 2012

Fourth Semester

ENGINEERING MATHEMATICS—III

(Common to all Branches)

[Improvement/Supplementary/2004 Admissions onwards]

Time : Three Hours Maximum : 100 Marks

Answer **one** *full question from each module.*
Each full question carries 20 *marks.*
Use of Statistical tables is permitted.

Module I

1. (a) Find the general solution of $p^2 + 2py \cot x = y^2$. (5 marks)

(b) Solve $xdx - xdy + \log xdx = 0$. (5 marks)

(c) Find the orthogonal trajectory of the cardioids

$r = a(1 - \cos\theta)$.

(10 marks)

Or

(d) Solve $(D^2 + 2D + 1)\, y = 2 + x^2$. (5 marks)

(e) Solve $(D^2 - 2D + 1)\, y = e^x \log x$ by the method of variation of parameters. (5 marks)

(f) A bullet enters a board of 0.1 m thickness with a velocity of 200 m/s, pierces it and leaves the board with a velocity of 80 m/s. Assuming that the resistance offered by the board to the bullet is proportional to the square of its velocity, find the time taken by the bullet to pierce the board.

(10 marks)

Module 2

2. (a) Solve $(pq - p - q)(z - px - qy) = pq$. (5 marks)

(b) Solve by Charpit's method : $q + xp = p^2$. (8 marks)

(c) Solve $\dfrac{\partial^2 z}{\partial x^2} - 7\dfrac{\partial^2 z}{\partial x \partial y} + 12\dfrac{\partial^2 z}{\partial y^2} = e^{x-y}$. (7 marks)

Or

(d) Find the complete solution of

$$\frac{\partial^2 z}{\partial x^2} - 3\frac{\partial^2 z}{\partial x \partial y} + 2\frac{\partial^2 z}{\partial y^2} = e^{(2x-3y)} + \sin(x-2y).$$

(10 marks)

(e) A bar with insulated sides is initially at temperature 0° C throughout. The end $x = 0$ is kept at 0° C and heat is suddenly applied at the end $x = l$ so that $\frac{\partial u}{\partial x} = A$ for $x = l$, where A is a constant. Find the temperature function $u(x, t)$.

(10 marks)

Module 3

3. (a) Using Fourier integrals, show that

$$\int_0^\infty \frac{\lambda \sin \lambda x}{k^2 + \lambda^2} d\lambda = \frac{\pi}{2} e^{-kx}, \; x > 0, k > 0$$

(8 marks)

(b) Solve the integral equation $\int_0^\infty F(x) \cos px dx = \begin{cases} 1-p & 0 \le p \le 1 \\ 0, & p > 1 \end{cases}$ and hence deduce that $\int_0^\infty \frac{\sin t}{t^2} dt = \frac{\pi}{2}$.

(12 marks)

Or

(c) Using Parseval's identity, show that $\int_0^\infty \frac{dx}{(1+x^2)^2} = \frac{\pi}{4}$. (10 marks)

(d) Find the Fourier cosine transform of $f(x) = \frac{1}{(1+x^2)}$ and hence derive Fourier sine transform of $\phi(x) = \frac{x}{1+x^2}$.

(10 marks)

Module 4

4. (a) In 800 families with 5 children each, how many families would be expected to have (i) 3 boys and 2 girls ; (ii) 2 boys and 3 girls ; (iii) no girl ; (iv) at the most two girls ? Assume probabilities for boys and girls to be equal.

(12 marks)

(b) Suppose a book of 585 pages contains 43 typographical errors. If these errors are randomly distributed throughout the book, what is the probability that 10 pages, selected at random, will be free from errors ?

(8 marks)

Or

(c) The probability that a man aged 40 years will die before reaching the age of 45 years is 0.018. Out of a group of 400 men, now aged 40 years, what is the probability that 2 men will die within the next 5 years ?

(10 marks)

(d) Fit a normal curve to the following distribution :

x :	2	4	6	8	10
f :	1	4	6	4	1

(10 marks)

Module 5

5. (a) In a simple sample of 600 men from a certain city, 400 are found smokers. In one of 900 men from another city, 450 are found to smoke. Do the data indicate that the cities are significantly different with respect to the prevalence of smoking among men ?

(10 marks)

(b) Tests for breaking strength were carried out on two lots of 5 and 9 steel wires respectively. The variance of first lot was 250 and that of the second was 482. Is there a significant difference in their variability ?

(10 marks)

Or

(c) Obtain the equation of the normal curve that may be fitted to the data and test the goodness of fit :

x :	4	6	8	10	12	14	16	18	20	22	24	Total
$f(x)$:	1	7	15	22	35	43	38	20	13	5	1	200

(10 marks)

(b) What is the probability that a correlation coefficient of 0.75 or less can arise in a sample of 30 from a normal population in which the true correlation coefficient is 0.9 ?

(10 marks)

[5 × 20 = 100 marks]

18. (a) Find the inverse Laplace Transform of $X(s)=\dfrac{-5s-7}{(s+1)(s-1)(s+2)}$ with ROC $-1<Re(s)<1$. (6 marks)

(b) If $X(z)=\dfrac{z}{3z^2-4z+1}$ find $x(n), n\geq 0$. Given ROC of $X(z)$ is $|x|>1$. (6 marks)

Module 5

19. The joint probability function of two discrete random variables X and Y is expressed as

$$f(x,y)=\begin{cases} C\,x^2y & \text{for } x=1,2,\ y=0,1,2 \\ 0 & \text{otherwise} \end{cases}$$

Find :

(a) The value of C.

(b) P(X > 1, Y ≤1) and

(c) Marginal probability functions of X and Y. (12 marks)

Or

20. The CDF of a random variable is given as

$$f_X(x)=\begin{cases} K\,e^{-bx} & \text{for } x\leq 0 \\ 0, & \text{for } x<0. \end{cases}$$

(a) Obtain the value of K in terms of b.

(b) Find m_x and σ_x^2. (12 marks)

[5 × 12 = 60 marks]

G 1406 (Pages : 4) Reg. No.....

Name.....

B.TECH. DEGREE EXAMINATION, MAY 2012

Fourth Semester

Branch : Electronics and Communication/Applied Electronics and Instrumentation/Electronics and Instrumentation/Information Technology

SIGNALS AND SYSTEMS (L A S T)

(Improvement/Supplementary—2004 ~~Admissions onwards~~)

Time : Three Hours Maximum : 100 Marks

Missing datas can be suitably assumed.

Part A

Answer **all** *questions briefly.*
Each question carries 4 *marks.*

1. Explain the linearity and stability of an LTI system.
2. Explain commutative and associative properties of convolution sum.
3. State and explain linearity and time shifting properties of Fourier Transform.
4. Determine the time domain signal corresponding to the following Fourier Transform

$$x(j\omega)=\cos\frac{\omega}{2}+j\sin\frac{\omega}{2}, |\omega|<\pi$$
$$=0 \quad \text{otherwise.}$$

5. Determine the DTFT of the signal $x(n)=u(n)$.
6. Prove that the Discrete Time Fourier Transform is periodic with period 2π
7. Find the z–transform of $x(n)=-a^n u(-n-1)$.
8. Find the Laplace Transform of $e^{-at}\sin(w_o t)\,u(t)$.
9. Find the autocorrelation of the signal $x(t)=A\cos(w_o t+\theta)$.
10. State and briefly explain the properties of cross correlation function, $R_{xy}(\tau)$.

(10 × 4 = 40 marks)

Turn over

Part B

Answer any **one** *full question from each module.*
Each full question carries 12 *marks.*

Module 1

11. Are the following signals periodic ? If periodic, determine the fundamental period.

(a) $\cos(t+\pi/4)$.

(b) $\cos\left(\frac{\pi t}{4}\right)+\sin(t)$.

(c) $e^{j}\left(\frac{\pi k}{3}-1\right)$.

(d) $\cos\left(\frac{n\pi}{2}\right)-3\sin\left(\frac{n\pi}{4}+\frac{\pi}{3}\right)$.

(e) $\sin^2\left(\frac{3\pi n}{5}\right)$.

(f) $6+2\sin(6\pi t)+\cos\left(\frac{4\pi t}{5}\right)$.

(6 × 2 = 12 marks)

Or

12. (a) Determine whether the following system $y(t)=x(2t)$ is

(i) Linear (ii) Time invariant
(iii) Memoryless (iv) Causal.

(4 × 2 = 8 marks)

(b) Find the differential equation description for the system with the frequency response

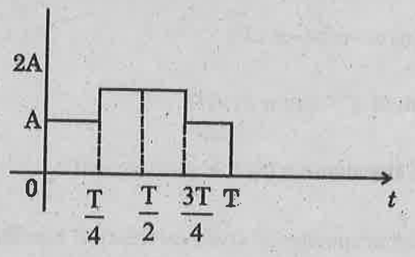
$$H(jw)=\frac{2+3jw-3(jw)^2}{1+4jw}.$$

(4 marks)

Module 2

13. (a) Use Parseval's theorem to find the signal energy of $x(t)=\frac{2\sin^2(3t)}{9t^2}$. (6 marks)

(b) Find the Fourier Transform of the signal shown below.



(6 marks)

Or

14. (a) Find the inverse Fourier Transform of $X(w)=\frac{jw+2}{(jw)^2+j5w+6}$. (6 marks)

(b) State and prove the following properties of Fourier Transform

(i) Convolution property.
(ii) Frequency shift property.

(2 × 3 = 6 marks)

Module 3

15. (a) A signal $x(n)$ has its DTFT given by $X(e^{jw})=\frac{1}{1-ae^{-jw}}$. Find the DTFTs of

(i) $y_1(n)=x(3n+1)$.

(ii) $y_2(n)=x(n)\cos(0.4\pi n)$ and

(iii) $y_3(n)=x(n-1)*x(n-2)$. (6 marks)

(b) Determine and plot amplitude and phase spectra of $x(nT)$ = {2, –1, 1, 0, –1, 2}, T = 20 ms. (6 marks)

Or

16. (a) Given $X(e^{jw})=\text{DTFT}[x(n)]$, show that

(i) $x(n)=\frac{1}{\pi}\int_0^{\pi}X(e^{jw})\cos(w_n)\,dw$ if $x(n)$ is real and even.

(ii) $x(n)=\frac{j}{\pi}\int_0^{\pi}X(e^{jw})\sin(wn)\,dw$ if $x(n)$ is real and odd. (6 marks)

(b) Find the DTFT representation of the sequence $x[n]=\cos^2\left(\frac{\pi}{8}\right)^n$. (6 marks)

Module 4

17. (a) Determine the z–transform of $x[n]=-u(-n-1)+\left(\frac{1}{2}\right)^n u(n)$. Find the ROC and pole zero locations of $x(z)$ in z – plane. (8 marks)

(b) Find the transfer function and impulse response of the system described by the difference equation $y(n)-\frac{1}{2}y(n-1)=2x(n-1)$ using z–transform. (4 marks)

Or

MODULE 5

19. Two independent sample sizes of 7 and 6 has the following values :

Sample A	:	28	30	32	33	31	29	34
Sample B	:	29	30	30	24	27	28	—

Examine whether the samples have been drawn from normal populations having the same variance.

(12 marks)

Or

20. Records taken of the number of male and female births in 800 fa ilies having four children are as follows :

No. of male births	:	0	1	2	3	4
No. of female births	:	4	3	2	1	0
No. of families	:	32	178	290	236	94

Test whether the data are consistent with the hypothesis tl he binomial law holds and the chance of male birth is equal to that of the female birth, namely, $p = q = \frac{1}{2}$.

(12 marks)

[5 × 12 = 60 marks]

G 1833 (Pages : 4) Reg. No.....

Name.....

B.TECH. DEGREE EXAMINATION, MAY 2012

Fourth Semester

EN 010 401—ENGINEERING MATHEMATICS—III

(Regular—2010 Admissions)

[Common to all Branches]

Time : Three Hours Maximum : 100 Marks

Part A

Answer **all** *questions.*
Each question carries 3 *marks.*

1. Expand $\pi x - x^2$ in a half range sine series in the interval $(0, \pi)$ upto the first three terms.

2. Find the Fourier Transform of $f(x) = \begin{cases} 1 \text{ for } |x| < 1 \\ 0 \text{ for } |x| > 1. \end{cases}$

3. Form the partial differential equation by eliminating the arbitrary functions from $f\left(x+y+z, x^2+y^2+z^2\right) = 0.$

4. During war, one ship out of nine was sunk on an average in a certain voyage. What was the probability that exactly 3 out of a convoy of 6 ships would arrive safely ?

5. A random sample of 900 members has a mean 3.4 cm. Check if it can be reasonably regarded as a sample from a large population of mean 3.2 cm. and SD = 2.3 cm.

(5 × 3 = 15 marks)

Part B

Answer **all** *questions.*
Each question carries 5 *marks.*

6. Obtain Fourier series for the function

$$f(x) = \pi x, \quad 0 \le x \le 1$$
$$= \pi(2-x) \quad 1 \le x \le 2$$

7. Find the Fourier cosine transform of $f(x) = \frac{1}{1+x^2}$ and hence derive Fourier sine Transform of $\phi(x) = \frac{x}{1+x^2}$.

8. Solve $\frac{\partial^2 z}{\partial x \partial y} = \sin x \sin y$, given that $\frac{\partial z}{\partial y} = -2 \sin y$, when $x = 0$ and $z = 0$, when y is an odd multiple of $\frac{\pi}{2}$.

9. Assume that the probability of an individual coal-miner being killed in a mine accident during an year is $\frac{1}{2400}$. Use Poisson's distribution to calculate the probability that in a mine employing 200 miners, there will be at least one fatal accident in a year.

10. A coin was tossed 400 times and the head turned up 216 times. Test the hypothesis that the coin is unbiased.

(5 × 5 = 25 marks)

Part C

Answer any **one** *full question from each module.*
Each full question carries 12 *marks.*

Module 1

11. If $f(x) = x, \quad 0 < x < \pi/2$
$= \pi - x, \ \pi/2 < x < \pi$, show that

(a) $f(x) = \frac{4}{\pi}\left[\sin x - \frac{\sin 3x}{3^2} + \frac{\sin 5x}{5^2} - \ldots\ldots\right]$. (5 marks)

(b) $f(x) = \frac{\pi}{4} - \frac{2}{\pi}\left[\frac{\cos 2x}{1^2} + \frac{\cos 6x}{3^2} + \frac{\cos 10x}{5^2} + \ldots\ldots\right]$. (7 marks)

Or

12. Obtain the first three coefficients in the Fourier Cosine series for y from the following data :

x :	0	1	2	3	4	5
y :	4	8	15	7	6	2

(12 marks)

Module 2

13. (a) Using Fourier integral representation, show that $\int_0^\infty \frac{\cos \omega x}{1+\omega^2}\, d\omega = \frac{\pi}{2} e^{-x} \ (x \geq 0)$. (6 marks)

(b) Solve for F (x) the integral equation $\int_0^\infty F(x) \sin tx \ dx = \begin{cases} 1, & 0 \leq t < 1 \\ 2, & 1 \leq t < 2 \\ 0, & t \geq 2. \end{cases}$ (6 marks)

14. (a) Using Parseval's identity, prove that $\int_0^\infty \frac{dt}{(a^2+t^2)(b^2+t^2)} = \frac{\pi}{2ab(a+b)}$. (5 marks)

(b) Solve the integral equation $\int_0^\infty F(x) \cos px = dx \begin{cases} 1-p, & 0 \leq p \leq 1 \\ 0, & p > 1 \end{cases}$ and hence deduce that

$\int_0^\infty \frac{\sin^2 t}{t^2}\, dt = \frac{\pi}{2}$.

(7 marks)

Module 3

15. Solve $2zx - px^2 - 2pxy + pq = 0$. (12 marks)

Or

16. Solve :

(a) $(D^2 - 2DD' + D'^2)z = e^{(2x+3y)}$. (6 marks)

(b) $\frac{\partial^2 z}{\partial x^2} + 3\frac{\partial^2 z}{\partial x \partial y} + 2\frac{\partial^2 z}{\partial y^2} = 12xy$. (6 marks)

Module 4

17. A random variable X has the following probability distribution values of X :

x :	0	1	2	3	4	5	6	7	8	9
$p(x)$:	a	$3a$	$5a$	$7a$	$9a$	$11a$	$13a$	$15a$	$17a$	$19a$

(a) Determine the value of a (3 marks)

(b) Find $P(X < 3), P(X \geq 3), P(2 \leq X < 5)$. (6 marks)

(c) What is the smallest value for which $P(X \leq x) > 0.5$? (3 marks)

Or

18. A sample of 100 button cells tested to find the length of life, produced the following results : $\bar{x} = 12$ hours, $\sigma = 3$ hours. Assuming the data to be normally distributed, what percentage of button cells are expected to have life

(a) more than 15 hours ; (4 marks)

(b) less than 6 hours ; and (4 marks)

(c) between 10 and 14 hours ? (4 marks)

Turn over