G 481 (Pages : 2) Reg. No.....

Name.....

B.TECH. DEGREE EXAMINATION, MAY 2014

Sixth Semester

Branch : Electrical and Electronics Engineering

MICROPROCESSORS AND APPLICATIONS (E)

(Old Scheme—Supplementary/Mercy Chance)

[Prior to 2010 Admissions]

Time : Three Hours Maximum : 100 Marks

Part A

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

1. Explain the signals used in DMA operation in 8085.
2. Describe the functioning of the S_0 and S_1 signals in 8085 in different cases.
3. Write a subroutine to generate a delay of 1 msec. (clock frequency = 3 MHz).
4. Explain the procedure for addition of two BCD numbers.
5. Explain the contents of the accumulator to run SIM instruction.
6. Explain restart as a software instruction. Describe the implementation of RST2.
7. Explain the bit set/reset mode of 8255.
8. Compare and contrast memory mapped and I/O mapped I/O techniques.
9. Why the maximum size of the keyboard matrix is 8 × 8, when interfaced with 8279 ?
10. Why segmentation is needed ? Give the segment registers of 8086.

(10 × 4 = 40 marks)

Part B

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

11. (a) List all the internal registers in 8085, their lengths and functioning.

    (b) Give the format of flag register in 8085 and explain the function of each flag.

Or

12. Draw and explain the (i) memory read cycle ; and (ii) I/O write cycle of 8085.

Turn over

13. Write an 8085 ALP to generate and display BCD up counter with a frequency of 10 Hz. Explain your algorithm with the help of flow chart.

Or

14. Ten binary numbers are stored starting from 4000 H. Write an Assembly Language program to find their squares and store the result starting from 4500 H. Explain your algorithm with the help of flow chart.

15. If the CALL and RET instructions are not provided in the 8085, could it be possible to write subroutine for 8085 ? If so, how will you call and return from the subroutine ? Illustrate with an example.

Or

16. With a neat block diagram, describe the interrupt structure of 8085. Explain what is meant by pending interrupts.

17. Interface 16 K bytes of EPROM and 8K bytes of RAM to 8085. Draw the circuit diagram and design the address decoding logic.

Or

18. Interface 4 × 4 matrix keyboard and six displays to the 8085 using 8279. Write initialisation program for encoded key scan and left entry for display.

19. With a neat block schematic of a DMA controller, explain the function of each signal connected to it. Explain how the DMA controller is used to transfer data between memory and peripheral devices.

Or

20. With a neat circuit diagram, show and explain how ADC 0808 is interfaced as input side and DAC 0800 from the outside in a 8085 system.

(5 × 12 = 60 marks)

G 452 (Pages : 2) Reg. No.....

Name.....

B.TECH. DEGREE EXAMINATION, MAY 2014

Sixth Semester

Branch : Electrical and Electronics Engineering

ELECTRICAL MACHINES—II (E)

(Old Scheme—Prior to 2010 Admissions)

[Supplementary/Mercy Chance]

Time : Three Hours Maximum : 100 Marks

Part A

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

1. Why is a rotating field system used in preference to a stationary field ?
2. Explain the effect of space harmonics.
3. Explain the MMF method of predetermination of the voltage regulation of cylindrical rotor alternator.
4. Draw the phasor diagram of a salient pole synchronous generator supplying a lagging power factor load.
5. What is the necessity of parallel operation of alternators ? Explain.
6. Explain the function of damper winding.
7. What are the conditions to be fulfilled before an alternator can be connected to an infinite bus ?
8. Write a note on transient and sub-transient reactances.
9. Discuss the excitation of any one type suitable for a large alternator.
10. Draw and describe the representation of an induction machine using general equations.

(10 × 4 = 40 marks)

Part B

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

11. (a) Why are salient-pole alternators more suitable for low speed and non-salient pole for high speed operation ? (4 marks)

(b) A star-connected, 3-phase, 6-pole alternator has a stator with 90 slots and 8 conductors per slot. The rotor revolves at 1000 r.p.m.. The flux per pole is 4×10^{-2} Wb. Calculate the e.m.f. generated if all the conductors in each phase are in series. Assume sinusoidal flux distribution and full pitched coils. (8 marks)

Or

Turn over

12. Find the no-load phase and line voltage of a star-connected, 3-phase, 6-pole alternator which runs at 1200 r.p.m., having flux per pole of 0.1 Wb sinusoidally distributed. Its stator has 54 slots having double layer winding. Each coil has 8 turns and the coil is chorded by 1 slot.

13. A 500 kVA, 1100 V, 50 Hz star-connected, 3-phase alternator has armature resistance per phase of 0.1 Ω and synchronous reactance per phase 1.5 Ω. Find its voltage for (a) unity p.f. ; (b) 0.8 lagging ; and (iii) 0.9 leading p.f. Also calculate the voltage regulation in each case.

Or

14. A 3-phase, star-connected synchronous generator supplies current of 10 A having phase angle of 20° lagging at 400 V. Find the load angle and components of armature current I_d and I_q if $X_d = 10\ \Omega$ and $X_q = 6.5\ \Omega$. Assume armature resistance to be negligible.

15. Two alternators are running in parallel and sharing a load in desired proportion. Explain clearly what will happen if

    (i) The excitations of alternators are changed while their prime-mover inputs are fixed.

    (ii) The prime mover inputs are varied while the excitations are kept fixed.

Or

16. A 3-phase, 415 V, 6 pole, 50 Hz star connected synchronous motor has e.m.f. of 520 V (L-L). The stator winding has a synchronous reactance of 2Ω per phase, and the motor develops a torque of 220 Nm. The motor is operating at 415 V, 50 Hz bus. (a) Calculate the current drawn from the supply and its power factor ; (b) Draw the phasor diagram showing all the relevant quantities.

17. A 3-phase salient pole synchronous motor is connected to an infinite bus. Derive an expression for the electromechanical power developed ? What will happen if the excitation is reduced to zero ? Also comment on the stability of the machine as compared to that of a cylindrical rotor machine.

Or

18. (a) What is a synchronous condenser ? Show the region of operation of the condenser on V-curves. Where are synchronous condensers used ?

    (b) Explain the effects of varying excitation on armature current and power factor in a synchronous motor. Draw the V curves.

19. (a) Explain the generalised machine theory.

    (b) The power input to the rotor of a 440 V, 50 Hz, 3-phase, 6 pole induction motor is 60 kW. It is observed that the roto e.m.f. makes 90 complete cycles per minute. Calculate (i) the slip ; (ii) the rotor speed ; (ii) rotor copper loss ; and (iv) mechanical power developed.

Or

20. A 3-phase, 50 Hz induction motor has a starting torque which is 1.25 times full-load torque and a maximum torque which is 2.5 times full-load torque. Neglecting stator resistance and rotational losses and assuming constant rotor resistance, find (i) the slip at full-load ; (ii) slip at maximum torque ; and (iii) the rotor current at starting in per unit of full-load rotor current.

(5 × 12 = 60 marks)

G 420 (Pages : 2) Reg. No.....

Name.....

B.TECH. DEGREE EXAMINATION, MAY 2014

Sixth Semester

Branch : Electrical and Electronics Engineering

EE 010 606 L06 – RENEWABLE ENERGY RESOURCES

(New Scheme – 2010 Admission onwards)

[Regular/Improvement/Supplementary]

Time : Three Hours Maximum : 100 Marks

Part A

Answer **all** *questions.*

Each question carries 3 *marks.*

1. What is the significance of an energy source?
2. How will you quantify solar radiation?
3. What is efficiency of a solar cell?
4. Write a note on availability of Wind energy.
5. Briefly discuss the importance of biomass.

(5 × 3 = 15 marks)

Part B

Answer **all** *questions.*

Each question carries 5 *marks.*

6. Explain Micro hydro power.
7. Discuss the solar collecting system.
8. What is an alone PV system? Discuss.
9. What are the applications of wind power generation?
10. Discuss the biomass conversion process.

(5 × 5 = 25 marks)

Turn over

Part C

Answer **all** *questions.*

Each full question carries 12 *marks.*

11. With necessary assumptions, derive and explain the hydro-power equation.

Or

12. Explain the different types of hydro-turbines and generators.

13. Explain the construction and working of a solar-based refrigeration system.

Or

14. With neat sketches, discuss the following :

    (a) Solar furnace.

    (b) Solar cooker.

(6 + 6 = 12 marks)

15. Explain the categories of PV systems.

Or

16. Discuss any *three* photovoltaic solar systems.

17. Explain the components of energy transfer systems in a windmill.

Or

18. Explain the types and applications of fuel cells.

19. Explain the construction and working of a tidal power plant.

Or

20. Discuss the resources, techniques of estimation and conversion systems of geothermal power.

[5 × 12 = 60 marks]

G 397 (Pages : 2) Reg. No.....

Name.....

B.TECH. DEGREE EXAMINATION, MAY 2014

Sixth Semester

Branch : Electrical and Electronics Engineering

EE 010 605—MICROCONTROLLERS AND EMBEDDED SYSTEMS (EE)

(New Scheme—2010 Admission onwards)

[Regular/Improvement/Supplementary]

Time : Three Hours Maximum : 100 Marks

Part A

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

1. Compare briefly microprocessors and microcontrollers.
2. Name *three* addressing modes of 8051. Give examples.
3. What are the various sources of interrupts in 8051 ?
4. Show how a DAC can be interfaced to 8051.
5. What are the various reset conditions of PIC 16F877 microcontroller ?

(5 × 3 = 15 marks)

Part B

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

6. Discuss the memory mapping of 8051.
7. What are the various jump and call instructions in 8051 ? Give examples.
8. Explain the Timer/Counter programming in 8051. What are the SFRs associated with it ?
9. With diagram, explain how external RAM can be connected to 8051.
10. Discuss briefly on Data memory mapping of PIC 16F877 microcontroller.

(5 × 5 = 25 marks)

Part C

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

11. With a neat block diagram, describe the architecture of 8051 microcontroller.

Or

12. What are the various SFRs in 8051 ? Explain the function of each.

Turn over

13. Write a program to copy the value 55 H into RAM locations 40H to 45 H using :

(a) Direct addressing mode ; (b) Register indirect addressing mode without a loop ; and (c) With a loop.

(3 × 4 = 12 marks)

Or

14. Write a program to generate two square waves one of 5 kHz frequency at pin 1.3 and another of frequency 25 kHz at pin 2.3. Assume XTAL = 22 MHz.

15. (a) Discuss how interrupts are enabled or disabled in 8051 microcontroller. (5 marks)

(b) Write a program to measure the width of a pulse appearing at the pin INTO. (7 marks)

Or

16. (a) What are the SFRs you need while programming a serial port ? Write a short program to initialize the serial port of 8051 in mode 1.

(8 marks)

(b) What are the various modes of serial data communication ? (4 marks)

17. Explain with neat diagram, the interfacing of an LCD module to 8051. Write the assembly language program to display the message 'NO'.

Or

18. Discuss with neat diagram how a stepper motor can be controlled using 8051 microcontroller.

19. Describe the architecture of PIC 16F877 microcontroller with neat block diagram.

Or

20. (a) Describe the interrupt structure in PIC 16F877 microcontroller. (8 marks)

(b) What are the various addressing modes in PIC 16F 877 microcontroller ? (4 marks)

[5 × 12 = 60 marks]

G 419 (Pages : 2) Reg. No.....

Name.....

B.TECH. DEGREE EXAMINATION, MAY 2014

Sixth Semester

Branch : Electrical and Electronics Engineering

EE 010 606 L05 – BIOMEDICAL ENGINEERING (Elective – I) (EE)

(New Scheme – 2010 Admission onwards)

[Regular/Improvement/Supplementary]

Time : Three Hours Maximum : 100 Marks

Part A

Answer **all** *questions.*

Each question carries 3 *marks.*

1. What are the objectives of Biomedical instrumentation system?
2. Explain Electro retinography.
3. What are Oxygenerators?
4. Discuss the various elements of intensive care monitoring.
5. Explain the photo chemical applications of lasers.

(5 × 3 = 15 marks)

Part B

Answer **all** *questions.*

Each question carries 5 *marks.*

6. Discuss the various types of electrodes used for biomedical measurements.
7. Explain the characteristics of bio-potential recorders.
8. Write short note on Artificial heart valves.
9. Define the important lung capacities and explain them.
10. Explain the principle of computer tomography.

(5 × 5 = 25 marks)

Turn over

Part C

Answer **all** *questions.*

Each question carries 12 *marks.*

11. What are the various types of transducers used in Biomedical Engineering?

Or

12. Explain Heart and Cardio-vascular system.

13. Explain 10–20 electrode placement method for EEG measurement.

Or

14. Explain Phonocardiography and its applications.

15. Explain the various modes of operation of Pacemakers.

Or

16. What do you mean by Fibrillation? How do you correct for it? Explain with a neat circuit the working of D.C. defibrillator.

17. Explain the various diathermy techniques used in biomedical systems.

Or

18. Explain different types of Gas analysers.

19. Explain the working of Ultrasonic imaging system. What are the important applications?

Or

20. Describe briefly, the working of X-ray machine. What are the uses of X-rays in medicine?

(5 × 12 = 60 marks)

G 356 (Pages : 3) Reg. No.....

Name.....

B.TECH. DEGREE EXAMINATION, MAY 2014

Sixth Semester

Branch : Electrical and Electronics Engineering

EE 010 601—POWER GENERATION AND DISTRIBUTION (EE)

(New Scheme—2010 Admission onwards)

[Regular/Improvement/Supplementary]

Time : Three Hours Maximum : 100 Marks

Part A

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

1. Explain the function of spill ways.
2. What are fixed and running charges ?
3. What are the limitations of Kelvin's Law ?
4. What is the importance of load power factor in AC distribution ?
5. What is energy efficient lighting ?

(5 × 3 = 15 marks)

Part B

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

6. Discuss the function of condenser in steam power plant. What are the types of condensers ?
7. Explain plant use factor and capacity factor.
8. Derive the expression for the voltage drop in a uniformly loaded distributor fed at one end.
9. Explain feeder, distributor and service mains.
10. Explain demand side energy management.

(5 × 5 = 25 marks)

Turn over

Part C

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

11. (a) Draw and explain the schematic arrangement of gas turbine plants. (8 marks)

(b) Discuss the advantages and disadvantages of steam power plants. (4 marks)

Or

12. (a) Draw the layout of thermal powerplant and explain its operation. (8 marks)

(b) Discuss the factors for the choice of site for a nuclear power plant. (4 marks)

13. (a) Explain the terms load factor and diversity factor ? How do these factors influence the cost of generation ?

(8 marks)

(b) Calculate the annual bill of a consumer whose maximum demand is 100 MW, p.f = 0.8 lagging and load factor = 60 %. The tariff used is Rs. 75 per KVA of maximum demand plus 25 paise per KWh consumed.

(4 marks)

Or

14. (a) What are the desirable characteristics of tariff ? Explain flat rate tariff and block rate tariff.

(8 marks)

(b) A generating station has a maximum demand of 500 MW. The annual load factor is 50% and capacity factor is 40%. Find the reserve capacity of the plant.

(4 marks)

15. (a) Explain the design considerations in a distribution system. On what basis distribution systems are classified ?

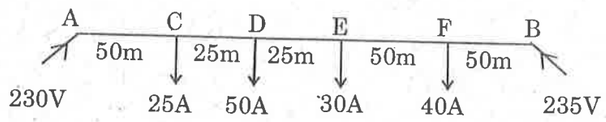
(8 marks)

(b) A uniform 2 wire dc distributor 500 metres long is loaded with 0.4 ampere/metre and is fed at one end. If the maximum permissible voltage drop is not to exceed 10 V, find the cross sectional area of the distributor. Take $\rho = 1.7 \times 10^{-4}$ Ω cm.

(4 marks)

Or

16. (a) A 2-wire d.c. distributor AB is fed from both ends and is loaded as shown in figure. The resistance per k.m. of one conductor is 0.3 Ω. Calculate the currents in various sections of the distributor and the minimum voltage at the point at which it occurs.



(8 marks)

(b) What is the purpose of inter connector in d.c. ring main distributor ? (4 marks)

17. Write short notes on the following :

(a) Effects of switching of capacitor banks.

(b) Power loss estimation in distribution systems.

(c) Optimum power factor for distribution systems.

(4 × 3 = 12 marks)

Or

18. A single phase distributor 2 km long supplies a load of 120 A at 0.8 p.f. lag at its far end and a load of 80 A at 0.9 pf lag at its midpoint. Both power factors are referred to the voltage at the far end. The resistance and reactance per km. for go and return are 0.05Ω and 0.1Ω respectively. If the voltage at the far end is maintained at 230 V, calculate the sending end voltage and the phase angle between voltages at the two ends.

(12 marks)

19. Explain in detail how energy saving is achieved in lighting systems. (12 marks)

Or

20. Explain the following :—

(a) Energy management.

(b) Types of energy audit.

(6 × 2 = 12 marks)

[5 × 12 = 60 marks]

G 365 (Pages : 3) Reg. No.....

Name.....

B.TECH. DEGREE EXAMINATION, MAY 2014

Sixth Semester

Branch : Electrical and Electronics Engineering

EE 010 602—INDUCTION MACHINES

(New Scheme—2010 Admission onwards)

[Regular/Improvement/Supplementary]

Time : Three Hours Maximum : 100 Marks

Part A

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

1. Discuss the construction of rotor of slip-ring induction motor.
2. What are the methods of improving starting torque of squirrel-cage induction motor ?
3. Discuss the types of induction generators.
4. Explain the applications of commutator machines.
5. Discuss the principle of linear induction motor.

(5 × 3 = 15 marks)

Part B

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

6. Explain crawling and how is it eliminated.
7. Explain pole changing and cascading of induction motors.
8. Discuss the different types of construction of rotor windings of synchronous induction motor.
9. Explain the types of repulsion motors.
10. Explain the construction of permanent magnet synchronous motor.

(5 × 5 = 25 marks)

Turn over

Part C

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

11. The following are the test results on a 440 V, 18.65 kW, 4-pole, three-phase delta-connected induction motor :

No load test : 440 V, 7.5 A, 1050 W

Blocked rotor test ; 100 V, 32 A, 2000 W

Draw the circle diagram and determine :

(a) Line current, power factor and efficiency for full-load output.

(b) Starting torque and maximum torque.

Assume ratio of stator copper loss to rotor copper loss at stand still is 7 : 6.

Or

12. (a) Explain power stages in three-phase induction motor. (6 marks)

(b) A three-phase induction motor having a star connected rotor has an induced e.m.f. of 85 V. between slip-rings at standstill on open circuit. The rotor has resistance and reactance of 1 Ω and 4 Ω per phase respectively. Calculate the rotor current and powerfactor when (i) slip rings are short circuited ; (ii) when slip rings are connected to star connected rheostat of 3 Ω per phase.

13. (a) Explain rotor resistance starting and design of rotor resistance starter. (8 marks)

(b) The cages of a double cage induction motor have standstill impedance of $(3.5 + j\ 1.5)\ \Omega$ and $(0.6 + j\ 7.0)\ \Omega$ respectively. The full-load slip is 6 %. Find the starting torque at normal voltage in terms of full-load torque. Neglect stator impedance and magnetising current. (4 marks)

Or

14. (a) Explain the operation of 3-phase induction motor when one of its stator windings gets accidentally disconnected during normal working. (8 marks)

(b) The rotor of a 4 pole, 50 Hz, slip ring induction motor has a resistance of 0.25 Ω per phase and runs at 1440 r.p.m. at full-load. Calculate the external resistance per phase to be added to lower the speed to 1200 r.p.m.., the torque being the same as before. (4 marks)

15. (a) Discuss how slip ring induction motor operate as synchronous induction motor. What are the different modes of operation ? (8 marks)

(b) Explain double revolving field theory. (4 marks)

Or

16. (a) Why single-phase induction motor is not self starting ? Explain the working of shaded pole motor. (8 marks)

(b) Explain the torque slip curve of single-phase induction motor. (4 marks)

17. (a) With circuit model and phasor diagram, explain the operation of single-phase series motor. (8 marks)

(b) Write short note on Hysterisis motor. (4 marks)

Or

18. (a) What is the principle of commutator motor ? Explain how e.m.f. is induced in commutator winding of AC commutator machines. (8 marks)

(b) Draw the typical speed torque curve of universal motor of DC and AC supply. (4 marks)

19. Explain the construction and operation of the following :—

(a) Stepper motor. (6 marks)

(b) BLDC motor. (6 marks)

Or

20. (a) Explain the construction and working of switched reluctance motor. (8 marks)

(b) Compare the performance of VR stepper motor and SR motor. (4 marks)

[5 × 12 = 60 marks]

G 374 (Pages : 3) Reg. No.....

Name.....

B.TECH. DEGREE EXAMINATION, MAY 2014

Sixth Semester

Branch : Electrical and Electronics Engineering

EE 010 603—CONTROL SYSTEMS (EE)

(New Scheme—2010 Admission onwards)

[Regular/Improvement/Supplementary]

Time : Three Hours Maximum : 100 Marks

Graph Sheets may be supplied.

Part A

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

1. Define static error and static error coefficients.
2. What are the advantages of Nyquist plot ?
3. Draw Bode plot of a lead compensator.
4. Explain the diagonalization technique.
5. Write the relationship between transfer function and state space model of a discrete system.

(5 × 3 = 15 marks)

Part B

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

6. Determine the error constants K_p, K_v ; and K_a for the system having transfer function :

$G(s)H(s) = \dfrac{K}{s(s+5)(s+10)}$. Also find the steady-state error for an input $r(t) = 5t + 5$.

7. Give the properties of minimum phase and non-minimum phase systems.
8. Draw circuit of a phase lag compensator using RC network and derive its transfer function.
9. Represent the following system in phase variable form : $G(s) = \dfrac{s+3}{s^2+2s+7}$.

Turn over

10. A dynamic system is represented by a state model :

$\dot{X} = \begin{bmatrix} 0 & 2 \\ -3 & -5 \end{bmatrix} X + \begin{bmatrix} 0 \\ 1 \end{bmatrix} u$. Given $X(0) = \begin{bmatrix} 1 \\ 0 \end{bmatrix}$.

Determine the state transition matrix of the system.

(5 × 5 = 25 marks)

Part C

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

11. Draw the Bode plot for unit feedback system with $G(s) = \frac{80}{s(s+2)(s+20)}$. Determine the gain margin and phase margin. Comment on the stability of the system.

Or

12. (a) For the system with transfer function $GH(s) = \frac{10}{s(s+1)(s+2)}$. Find the steady-state error when it is subjected to the input $r(t) = 1 + 2t + \frac{3t^2}{2}$.

(7 marks)

(b) Explain how the transportation lag is incorporated in obtaining the frequency response plots ?

(5 marks)

13. Sketch the Nyquist plot of unity feedback control system having the open loop transfer function $G(s) = \frac{(s+4)}{(1-s^2)}$. Determine the stability of the system using Nyquist stability criterian.

Or

14. Sketch the polar plot for the system with $G(s) = \frac{10}{s(s+1)(s+2)}$ and unity feedback. Find the phase margin and gain margin and comment on the stability.

15. The forward path transfer function of a unity negative feedback system is $G(s) = \frac{K}{s(s+2)(s+30)}$. Design a lead compensator to meet the following specifications :

(i) Phase margin $\geq 35°$.

(ii) Steady-state error for unit ramp input ≤ 0.04 rad/sec.

Or

16. Describe the design procedure for the PID controller using frequency response method.

17. Obtain Jordan Canonical form realisation of the system $\frac{Y(z)}{R(z)} = \frac{z^3 + 8z^2 + 17z + 8}{(z+1)(z+2)(z+3)}$.

Or

18. Obtain the state model for the transfer function :

$\frac{Y(s)}{U(s)} = \frac{10s+1}{(s+1)(s+2)(s+4)}$ in

(i) phase variable form ; and

(ii) canonical variable form.

Draw the simulation diagram in each case.

19. Consider the control system described by the state model :

$\dot{X} = \begin{bmatrix} 1 & 4 \\ -2 & -5 \end{bmatrix} X + \begin{bmatrix} 0 \\ 1 \end{bmatrix} u$ and $y = [1 \quad 0]x$ given $x(0) = \begin{bmatrix} 1 \\ 0 \end{bmatrix}$. Determine

(i) State transition matrix ; and

(ii) Time response for unit step input.

Or

20. Express the following continuous time equations in discrete form :

$\dot{x} = \begin{bmatrix} 1 & 1 \\ -4 & -5 \end{bmatrix} x + \begin{bmatrix} 0 \\ 1 \end{bmatrix} u, \quad y = [0 \quad 1]x.$

Take sampling period T = 0.01 sec.

(5 × 12 = 60 marks)

G 385 (Pages : 3) Reg. No.....

Name.....

B.TECH. DEGREE EXAMINATION, MAY 2014

Sixth Semester

Branch : Electrical and Electronics Engineering

EE 010 604—DIGITAL SIGNAL PROCESSING

(New Scheme—2010 Admission onwards)

[Regular/Improvement/Supplementary]

Time : Three Hours Maximum : 100 Marks

Part A

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

1. Check whether the following system is linear or not ?

$$y(n) = \frac{x(n-5) + x(n-7)}{x(n-2)\, x(n-3)}.$$

2. Explain the circular shift property of DFT.

3. Draw the direct form I structure of a filter whose difference equation is

$$y(n) - \frac{3}{4} y(n-1) + \frac{1}{8} y(n-2) = x(n) + \frac{1}{2} x(n-1).$$

4. Write the equations specifying any *three* windows used in FIR filter design.

5. What is truncation ? What is the error that arises due to truncation in floating point numbers ?

(5 × 3 = 15 marks)

Part B

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

6. Find Z-transform of $x(n) = a^n \cos(\Omega_0 n)\, u(n)$.

7. Find the circular convolution of the sequences $x_1(n) = \left\{2, \underset{\uparrow}{1}, 2, 1\right\}$, $x_2(n) = \{1, 2, 3, 4\}$.

8. Explain the forward difference method of converting analog to digital filters.

Turn over

9. Obtain the direct form realisation with minimum number of multipliers :

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

10. Draw and explain the quantizer characteristics with : (a) Round off ; and (b) Truncation.

(5 × 5 = 25 marks)

Part C

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

11. (a) Solve the difference equation $y(n) - \frac{1}{4}y(n-1) - \frac{1}{8}y(n-2) = x(n) + x(n-1)$, given $y(-1) = 2,\ y(-2) = -1,\ x(n) = 2^n u(n)$.

(8 marks)

(b) Specify the Nyquist rate for the following :

(i) $g_1(t) = \sin(200k)$.

(ii) $g_2(t) = \sin(200t) + \sin^2(200t)$.

(2 + 2 = 4 marks)

Or

12. (a) Find the inverse Z-transform of $X(Z) = \frac{z^3 - 10z^2 - 4z + 4}{2z^2 - 2z - 4}$, $|z| < 1$. (8 marks)

(b) Find the Fourier Transform of $p(t) = \sum_{n=-\infty}^{\infty} \delta(t - n\tau)$, where τ is the fundamental period.

(4 marks)

13. Let $X(e^{jw})$ denote the Fourier Transform of the sequence $x(n) = \left(\frac{1}{2}\right)^n u(n)$. Let $y(n)$ denote a finite duration sequence of length 10. ie, $y(n) = 0, n < 0$ and $y(n) = 0, n \geq 10$. The 10-point DFT of $y(n)$ denoted by $Y(k)$ corresponds to 10 equally spaced samples of $X(e^{jw})$ *ie*, $Y[K] = X(e^{j2\pi k/10})$. Determine $y(n)$.

Or

14. Compute the 8-point DFT of the sequence $x(n) = \begin{cases} 1 & , 0 \leq n \leq 7 \\ 0 & , \text{otherwise} \end{cases}$ using DIT and DIF algorithms.

15. Realise the following system function in parallel form :

$$H(z) = \frac{1 - \frac{2}{3}z^{-1}}{1 - \frac{7}{8}z^{-1} + \frac{3}{32}z^{-2}} + \frac{1 + \frac{7}{4}z^{-1} - \frac{1}{2}z^{-2}}{1 - z^{-1} + \frac{1}{2}z^{-2}}$$

Or

16. Design a second order Butterworth digital filter with cut-off frequency 1.2 kHz and sampling frequency of 10^4 samples/sec by Bilinear Transformation.

17. Determine the impulse response $h(n)$ of a filter having desired frequency response

$$H_d(e^{jw}) = \begin{cases} e^{-j(N-1)fz}, & 0 \leq |w| < \frac{\pi}{2} \\ 0 \quad \text{for } \frac{\pi}{2} \leq w \leq \pi \end{cases}$$

where N = 7. Use frequency sampling.

Or

18. Design an ideal band pass filter with frequency response $H_d(e^{jw}) = 1$ for $\frac{\pi}{4} \leq |w| \leq \frac{3\pi}{4}$. Use rectangular window with N = 11 in the design.

19. Realise the first order transfer function $H(z) = \frac{1}{1 - 0.5z^{-1}}$ and draw its quantization noise model. Also find the steady-state noise power due to round off. Take number of bits = 4.

Or

20. Discuss the applications of DSP in :

(i) Channel vocoder.

(ii) Homomorphic vocoder.

(iii) Speech processing.

(3 × 4 = 12 marks)

[5 × 12 = 60 marks]

17. Determine the phase margin, gain margin, percentage overshoot from the Bode plot for a step change for the system whose output response is given by $C(s) = \frac{22.5}{s(s+4)(s^2+0.9s+9)}$.

(12 marks)

Or

18. The open loop transfer function of a unity feedback system is $G(s) = \frac{1}{s(1+s)(1+2s)}$. Sketch the polar plot on a plain paper and determine the gain margin and phase margin.

(12 marks)

19. The open loop transfer function of a feedback system is $G(s)H(s) = \frac{k(1+s)}{(1-s)}$. Comment on stability using Nyquist plot.

(12 marks)

Or

20. The open loop transfer function of a unity feedback system is $G(s) = \frac{k}{s(s+2)(s+10)}$. By using Nyquist plot,

(a) find the range of k for stability.

(b) find the value of k for gain margin 10 dB.

(c) find the value of k for a phase margin 40°.

(12 marks)

[5 × 12 = 60 marks]

G 442 (Pages : 4) Reg. No.....

Name.....

B.TECH. DEGREE EXAMINATION, MAY 2014

Sixth Semester

Branch : Electrical and Electronics Engineering

CONTROL SYSTEMS—I (E)

(Old Scheme—Prior to 2010 Admissions)

[Supplementary/Mercy Chance]

Time : Three Hours Maximum : 100 Marks

Graph sheets and semilog sheets to be supplied.

Part A

Answer **all** *questions briefly.*

Each question carries 4 *marks.*

1. Explain the merits and demerits of the block diagram reduction technique over signal flow graph method.
2. Obtain a mathematical model of sampler and zero order hold circuit.
3. Distinguish between type and order of a control system.
4. Discuss the importance of steady-state error constants K_p, K_v and K_a.
5. Check if the roots of the characteristic equation $z^3 - 1.3z^2 - 0.08z + 0.24 = 0$ lie within unit circle ?
6. What is direct root locus, inverse root locus and root contours ?
7. Explain how is the stability of a system is determined by the frequency domain specification ?
8. Define phase margin and gain margin ? Give practical values for good relative stability.
9. Define the working of an amplidyne ?
10. Discuss the advantages and disadvantages of the Bode plot compared to the Nyquist plot.

(10 × 4 = 40 marks)

Part B

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

11. Fig. 1 below shows the signal flow graph of a system with two input and two outputs. Find the expression for the outputs C_1 and C_2.

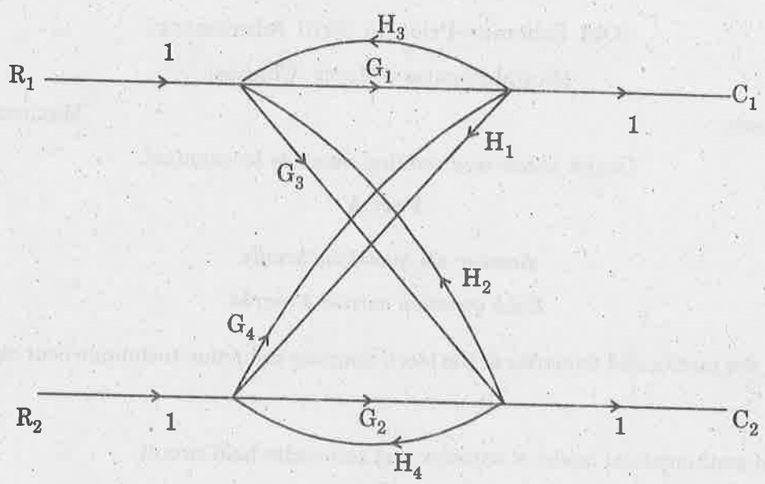


Fig. 1

(12 marks)

Or

12. Obtain the transfer function of the feedback control system shown in Fig. 2 by block diagram reduction technique.

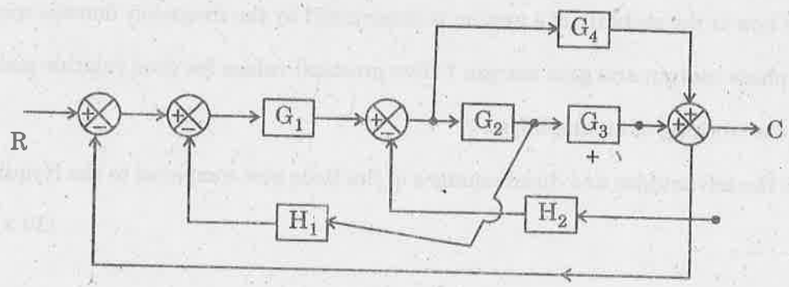


Fig. 2

(12 marks)

13. A unity negative feedback closed loop system with open loop transfer function $G(s) = \dfrac{3}{s(s+0.4)}$ is excited with unit step input.

Derive the response of the system. Plot the response of the system to step input and obtain the values of 2 % settling time, rise time, peak time and maximum percentage peak overshoot.

(12 marks)

Or

14. (a) A closed loop transfer functions of certain second order unity feedback control systems are given below. Determine the type of damping in the systems.

(i) $\dfrac{C(s)}{R(s)} = \dfrac{2}{s^2 + 4s + 2}$.

(ii) $\dfrac{C(s)}{R(s)} = \dfrac{2}{s^2 + 4}$.

(iii) $\dfrac{C(s)}{R(s)} = \dfrac{2}{s^2 + 2s + 1}$.

(3 × 2 = 6 marks)

(b) A unity feedback system has $G(s) = \dfrac{k}{s(s+1)(0.1s+1)}$ and $r(t) = 10t$. If $K = \dfrac{2}{s}$, determine $e_{ss}(t)$.

(6 marks)

15. (a) By means of Routh criterion, determine the stability of the system represented by $s^6 + 3s^5 + 5s^4 + 9s^3 + 8s^2 + 6s + 4 = 0$.

(6 marks)

(b) Using Jury's test examine the stability of the system whose characteristic equation is $F(z) = 2z^4 + 7z^3 + 10z^2 + 4z + 1$.

(6 marks)

Or

16. For a unity feedback system $G(s) = \dfrac{K}{s(s+2)(s+4)}$, sketch the nature of root locus showing all details on it. Comment on the stability of the system.

(12 marks)

Turn over

G 471 (Pages : 3) Reg. No.....

Name.....

B.TECH. DEGREE EXAMINATION, MAY 2014

Sixth Semester

Branch : Electrical and Electronics Engineering

DIGITAL SIGNAL PROCESSING (E)

(Old Scheme—Prior to 2010 Admissions)

[Supplementary/Mercy Chance]

Time : Three Hours Maximum : 100 Marks

Part A

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

1. Define a causal system with an example.
2. Determine if the system describe by the following input-output equations are linear or non-linear (i) $y(n) = x^2(n)$; (ii) $y(n) = x(n) + \frac{1}{x(n-1)}$.
3. State and prove any *two* properties of DFT.
4. What are the advantages of FFT over DFT ?
5. Obtain direct from II structure for filter $H(z) = \frac{1+0.4z^{-1}}{1-0.5z^{-1}+0.06z^{-2}}$.
6. Explain the shifting properly of z-transform.
7. What is window ? Classify the different types of window functions ?
8. Write a note on multiplexed FIR filter realizations.
9. Obtain the transfer function for a normalized Butterworth filter of order 2.
10. Derive the impulse invariant transformation of transforming analog filter to digital filter.

(10 × 4 = 40 marks)

Part B

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

11. A continuous time system is described by the following input output relationship, $y(t) = T\{x(t)\} = [\sin 6t]\, x(t)$. Determine whether this system is

Turn over

(i) Memoryless. (ii) Time invariant.

(iii) Periodic. (iv) Linear.

(v) Causal. (v) Stable.

(6 × 2 = 12 marks)

Or

12. (a) Give the condition of causality of continuous time and discrete time LTI systems in terms of impulse responses.

(4 marks)

(b) Find the impulse response of the system described by the difference equation $y(n) + y(n-1) = x(n) - 2x(n-1)$.

(8 marks)

13. Find the DFT of the sequence $x[n] = [1, 1, 3, 3, 1, 1, 2, 2]$ using radix 2, DIF-FFT algorithm.

Or

14. G (K) and H (K) are 6-point DFTs of sequences $g(n)$ and $h(n)$ respectively. The DFT. G (K) is given as G (K) = $\{1+j, -2{\cdot}1+j3{\cdot}2, -1{\cdot}2-j2.4, 0, 0{\cdot}9+j3{\cdot}1, -0{\cdot}3+j1{\cdot}1\}$. The sequences $g(n)$ and $h(n)$ are related by the circular time shift as $h(n) = g[n-1]6$. Determine H (K), without computing the DFT.

15. Draw the cascade and parallel realizations of the following system function :

$$H(z) = \frac{\left(1+\frac{1}{4}z^{-1}\right)}{\left(1+\frac{1}{2}z^{-1}\right)\left(1+\frac{1}{2}z^{-1}+\frac{1}{4}z^{-2}\right)}.$$

Or

16. A causal LTI system is $H(z) = \frac{\left(1-\frac{1}{5}z^{-1}\right)}{\left(1+\frac{1}{4}z^{-1}\right)\left(1-\frac{1}{2}z^{-1}+\frac{1}{3}z^{-2}\right)}$. Obtain the direct form I and direct form II implementation of the system.

17. The desired frequency response of a low pass filter is

$$H_2\left(e^{jw}\right) = H_d(w) = \begin{cases} e^{-j3w}, & |w| < 3\pi/4 \\ 0, & \frac{3\pi}{4} < |w| < \pi \end{cases}$$

Determine the frequency response of FIR filter if hamming window is used with N = 7.

Or

18. Design a FIR linear phase filter using Kaiser window to meet the following specifications :

$$0.99 \le \left|H e^{(jw)}\right| \le 1.01, \quad 0 \le |w| \le 0.19\pi$$
$$\left|H\left(e^{(jw)}\right)\right| \le 0.01, \quad 0.21\pi \le |w| \le \pi$$

19. Design a digital Chebyshev I filter that satisfies the following constraints

$$0.8 \le |H(w)| \le 1 \qquad 0 \le w \le 0.2\pi$$
$$|H(w)| \le 0.2 \qquad 0.6\pi \le w \le \pi$$

Use impulse invariant transformation.

Or

20. With neat block diagram, explain the architecture of TMS 320 C5X DSP processor. Explain its key features clearly.

(5 × 12 = 60 marks)

G 462 (Pages : 3) Reg. No.....

Name.....

B.TECH. DEGREE EXAMINATION, MAY 2014

Sixth Semester

Branch : Electrical and Electronics Engineering

ELECTRICAL POWER TRANSMISSION (E)

(Old Scheme—Supplementary/Mercy Chance)

[Prior to 2010 Admissions]

Time : Three Hours Maximum : 100 Marks

Part A

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

1. What is transported transmission line ? What is its effect on the performance of the line ?
2. Clearly explain what you understand by GMR and GMD of a transmission line.
3. What are the different types of line supports ? Explain.
4. Define string efficiency. Why is it necessary to have high string efficiency ?
5. Briefly explain the effect of powerfactor on the regulation of short transmission line.
6. Describe the "off-load" and "on-load" tap changing transformers.
7. Describe the phenomenon of corona. Explain the factors affecting corona.
8. Briefly discuss the classification of substations.
9. Discuss the methods to increase the transmission capability of EHV lines.
10. Discuss the advantages of HVDC transmission system.

(10 × 4 = 40 marks)

Part B

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

11. (a) Derive an expression for inductance of a single-phase two wire system. (7 marks)

    (b) Calculate the inductance of a single-phase circuit comprising of two parallel conductors of 6 mm. in diameter spaced 1 m. apart. If the material of conductor is (i) copper ; and (ii) steel with a relative permeability of 1 and 50 respectively.

Or

12. Derive an expression for capacitance of a three-phase transmission line with unequal spacing assuming uniform transposition.

Turn over

13. (a) What are bundled conductors ? Discuss the advantages of bundled conductors, when used for OH lines.

(6 marks)

(b) A transmission line has a span of 150 m. between level supports. The line conductor has a cross-section area of 1.25 cm^2 and it weighs 120 kg. per 100 m. If the breaking stress of the copper conductor is 4200 kg/cm^2, calculate the maximum sag for a safety factor of 4. Assume a maximum wind pressure of 90 kg/m^2.

(6 marks)

Or

14. (a) What electrical and mechanical characteristics are required for a good insulator for using in HV transmission lines ?

(5 marks)

(b) Each conductor of a 3-phase overhead transmission line is suspended from a cross arm of a steel tower by a string of four suspension insulators. The voltage across the second unit is 15 kV and across the third 27 kV. Find the voltage between conductors and string efficiency.

(7 marks)

15. Explain the rigorous solution of long transmission lines.

Or

16. (a) A three-phase, 50 Hz, 16 km. long overhead transmission line supplies 1000 kW at 11 kV, 0.8 p.f. lagging. The line resistance is 0.03 Ω per phase per km. and the line inductance is 0.7 mH per phase per km. Calculate the sending end voltage, voltage regulation and efficiency of transmission.

(7 marks)

(b) Explain the function of a synchronous phase modifier placed at the receiving end of the transmission line.

(5 marks)

17. (a) Explain the following terms with reference to corona :

(i) Critical disruptive voltage.

(ii) Visual critical voltage.

(6 marks)

(b) A 3-phase, 220 kV, 50 Hz transmission line has equilateral triangular spacing of side 2 m. The conductor diameter is 3 cm. The air density factor and the irregularity factor is 0.95 and 0.83 respectively. Find the disruptive critical voltage and corona loss per km. Assume any data required.

(6 marks)

Or

18. (a) Briefly explain the general layout of a substation. (7 marks)

(b) Write a short note on grounding transformer. (5 marks)

19. (a) Explain the methods to provide reactive power compensation in EHV lines. (7 marks)

(b) Write a note on EHV systems in India. (5 marks)

Or

20. With help of neat diagrams, explain the working of 3-phase converter used in HVDC transmission system. Also derive the expression for output voltage.

[5 × 12 = 60 marks]