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15EE51

Fifth Semester B.E. Degree Examination, Dec.2019/Jan.2020
Management and Entrepreneurship

Time: 3 hrs. Max. Marks: 80

Note: *Answer any FIVE full questions, choosing ONE full question from each module.*

Module-1

1 a. Define Management. (02 Marks)
b. Discuss the levels of management. (09 Marks)
c. Explain the steps in decision making. (05 Marks)

OR

2 a. Why is Planning important? (02 Marks)
b. What are the limitations of planning? (05 Marks)
c. How is management considered as an art, science and profession? (09 Marks)

Module-2

3 a. Compare between Centralization and Decentralization of authority and responsibility. (10 Marks)
b. Briefly explain the steps in controlling. (06 Marks)

OR

4 a. Discuss the Motivation theories (any two). (08 Marks)
b. Why is Communication important? (02 Marks)
c. Explain the various Leadership styles. (06 Marks)

Module-3

5 a. Explain the social responsibilities of a businessman towards different groups in the society. (08 Marks)
b. What are the wrong ideas of public about how an entrepreneur should be? (05 Marks)
c. List the limitations of social audit. (03 Marks)

OR

6 a. How is Entrepreneurship important? Classify it. Explain the building the capacity of good entrepreneurship. (10 Marks)
b. What do you mean by social responsibility of an entrepreneurship? (03 Marks)
c. Mention the characteristics on an Entreprenuer. (03 Marks)

Module-4

7 a. Discuss Governments policies for developments of small scale industries in India. (08 Marks)
b. Write a short note on GATT. (05 Marks)
c. List a few State – levels institution that have given a helping hand in the State. (03 Marks)

OR

8 a. Discuss the schemes of central level institutions in upbringing of SSI. (08 Marks)
b. Explain the impact of globalization on SSI. (05 Marks)
c. Define Auxillary Industry and Tiny Industry. (03 Marks)

Module-5

9 a. Explain the various guidelines provided by the planning commission for preparation of project report. **(08 Marks)**

b. Tabulate the uses and limitations of PERT and CPM. **(08 Marks)**

OR

10 a. Explain the control techniques of a SSI. **(08 Marks)**

b. List the pre – requisites necessary for a successful project implementation. **(04 Marks)**

c. What is Human and Administrative aspects of Project Management? **(04 Marks)**

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15EE52

Fifth Semester B.E. Degree Examination, Dec.2019/Jan.2020
Microcontroller

Time: 3 hrs. Max. Marks: 80

Note: *Answer any FIVE full questions, choosing ONE full question from each module.*

Module-1

1 a. Explain the important features of 8051µc. **(04 Marks)**

b. Explain the working of stack and stack pointer. **(06 Marks)**

c. Explain any 4 addressing modes of 8051µc with an example **(06 Marks)**

OR

2 a. Briefly explain the memory organization of 8051µc. **(07 Marks)**

b. Explain the pin functions of port 3 in 8051µc **(05 Marks)**

c. Compare microcontroller and microprocesses. **(04 Marks)**

Module-2

3 a. Classify the CALL instruction in 8051. Explain each one. **(06 Marks)**

b. Write an ALP to generate 50 odd numbers from one (in BCD) and store them starting from location 30h. **(05 Marks)**

c. Write an ALP to load accumulator with the value 55h and complement the content of accumulator 900 times. **(05 Marks)**

OR

4 a. Explain the working of DA A instruction with an example. Assume that data is 99h and 99h. **(05 Marks)**

b. Explain CJNE and JZ instruction with an example. **(06 Marks)**

c. Explain 5 assembler directives available in ALP. **(05 Marks)**

Module-3

5 a. Explain mode 2 timer programming with neat sketch and specify the programming steps. **(06 Marks)**

b. Write an ALP to generate the following waveform on P1.2.XTAL = 22MHz. Use timer 1 mode 1.

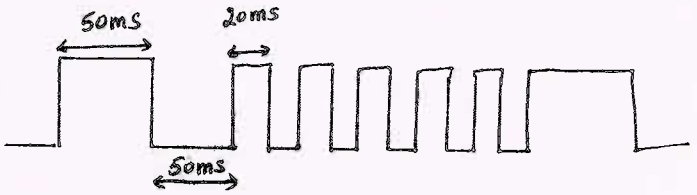

Fig Q5(b) **(10 Marks)**

OR

6 a. Write a C program to get a bit from P1.0 and send it to P2.7 after inverting it. **(05 Marks)**

b. Explain different data types in 8051C. **(05 Marks)**

c. Write a C program to convert ASCII digits of '4' and '7' to packed BCD and display them on P1. **(06 Marks)**

Module-4

7 a. Explain RS232 handshaking signal and specify the purpose of MAX232 while interfacing. **(08 Marks)**

b. Write an ALP to transfer serially the message "VTU BELGAUM" continuously at a band rate of 9600. Also write the importance of SCON register. **(08 Marks)**

OR

8 a. Write a C program using interrupts to do the following :

i) Receive data serially and send it to P0

ii) Read port P1, transmit data serially and give a copy to P2.

iii) Make timer 0 generate a square wave of 5KHz frequency on P0.1.

Assume XTAL = 11.0592 MHz. set the band rate 4800. **(10 Marks)**

b. Explain the significance of IE and IP register. **(06 Marks)**

Module-5

9 a. Explain interfacing of DC motor to 8051μc with a neat diagram and write a C program to monitor the status of SW and perform the following :

i) If SW = 0, the DC motor moves with 50% duty cycle pulse.

ii) If SW = 1, the DC motor moves with 25% duty cycle pulse. **(10 Marks)**

b. Draw the pin diagram of 8255 and briefly explain the signals. **(06 Marks)**

OR

10 a. Draw the block schematic of DAC 0808 interfaced to 8051 and write an C program to generate sine wave. **(08 Marks)**

b. With a neat diagram, show how a stepper motor in interfaced to 8051. Write a program to rotate stepper motor continuously. **(08 Marks)**

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15EE53

Fifth Semester B.E. Degree Examination, Dec.2019/Jan.2020
Power Electronics

Time: 3 hrs. Max. Marks: 80

Note: *Answer any FIVE full questions, choosing ONE full question from each module.*

Module-1

1 a. Mention the types of Power Electronic Circuits. Explain different power electronic circuits. With neat circuit diagram, input and output waveform. **(08 Marks)**

b. What is Power Electronics? Mention the major applications of Power Electronics. **(04 Marks)**

c. With circuit diagram, voltage waveforms, explain control characteristics of
i) Thyristor ii) GTO iii) MOSFET iv) BJT. **(04 Marks)**

OR

2 a. With neat circuit diagram and waveforms, explain single phase full wave rectifiers. **(07 Marks)**

b. With the help of power converter block diagram, explain peripheral effects. **(04 Marks)**

c. With the help of waveforms, explain the reverse recovery characteristics of a power diode. **(05 Marks)**

Module-2

3 a. With neat circuit diagram and switching waveforms, explain switching characteristics of BJT. **(08 Marks)**

b. Explain the switching characteristics of MOSFET with switching circuit model and waveforms. **(08 Marks)**

OR

4 a. What is the necessity of Isolating gate and base drive circuits? With circuit diagram, explain Opto – Couplers. **(08 Marks)**

b. Explain the switching limits of BJT. **(04 Marks)**

c. The bipolar transistor in fig. Q4(c), shown below is specified to have β in the range of 8 to 40. The load resistance is $h_c = 11\Omega$. The dc supply voltage is $V_{CC} = 200V$ and the input and $V_{BE(sat)} = 1.5V$, $V_B = 10V$. Find
i) The value of RB that results in saturation with an ODF of 5.
ii) The forced β and
iii) The power loss P_T in the transistor. **(04 Marks)**

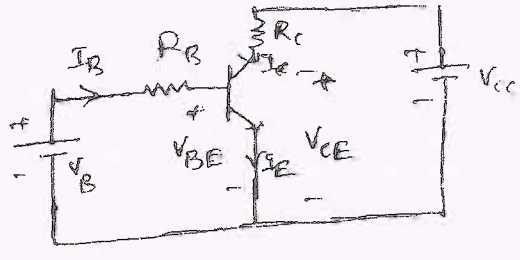


Fig.Q4(c)

Module-3

5 a. With circuit diagram and waveforms, explain RC half wave triggering circuit. **(04 Marks)**

b. Derive an expression for the anode current of thyristor with two transistor nodel. **(07 Marks)**

c. Design the values of di/dt inductor and RC snubber components for an SCR working in a 230V system. Given di/dt rating is 90A/μs and dv/dt rating is 200V/μs. Effective series resistance is 1.5Ω and damping factor is 0.6. **(05 Marks)**

OR

6 a. With neat waveforms, explain Thyristor turn – on and turn – off characteristics. **(06 Marks)**

b. With neat circuit diagrams, explain dv/dt protection of SCR. **(05 Marks)**

c. With neat diagram, explain V – I characteristics of SCR. **(05 Marks)**

Module-4

7 a. With circuit diagram and waveforms, explain the operation of 1 – ϕ dual converter. **(08 Marks)**

b. A single phase full wave AC voltage controller has a resistive load of R = 10Ω and the input voltage is V_S = 120 V(rms) , 60 Hz. The delay angle of Thyristor T_1 and T_2 are equal ; $\alpha_1 = \alpha_2 = \pi/2$. Determine i) The rms o/p voltage V_o ii) The input power factor PF iii) The average thyristor current I_A. **(08 Marks)**

OR

8 a. With circuit diagram and waveform, explain the operation of a Three phase dual converter. **(08 Marks)**

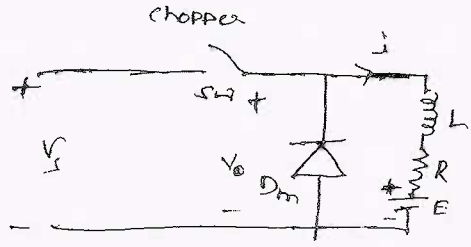
b. With circuit diagram and waveforms, explain 1 – ϕ full wave A.C voltage controllers with resistive load. **(08 Marks)**

Module-5

9 a. With the help of circuit and quadrant diagram, classify the different types of choppers. Explain four quadrant chopper with circuit diagram. **(08 Marks)**

b. A chopper is feeding and RL load as shown in fig. Q9(b) with V_S = 220V , R = 5Ω , L = 7.5mh , f = 1 KHz , K = 0.5 and E = 0V. Calculate i) The minimum instantaneous load current I_1 ii) The peak instantaneous load current I_2 iii) The maximum peak to peal load ripple current iv) The average value of load current I_a v) The rms lad control I_o. **(08 Marks)**

Fig.Q9(b)



OR

10 a. With circuit diagram and waveforms, explain single phase full bridge inverter. **(08 Marks)**

b. With circuit diagram and waveforms, explain three phase bridge inverter. **(08 Marks)**

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15EE54

Fifth Semester B.E. Degree Examination, Dec.2019/Jan.2020
Signals & Systems

Time: 3 hrs. Max. Marks: 80

Note: ***Answer any FIVE full questions, choosing ONE full question from each module.***

Module-1

1 a. Categorize the following signal as energy signal or power signal. Find out corresponding value:

$$x(t)=\begin{cases} t & 0\le t\le 1 \\ 2-t & 1\le t\le 2 \\ 0 & \text{Otherwise} \end{cases}$$ **(04 Marks)**

b. What are different elementary signals? Explain them with neat sketch. **(04 Marks)**

c. Sketch and label for each of the following for given signal x(t) shown in Fig. Q1 (c):

(i) $x(2t+1)$ (ii) $x(-2t+3)$ (iii) $x\left(2\left(\frac{t}{3}-2\right)\right)$

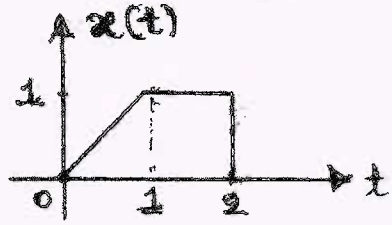

Fig. Q1 (c)

(08 Marks)

OR

2 a. Explain different classification of signals. **(05 Marks)**

b. Given discrete time system $y(n)=2x(2^n)$. Determine whether the system is,
(i) Linear (ii) Time variant (iii) Memoryless (iv) Stable. **(05 Marks)**

c. Find the even and odd part of the following signal,
(i) $x(t)=e^{-2t}\cos(t)$ (ii) $x(t)=e^{jt}$ **(06 Marks)**

Module-2

3 a. Find the following convolution sum $y(n)=\left(\frac{3}{4}\right)^n u(n)*u(n-2)$ and evaluate the value for $n=\pm 5$. **(06 Marks)**

b. Find out the total response of the system given by,

$$\frac{d^2}{dt^2}y(t)+3\frac{d}{dt}y(t)+2y(t)=2x(t)$$

with $y(0)=-1$, $\left.\frac{dy(t)}{dt}\right|_{t=0}=1$ and $x(t)=\cos(t)u(t)$ **(10 Marks)**

OR

4 a. The impulse response of an LTI system is given by $h(t) = u(t) - u(t-2)$. Find the output of the system for a given input $x(t) = u(t) - u(t-3)$. Draw the output response. **(10 Marks)**

b. Draw the direct form I and direct form II implementations for the following difference equation.

$$y[n] + \frac{1}{2}y[n-1] - y[n-3] = 3x[n-1] + 2x[n-2]$$ **(06 Marks)**

Module-3

5 a. Find the Fourier Transform (FT) of the following signals:

(i) $x(t) = e^{-a|t|}$ (ii) $x(t) = \frac{1}{a^2 + t^2}$ (iii) $x(t) = \cos\omega_0 t$ **(10 Marks)**

b. State and prove the following properties in Fourier Transforms:

(i) Differentiation property (Time)

(ii) Time shift property **(06 Marks)**

OR

6 a. Find the frequency response of the system and impulse response if differential equation of the system is given by,

$$\frac{d^2}{dt^2}y(t) + 5\frac{d}{dt}y(t) + 6y(t) = -\frac{d}{dt}x(t)$$ **(08 Marks)**

b. The RC filter is characterized by following impulse response find out corresponding frequency response:

$$h(t) = \frac{1}{RC}e^{-t/RC}u(t)$$

For the above LTI system plot the magnitude curve. **(08 Marks)**

Module-4

7 a. Find the Discrete Time Fourier Transform (DTFT), of a rectangular pulse sequence given by $x[n] = u[n] - u[n-N]$ **(08 Marks)**

b. A causal discrete LTI system is described by,

$$y[n] - \frac{3}{4}y[n-1] + \frac{1}{8}y[n-2] = x[n]$$

(i) Determine frequency response of the system $H(\Omega)$.

(ii) Find the impulse response h[n] of the system. **(08 Marks)**

OR

8 a. Use appropriate properties to find DTFT of the following signal:

(i) $x[n] = \left[\frac{1}{2}\right]^n u[n-2]$.

(ii) $x[n] = n\left[\frac{1}{2}\right]^{|n|}$ **(08 Marks)**

b. A discrete LTI first order system is given by,

$y[n] = x[n] + x[n-1]$

Find out the frequency response of the system and impulse response. **(08 Marks)**

Module-5

9 a. Determine the z-transform, ROC and the location of poles and zeros of X(z) for the given x(n),

$$x(n) = -\left(\frac{1}{2}\right)^n u(-n-1) - \left(-\frac{1}{3}\right)^n u(-n-1).$$ **(08 Marks)**

b. Use the method of partial fractions to obtain time domain signal corresponding to the given X(z).

$$X(z) = \frac{z^2 - 3z}{z^2 + \frac{3}{2}z - 1} \quad \text{ROC } \frac{1}{2} < |z| < 2$$ **(08 Marks)**

OR

10 a. What are the properties of Region Of Convergence (ROC) in z-transform? **(04 Marks)**

b. Find the inverse – z transform of $X(z) = \ln(1 + z^{-1})$ using power series expansion. **(04 Marks)**

c. Solve the following difference equation using unilateral z-transform:

$$y(n) - \frac{3}{2}y(n-1) + \frac{1}{2}y(n-2) = x(n) \quad \text{for } n \geq 0$$

$$y(-1) = 4,\ y(-2) = 10 \text{ and } x(n) = \left(\frac{1}{4}\right)^n u(n)$$ **(08 Marks)**

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15EE552

Fifth Semester B.E. Degree Examination, Dec.2019/Jan.2020
Electrical Engineering Materials

Time: 3 hrs. Max. Marks: 80

Note: *Answer any FIVE full questions, choosing ONE full question from each module.*

Module-1

1 a. Explain about Spintronics. **(05 Marks)**
b. Explain about Left handed materials. **(05 Marks)**
c. Explain Seebeck effect. **(06 Marks)**

OR

2 a. List out the factors affecting conductivity. **(04 Marks)**
b. Explain about Ferromagnetic Semiconductor. **(06 Marks)**
c. Explain about Wiedemann – Franz Law and Lorentz relation. **(06 Marks)**

Module-2

3 a. Compare between Low Resistance and High Resistive Materials. **(08 Marks)**
b. Compare different polarization processes. **(08 Marks)**

OR

4 a. Explain material for brush, cable, Fuse, Solder. **(08 Marks)**
b. Explain Dielectric strength and Dielectronic loss. **(08 Marks)**

Module-3

5 a. Explain properties and applications of mica and Bakelite. **(06 Marks)**
b. Explain Bubble theory for Liquids. **(05 Marks)**
c. Explain properties of Gaseous insulating materials. **(05 Marks)**

OR

6 a. Explain Paramagnetism with material examples. **(06 Marks)**
b. Explain Ferro magnetic material properties and applications. **(08 Marks)**
c. List out equations for i) Relative permittivity ii) Susceptibility. **(02 Marks)**

Module-4

7 a. Explain about Soft magnetic materials. **(08 Marks)**
b. Explain properties and application of Type – I super conductors. **(08 Marks)**

OR

8 a. Explain properties of High Energy Magnetic materials. **(08 Marks)**
b. Explain BCS theory for super conductor. **(08 Marks)**

Module-5

9 a. Explain mechanical properties of plastics. **(04 Marks)**
b. Explain optical properties of semiconductor. **(04 Marks)**
c. Define following :
(i) Reflection (ii) Refraction (iii) Transmitivity (iv) Luminescence. **(08 Marks)**

OR

10 a. Explain properties and application of thermoplastics. **(08 Marks)**
b. Explain optical properties of metals and non- metals. **(08 Marks)**

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15EE563

Fifth Semester B.E. Degree Examination, Dec.2019/Jan.2020
Renewable Energy Sources

Time: 3 hrs. Max. Marks: 80

Note: *Answer any FIVE full questions, choosing ONE full question from each module.*

Module-1

1 a. Explain the causes of energy scarcity. What are the solution to energy scarcity and limitations of renewable energy sources? **(09 Marks)**

b. Explain the factors affecting energy resources development. **(04 Marks)**

c. Explain the classification energy resources. **(03 Marks)**

OR

2 a. With reference to the solar radiation geometry define the following :
Declination Angle(δ), Latitude angle(ϕ), Solar Altitude Angle(α), Surface Azimuth Angle(γ). **(06 Marks)**

b. Calculate Zenith angle of the sun at Lucknow (26.75°N) at 9.30AM on February 16, 2014. **(04 Marks)**

c. Write the short notes on the following :
i) Beam and diffuse radiation and
ii) Solar constant. **(06 Marks)**

Module-2

3 a. With a neat sketches, discuss the important parts of any flat plate collector? Discuss the material aspects of individual parts. **(08 Marks)**

b. What are the advantages and disadvantages of concentrating collectors over a flat plate collectors. **(08 Marks)**

OR

4 a. Write a notes on the following :
i) Solar water heating system
ii) Solar pond power generation. **(06 Marks)**

b. Explain the principle of solar photovoltaic power generation? What are main parts of solar PV systems? **(05 Marks)**

c. What are the major advantages and disadvantages of solar PV systems? **(05 Marks)**

Module-3

5 a. State and explain briefly the methods of hydrogen production technologies. **(05 Marks)**

b. What are the applications, advantages and disadvantages of hydrogen energy? **(07 Marks)**

c. Mention the problems associated with the development and application of hydrogen energy. **(04 Marks)**

OR

6 a. Explain the considerations and guidelines for the site selection of wind power generation. **(05 Marks)**

b. Explain any one type of geothermal based electric power generation. **(06 Marks)**

c. What are the advantages and disadvantages of horizontal – axis wind turbine? **(05 Marks)**

Module-4

7 a. Explain the theory of biomass gasification? List the classification ad applications of biomass gasifiers. **(04 Marks)**

b. Explain with figures up draft and down draft gasifiers? What are their uses above gasifiers. **(08 Marks)**

c. What are the main applications of gasifiers. **(04 Marks)**

OR

8 a. What is biogas? Explain with block diagram and main stages (process) of Anaerobic digestion. **(05 Marks)**

b. Explain the construction and working of a typical biogas plants. **(06 Marks)**

c. What are the advantages and disadvantages tidal power generation? **(05 Marks)**

Module-5

9 a. Discuss the principle and working of sea wave energy. What are the limitations sea wave energy conversion? **(05 Marks)**

b. What are the advantages and disadvantages of sea wave power? Limitations of sea wave power. **(06 Marks)**

c. Write a note on devices for harnessing wave energy. **(05 Marks)**

OR

10 a. Explain the principle of OTEC? Explain the basic Rankine cycle and its working. **(05 Marks)**

b. With block diagram, explain the working of open cycle OTEC. **(05 Marks)**

c. What are the advantages, disadvantages and benefits of OTEC? **(06 Marks)**

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17EE51

Fifth Semester B.E. Degree Examination, Dec.2019/Jan.2020
Management and Entrepreneurship

Time: 3 hrs. Max. Marks: 100

Note: *Answer any FIVE full questions, choosing ONE full question from each module.*

Module-1

1 a. What is management? Discuss the various characteristics of management. **(07 Marks)**
b. Explain the various roles played by the manager. **(07 Marks)**
c. Discuss whether management is art, science or profession. **(06 Marks)**

OR

2 a. Discuss the hierarchy of plans with examples. **(06 Marks)**
b. What are the different steps involved in planning? Explain. **(08 Marks)**
c. What is decision making? Classify the different types of decisions. **(06 Marks)**

Module-2

3 a. What are the various principles of management? **(08 Marks)**
b. Explain the steps in selection process. **(06 Marks)**
c. What are the various types of organizations? Explain line organization. **(06 Marks)**

OR

4 a. Distinguish between centralization and decentralization. **(04 Marks)**
b. Explain Maslow's and Hertzberg's theories of motivation. **(10 Marks)**
c. Write a note on barriers of communication. **(06 Marks)**

Module-3

5 a. Who are entrepreneurs? What are their qualities? Explain any two important qualities. **(07 Marks)**
b. What are the various stages in the entrepreneurial process? Discuss. **(09 Marks)**
c. Differentiate between entrepreneur and Intrapreneur. **(04 Marks)**

OR

6 a. Discuss the social responsibilities of business towards different groups. **(08 Marks)**
b. Write a note on classification of entrepreneurs. **(06 Marks)**
c. What is Social Audit? List the merits and demerits of internal and external auditing. **(06 Marks)**

Module-4

7	a.	Define SSI. What are the general characteristics of SSI?	(06 Marks)
	b.	Discuss the role of SSI in the development of the country.	(08 Marks)
	c.	Explain the various problems faced by SSI.	(06 Marks)

OR

8	a.	Write a note on the activities of SIDBI and KIADB.	(08 Marks)
	b.	List the institutions that provide technical, marketing and training support to small industries.	(06 Marks)
	c.	What are the important functions of NSIC?	(06 Marks)

Module-5

9	a.	Explain the meaning of projects. Classify them.	(05 Marks)
	b.	What are the steps involved in the formulation of project report? Explain.	(10 Marks)
	c.	Write a note on project life cycle.	(05 Marks)

OR

10	a.	Discuss the concept and importance of network analysis.	(06 Marks)
	b.	What are the steps involved in CPM? List its merits and demerits.	(08 Marks)
	c.	What is PERT? Explain.	(06 Marks)

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17EE52

Fifth Semester B.E. Degree Examination, Dec.2019/Jan.2020
Microcontroller

Time: 3 hrs. Max. Marks: 100

Note: Answer any FIVE full questions, choosing ONE full question from each module.

Module-1

1 a. Draw the block diagram of 8051 μC. Explain the working of:
(i) Program counter and data pointer
(ii) Accumulator and register B
(iii) Register bank, stack and stack pointer **(10 Marks)**

b. Draw and explain program status word register of 8051 μC. Calculate the status of carry, auxiliary carry and parity flags after the addition of (i) 55h and 52h (ii) 91h and 92h. What is the hexadecimal sum in each case? **(10 Marks)**

OR

2 a. Explain register indirect addressing mode. State its advantages. **(05 Marks)**

b. Explain indexed addressing mode with MOVC and MOVX instructions. **(05 Marks)**

c. What is memory address decoding? Explain the steps in interfacing memory chips to μC. Develop the interfacing circuit to connect 4K × 8 memory IC using logic gates as decoder. Assume the memory address from 3000 h to 3FFF h. **(10 Marks)**

Module-2

3 a. Define assembler directive. Explain DB and ORG directives. **(05 Marks)**

b. Write a program to multiply 35 by 10 using repeated addition. Save the result in R6. Neglect carry. **(05 Marks)**

c. Explain the working of MUL AB and DIV AB instructions. **(05 Marks)**

d. State the following instructions as valid or invalid. Give reasons:
(i) MOV A, @ R4 (ii) PUSH R0 (iii) MOV R5, R6
(iv) POP 00h (v) MOV P1, #0FFh **(05 Marks)**

OR

4 a. Explain the working of port 0 as input port. State its dual role. **(05 Marks)**

b. Calculate the delay for the following program. Assume clock frequency as 11.0592 MHz.

	Machine cycle
MOV R3, #255	1
GO: NOP	1
NOP	1
DJNZ R3, GO	2
RET	1

(05 Marks)

c. How the following numbers are represented in 8051?
(i) 4 (ii) –4 (iii) 82 (iv) –82 (v) –128 **(05 Marks)**

d. Explain the working of overflow flag. After the addition of +45 with +04, what is the status of overflow flag and what is the sum, according to μC? **(05 Marks)**

Module-3

5 a. State and explain the advantages of using 'C' program for 8051 μC. **(05 Marks)**

b. Write 8051 'C' program to toggle bit D7 of port 0, 60,000 times. **(05 Marks)**

c. Explain the differences between sbit, bit and sfr declarations. **(05 Marks)**

d. Write 8051 'C' program to convert ASCII digits '9' and '2' to packed BCD and display it on port P2. **(05 Marks)**

OR

6 a. Explain the bit status of TMOD register. **(05 Marks)**

b. Write an assembly program to generate square wave with ON time = 5 ms and OFF time = 20 ms on all pins of port-1. Use Timer0 in Mode1. Assume crystal frequency = 11.0592 MHz. Calculate the duty cycle. Explain TH0, TL0 and TMOD calculations. **(10 Marks)**

c. Explain the characteristics and operations of mode-2 program in 8051 timer. **(05 Marks)**

Module-4

7 a. Explain the bit status of SCON register. With XTAL = 11.0592 MHz, calculate the TH1 value needed for the band rates; (i) 9600 (ii) 2400. **(10 Marks)**

b. A square wave is being generated at pin P1.2. This square wave is to be sent to a receiver connected in serial form to 8051.Write an assembly language program for this. Explain the calculations of TMOD, SCON, TH1 value. Assume Timer0 and Timer1 in Mode2. Assume baud rate = 9600 and XTAL = 11.0592 MHz. **(10 Marks)**

OR

8 a. Compare interrupts versus polling methods, in 8051 interrupts. **(05 Marks)**

b. Explain the 6 interrupts in 8051. Also state its ROM location. **(05 Marks)**

c. Write an assembly program to get data continuously from port 0 and send it to port P1 while simultaneously creating a square wave of 200 μs period on P2.1 Use Timer0 to create square wave. Assume XTAL = 11.0592 MHz. Explain IE, TMOD, TH0 calculations. **(10 Marks)**

Module-5

9 a. State advantages of LCD over multi-segment LEDS. Explain the architecture and working of 14 pin LCD. Draw its schematic diagram. **(10 Marks)**

b. Explain the interfacing circuit of DAC to 8051 μC. If I_{ref} = 2 mA, calculate the DAC output if all the inputs to DAC are high. **(05 Marks)**

c. Calculate V_0 of sawtooth wave (with respect to DAC interface) with the following program. Assume R_F = 5 KΩ in I/V converter in DAC circuit interfacing.[Refer fig.Q9(c)]

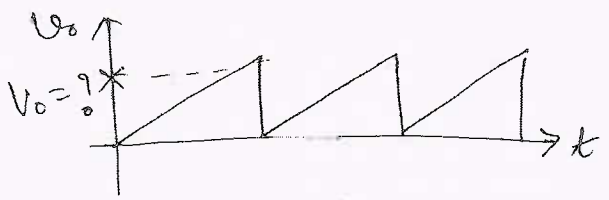

Fig.Q9(c)

```
Program:  MOV A, #00h
          MOV P1, A
       GO: INC A
          SJMP GO
```

(05 Marks)

OR

10 a. Explain the construction and working of stepper motor. Also explain 2-ϕ, 4 step stepping sequence, step angle and steps per revolution. **(10 Marks)**

b. Explain the control word format of 8255 IC. What is the control word for all the ports as output ports? **(05 Marks)**

c. Explain the principle of opto isolator and its purpose in interfacing to 8051 μC. **(05 Marks)**

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CBCS SCHEME

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17EE53

Fifth Semester B.E. Degree Examination, Dec.2019/Jan.2020
Power Electronics

Time: 3 hrs. Max. Marks: 100

Note: *Answer any FIVE full questions, choosing ONE full question from each module.*

Module-1

1 a. Explain any five types of power electronics converter system and also specify the form of input and output waveform. **(10 Marks)**

b. With block diagram, explain the peripheral effects of power electronic equipments. **(06 Marks)**

c. Discuss the major industrial applications of power electronic converter circuits. **(04 Marks)**

OR

2 a. Briefly explain the different types of power diodes. **(08 Marks)**

b. With circuit diagram and waveform explain uncontrolled single phase full wave rectifier with RL load. **(08 Marks)**

c. Compare the advantages and disadvantages of bridge rectifier and rectifier with center tapped transformer. **(04 Marks)**

Module-2

3 a. With neat circuit diagram, explain steady state and switching characteristics of power MOSFET. **(12 Marks)**

b. A BJT is specified to have β in the range 8 to 40 load resistance $R_C = 11\Omega$, the DC supply voltage is $V_{CC} = 200$volts and the input voltage to the base circuit is $V_{BB} = 10$ volts. If $V_{CE(sat)} = 1$ volt and $V_{BE(sat)} = 1.5$ volt, find :

i) The value of R_B that result in saturation with an ODF of 5.

ii) The forced β value and

iii) Power loss in the transistor. **(08 Marks)**

OR

4 a. With necessary waveform explain the switching characteristics of IGBT. **(06 Marks)**

b. Discuss the importance of providing isolation of gate/base drive from power circuits and explain the two methods. **(06 Marks)**

c. Sketch the structure of n-channel enhancement type MOSFET and explain its working principle. **(08 Marks)**

Module-3

5 a. Explain the V-I characteristics of SCR also define : i) Holding current ii) Latching current. **(06 Marks)**

b. Explain different methods of turning ON of thyristor. **(08 Marks)**

c. For the circuit shown in Fig.Q5(c). If the latching current is 4mA calculate the minimum width of gate pulse required properly turn ON the SCR. **(06 Marks)**

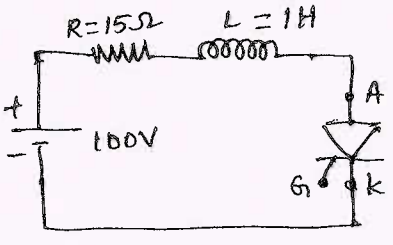

Fig.Q5(c)

OR

6 a. Derive an expression for the anode current of thyristor with the help of two transistor analogy. **(10 Marks)**

b. With circuit diagrams and waveforms, explain the methods of protection of SCR. **(10 Marks)**

Module-4

7 a. With the help of circuit diagram and wave forms, explain the working of single – phase full converter with R–L load. **(10 Marks)**

b. A single phase full wave AC voltage controller has an input voltage of 230V and load resistance of 10Ω. The firing angle is 45°, calculate :

i) RMS output voltage
ii) The output power
iii) The input power factor. **(10 Marks)**

OR

8 a. With circuit diagram and waveforms explain 1ϕ dual converter. **(10 Marks)**

b. With circuit diagram and waveform, explain the operation of 3ϕ full converters. **(10 Marks)**

Module-5

9 a. Explain the working of step-up chopper. Draw the relevant waveforms, derive an expression for average output voltage. **(08 Marks)**

b. Write a note on performance parameters of chopper. **(04 Marks)**

c. A stepdown chopper with resistive load has a resistive load of 10Ω and the input voltage is V_S = 220V. When the converter switch remains ON its voltage drop is 2V and the chopping frequency is f = 1KHz, if the duty cycle is 50% determine :

i) Average output voltage
ii) RMS output voltage
iii) Chopper efficiency
iv) Effective input resistance. **(08 Marks)**

OR

10 a. With circuit diagram, explain the operation of a single phase–full bridge inverter suppling a resistive load. **(10 Marks)**

b. Explain any two modulation technique available for voltage control of a single phase inverter. **(10 Marks)**

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17EE54

Fifth Semester B.E. Degree Examination, Dec.2019/Jan.2020
Signals and Systems

Time: 3 hrs. Max. Marks: 100

Note: *Answer any FIVE full questions, choosing ONE full question from each module.*

Module-1

1 a. Explain operations performed on the independent variables of a continuous time signals. **(06 Marks)**

b. Explain even and odd component of the signal and derive its equation. Also find and sketch the even and odd component of the signal. $x(t) = e^{-t/4}\ u(t)$. **(06 Marks)**

c. Sketch the signal :

i) $x(t) = -u(t+3) + 2u(t+1) - 2u(t-1) + u(t-3)$

ii) $x(t) = r(t+1) - r(t) + r(t-1)$. **(08 Marks)**

OR

2 a. Explain energy and power signals with its equation. **(06 Marks)**

b. For the system, determine whether the system is linear, time invariant, memoryless, causal and stable. $H\{x(n)\} = x(n - n_d)$. **(06 Marks)**

c. Find total energy of

i) $x(t) = \begin{cases} \frac{1}{2}[\cos\omega t + 1]; & \frac{-\pi}{2} \le t \le \frac{\pi}{2} \\ 0; & \text{otherwise} \end{cases}$

ii) $x(n) = \begin{cases} n; & 0 \le n \le 5 \\ 10 - n; & 5 < n \le 10 \\ 0; & \text{otherwise} \end{cases}$. **(08 Marks)**

Module-2

3 a. Find the total response of the system given by : $\frac{d^2y(t)}{dt^2} \frac{3dy(t)}{dt} + 2y(t) = 2x(t)$

With $y(0) = -1$ and $\frac{d}{dt}y(t)\Big|_{t=\infty} = 1$ and $x(t) = \cos u(t)$. **(06 Marks)**

b. Find the difference equation corresponding to the block diagram shown in Fig.Q3(b). **(06 Marks)**

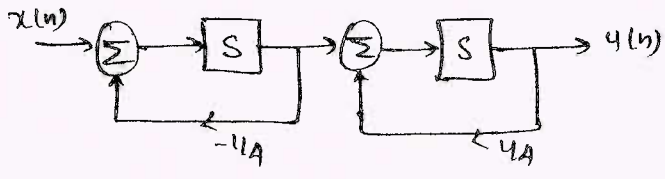

Fig.Q3(b)

c. Evaluate the convolution of x(n) and h(n), where

$x(n) = 1;\ 0 \le n \le 4;\ h(n) = \alpha^n;\ 0 \le n \le 6$

$= 0;$ otherwise ; $= 0;$ otherwise **(08 Marks)**

OR

4 a. Find the forced response of the system described by the difference equation :

$$y(n) = \frac{5}{6}y(n-1) + \frac{1}{6}y(n-2) = x(n)$$

Where $x(n) = 2^n : n \geq 0$. **(06 Marks)**

$= 0$: elsewhere

b. Explain the following properties of impulse response representation of LTI system

i) Distributive ii) Associative iii) Causal. **(06 Marks)**

c. Evaluate $y(t) = x(t) * h(t)$ for $x(t) = e^{-3t}\{u(t) - u(t-2)\}$ and $h(t) = e^{-t}u(t)$. **(08 Marks)**

Module-3

5 a. Describe the following properties of CTFT :

i) Parsavel's theorem

ii) Frequency differentiation

iii) Frequency shift. **(06 Marks)**

b. Obtain the CTFT of the signal $x(t) = e^{-at}u(t)$; $a > 0$. Draw its magnitude and phase spectra. **(06 Marks)**

c. Find CTFT of the signal :

i) $x(t) = t\,e^{-2t}\,u(t)$. Obtain its magnitude and phase spectra.

ii) x(t) is describe by the following Fig.Q5(c). **(08 Marks)**

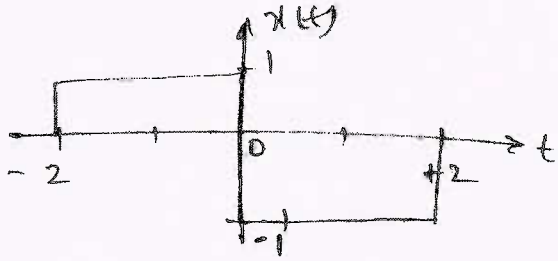

Fig.Q5(c)

OR

6 a. Explain the following properties of CTFT.

i) Scaling

ii) Integration

iii) Modulation. **(06 Marks)**

b. Find the Fourier transform of the signum function described by

$sgn(t) = 1 \quad : t > 0;$

$= -1 \quad : t < 0$

Draw its magnitude and phase spectra. **(06 Marks)**

c. Evaluate the Fourier transform of the signal

$x(t) = 1 + \cos \pi t : |t| \leq 1$

$= 0 \quad : |t| > 1$

$x(t) = e^{-3(t)} \sin 2t$: using appropriate properties. **(08 Marks)**

Module-4

7 a. Discuss the properties of DTFT for i) Linearity ii) Scaling iii) Modulation. **(06 Marks)**

b. Find the DTFT of the signal i) $x(n) = \alpha^n u(n) : |\alpha| < 1$. Draw its magnitude spectrum $x(n) = \{1, 3, \underset{\uparrow}{5}, 3, 1\}$ and evaluate DTFT at $\Omega = 0$. $[X(e^{i\Omega}) \text{ at } \Omega = 0]$. **(06 Marks)**

c. Find the DTFT of the signal with the magnitude spectrum :

i) $\delta(n)$

ii) $x(n) = 1 : |n| \leq m$

$= 0 \; |n| > m$

Where x(n) is an rectangular pulse. **(08 Marks)**

OR

8 a. Describe the properties of DTFT for i) Time shift ii) Time scaling iii) Convolution. **(06 Marks)**

b. Find the DTF of the signal described by : i) x(n) = u(n) ii) x(n) = u(n) – u(n – 6). **(06 Marks)**

c. Find the DTFT of the signal

i) $x(n) = a^{|n|} : |a| < 1$

ii) $x(n) = \left\{1, 1, 0, \underset{\uparrow}{0}, 0, 1, -1\right\}$

Derive the expression for phase and magnitude spectra. **(08 Marks)**

Module-5

9 a. Define region of convergence and derive an equation for ROC. **(06 Marks)**

b. Find the Z–transform of the signal $x(n) = 7(\frac{1}{3})^n u(n) - 6(\frac{1}{2})^n u(n)$ also find the ROC. **(06 Marks)**

c. Describe the following properties of Z-transform :

i) Scaling in Z–domain

ii) Time reversal

iii) Time expansion. **(08 Marks)**

OR

10 a. Describe the properties of region of convergence in z – plane. **(06 Marks)**

b. Determine the Z-transform of $x(n) = -u(-n-1) + (\frac{1}{2})^n u(n)$. Find the ROC and pole zero location s of X(z) in Z plane. **(06 Marks)**

c. Using appropriate properties, find the Z-transform of the signal.

i) $x(n) = 3.2^n u(-n)$

ii) $x(n) = n^2 (\frac{1}{2})^n u(n-3)$. **(08 Marks)**

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CBCS SCHEME

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17EE552

Fifth Semester B.E. Degree Examination, Dec.2019/Jan.2020
Electrical Engineering Materials

Time: 3 hrs. Max. Marks: 100

Note: Answer any FIVE full questions, choosing ONE full question from each module.

Module-1

1 a. Explain the requirement of engineering materials. **(10 Marks)**

b. Discuss the different levels of material structure. **(06 Marks)**

c. What is Thomson effect? Mention its types. **(04 Marks)**

OR

2 a. Classify the solids on the basis of energy gap and briefly explain each of them. **(10 Marks)**

b. Briefly explain working principle of spintronics devices. **(04 Marks)**

c. Briefly explain thermal conductivity of solids. **(06 Marks)**

Module-2

3 a. What are the types of conducting materials? Explain. **(10 Marks)**

b. What are requirements of good contact materials? Explain the types of contact materials. **(10 Marks)**

OR

4 a. What is dielectric strength? Explain the types of dielectric breakdowns. **(10 Marks)**

b. Explain polarizability and factors affecting polarizability. **(10 Marks)**

Module-3

5 a. What are the requirements of good insulating materials? Write the characteristics of transformer oil. **(10 Marks)**

b. Briefly explain following gaseous insulating materials:
(i) Air
(ii) Vacuum **(06 Marks)**

c. Give classification of magnetic materials on the basis of distribution of magnetic moments. Explain in brief. **(04 Marks)**

OR

6 a. Derive the relation between relative permeability and magnetic susceptibility. **(06 Marks)**

b. Relative permeability of "supermalloy" is 200000 it has a magnetization of 6000 A/m. Determine the strength of magnetic thus produced. Take $\mu_0 = 4\pi \times 10^{-7}$ henry/metre. **(06 Marks)**

c. Define the following terms:
(i) Magnetic dipole moment
(ii) Bohr magneton
(iii) Magnetic flux density
(iv) Susceptibility **(08 Marks)**

Module-4

7 a. What are the types of magnetic materials? Explain. **(10 Marks)**

b. Explain commercial grade soft magnetic materials. **(10 Marks)**

OR

8 a. Prove that the susceptibility of a super conductor is –1 and relative permeability is zero. **(06 Marks)**

b. Briefly explain the following:
(i) Silsbee rule
(ii) London's theory for type-I superconductors. **(06 Marks)**

c. What are the applications and limitations of super conductors? **(08 Marks)**

Module-5

9 a. Explain the optical properties of metals and nonmetals. **(08 Marks)**

b. Sketch and explain the construction and working of photoconductive cell. **(08 Marks)**

c. Define the following:
(i) Photo emissivity
(ii) Optical absorption
(iii) Brightness
(iv) Photons **(04 Marks)**

OR

10 a. What is luminescence? What are its different types? Differentiate between fluorescence and phosphorescence. **(08 Marks)**

b. What is optical absorption? State the condition of photon absorption. Explain optical absorption. **(08 Marks)**

c. Explain mechanical properties of plastics. **(04 Marks)**

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17EE563

Fifth Semester B.E. Degree Examination, Dec.2019/Jan.2020
Renewable Energy Resources

Time: 3 hrs. Max. Marks: 100

Note: *Answer any FIVE full questions, choosing ONE full question from each module.*

Module-1

1 a. Explain causes of energy scarcity. **(06 Marks)**

b. Classify the energy resources. What are the factors affecting energy resource development. **(08 Marks)**

c. Discuss Indian renewable energy availability. **(06 Marks)**

OR

2 a. With the help of a diagram. Define :
i) Hour angle
ii) Latitude angle
iii) Solar Azimuth angle
iv) Declination angle. **(08 Marks)**

b. Explain basic Rankine cycle of electricity production. **(04 Marks)**

c. Briefly explain any six solar thermal energy applications. **(08 Marks)**

Module-2

3 a. With a neat sketch discuss the operation of solar flat plate air and liquid collectors. **(08 Marks)**

b. Explain the advantages of solar pond? Discuss the operation of a solar pond with neat diagram. **(06 Marks)**

c. Discuss solar space cooling and solar cookers working and uses. **(06 Marks)**

OR

4 a. Explain about solar cell materials. **(06 Marks)**

b. Discuss the various applications of solar cell systems. **(06 Marks)**

c. Explain I-V characteristics of a solar cell. Discuss the efficiency of a solar cell. **(08 Marks)**

Module-3

5 a. Discuss the advantages of hydrogen energy. **(06 Marks)**

b. Explain different hydrogen production technologies. **(06 Marks)**

c. Discuss the considerations and guidelines for wind turbine site selection. Also explain worldwide wind energy scenario. **(08 Marks**

OR

6 a. With a neat diagram, explain any two types of Geothermal Based Electric power generations. **(08 Marks)**

b. With a block diagram briefly explain waste recovery management scheme. **(08 Marks)**

c. Discuss the recycling of plastics. **(04 Marks)**

Module-4

7	a.	Explain how biomass production takes place.	(06 Marks)
	b.	With a neat sketch, explain updraft and down draft gasifiers.	(08 Marks)
	c.	Explain advantages and uses of Biogas.	(06 Marks)

OR

8	a.	Explain the single basin and two basin systems of tidal power harnessing.	(08 Marks)
	b.	With a neat diagram, explain floating dome type biogas plant.	(08 Marks)
	c.	Discuss the tidal Power Generation in India.	(04 Marks)

Module-5

9	a.	Explain the various devices for Harnessing wave energy.	(06 Marks)
	b.	What are the advantages and disadvantages of wave power?	(06 Marks)
	c.	Explain open cycle and closed cycle OTEC techniques.	(08 Marks

OR

10	a.	With a neat diagram, explain oscillating water column device for harnessing sea wave energy.	(08 Marks)
	b.	Explain basic OTEC hybrid cycle.	(06 Marks)
	c.	What are the advantages disadvantages and benefits of OTEC?	(06 Marks)

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15EE61

Sixth Semester B.E. Degree Examination, Dec.2019/Jan.2020
Control System

Time: 3 hrs. Max. Marks: 80

Note: Answer any FIVE full questions, choosing ONE full question from each module.

Module-1

1 a. Define Control System. Distinguish between open-loop and closed loop control system with an examples. **(06 Marks)**

b. For the mechanical system shown in Fig.Q1(b), write the differential equation relating to the force F(t). Also obtain the analogous electrical circuits based on i) Force-current analogy ii) Force-voltage analogy. **(10 Marks)**

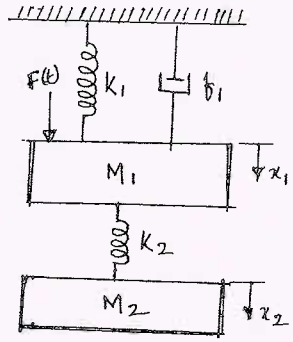

Fig 1(b) Mechanical System.

Fig.Q.1(b)

OR

2 a. Define servomotor. Compare AC servomotor and DC servomotor. **(04 Marks)**

b. Derive an expression for the transfer function of an armature controlled D.C. motor and also construct the block diagram of d.c. motor. **(12 Marks)**

Module-2

3 a. For the system represented by the following equations and find the transfer function X(s)/U(s) by the signal flow graph technique.

$$x = x_1 + \alpha_0 u\ ;\ \frac{dx_1}{dt} = -\alpha_1 x_1 + x_2 + \alpha_2 u\ ;\ \frac{du_2}{dt} = -\alpha_2 x_1 + \alpha_1 u$$ **(08 Marks)**

b. Using block diagram reduction technique. Obtain the transfer function of C(s)/R(s) as shown in Fig.Q.3(b). **(08 Marks)**

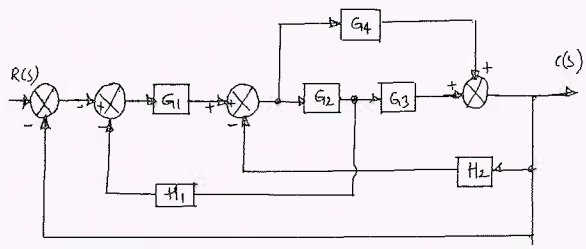

Fig.Q.3(b)

OR

4 a. State the Mason's gain formula. Find the transfer function $\frac{X_5}{X_1}$ of the system described by the signal flow graph (SFG) shown in Fig.Q.4(a). **(08 Marks)**

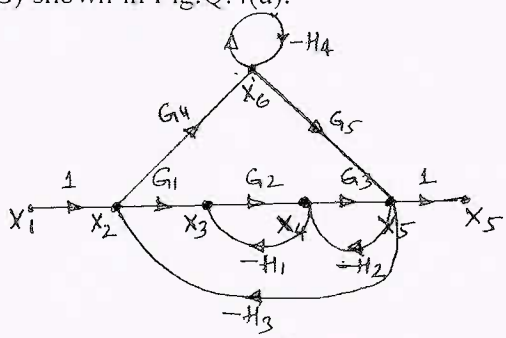

Fig.Q.4(a)

b. For the network shown in Fig.Q.4(b), construct the signal flow graph and determine the transfer function using Mason's gain formula. **(08 Marks)**

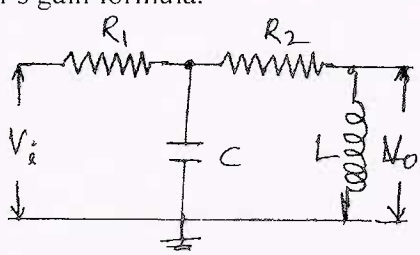

Fig.Q.4(b)

Module-3

5 a. Derive an expression for rise time and peak-time for a second order system excited by a step input (under-damped case). **(08 Marks)**

b. A unity feedback control system is characterized by an open-loop T.F. $G(s)=\frac{K}{s(s+\alpha)}$.

Where K and α are positive constant,
By what factor the amplifier gain K should be reduced so that the peak osvershoot of the unit step response reduces from 75% to 25%. **(08 Marks)**

OR

6 a. A unity feedback system having open-loop T.F. of $G(s)=\frac{K(2s+1)}{S(s+1)(s+1)^2}$. The input $r(t) = 1 + 6t$ is applied to the system. Determine the minimum value of K, if the steady state error is to be less than 0.1. **(04 Marks)**

b. A unity feedback control system has $G(s)=\frac{K(s+4)}{s(s+1)(s+2)}$ using Routh Hurwitz criterion. Find the range of K for which system to be stable and also determine the frequency of oscillations. **(06 Marks)**

c. What are the difficulties encountered while assessing the R-H criteria and how do you eliminate these difficulties? Explain with examples. **(06 Marks)**

Module-4

7 a. What do you means by (i) breakaway point and (ii) break in point. How can they be determined with an example? **(04 Marks)**

b. Sketch the roots locus plot for the system $G(s)H(s) = \frac{K}{s(s+2)(s+4)}$. Determine the range of K for which the system will have damped oscillating response. **(07 Marks)**

c. Show that part of root locus for the open loop T.F. $G(s)H(s) = \frac{K(s+2)}{S(s+1)}$ is a circle. **(05 Marks)**

OR

8 a. Derive an expression for resonant peak and resonant frequency for a second order system. **(06 Marks)**

b. Sketch the Bode-plot for the open-loop transfer function $G(s)H(s) = \frac{K}{s(s+1)(0.1s+1)}$ and determine the value of K for which system is to be stable. Also find the gain margin and phase margin. **(10 Marks)**

Module-5

9 a. State and explain the Nyquist stability criterion. **(06 Marks)**

b. Sketch the Nyquist plot and comment on the stability of the closed loop system whose open-loop transfer function is $G(s)H(s) = \frac{K(s-4)}{(s+1)^2}$. **(10 Marks)**

OR

10 a. Explain the pharse lag compensator with neat circuit diagram and derive expression for the transfer function of a lag compensator. **(06 Marks)**

b. What are the limitations of single stage phase lead control? **(04 Marks)**

c. Write notes on PID controller. **(06 Marks)**

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15EE62

Sixth Semester B.E. Degree Examination, Dec.2019/Jan.2020
Power System Analysis – I

Time: 3 hrs. Max. Marks: 80

Note: Answer any FIVE full questions, choosing ONE full question from each module.

Module-1

1 a. Define per unit quantity. Mention the advantages of per unit system. **(04 Marks)**

b. Show that the per unit impedance of a transformer remains same whether it is referred to HV or LV winding. **(04 Marks)**

c. A 100MVA, 33KV 3ϕ generator has a subtransient reactance of 15%. The generator supplies 3 motors through a step-up transformer, transmission line, step-down transformer arrangement. The motors have rated inputs of 30MVA, 20MVA and 50MVA at 30KV with 20% subtransient reactance each. The three phase transformers are rated at 100MVA 32KV-Δ/110 KV-Y with 8% leakage reactance. The line has a reactance of 50Ω. By selecting the generator ratings as base in the generator circuit, determine the loose values in all other parts of the system, Hence evaluate the corresponding per unit values and draw the equivalent per unit reactance diagram. (Ref.Fig.Q.1(c)) **(08 Marks)**

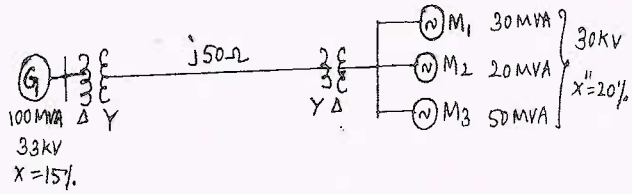


Fig.Q.1(c)

OR

2 a. Draw single line diagram of a power system indicating the various components of it. Obtain the impedance diagram and reactance diagram. Explain each component and the assumptions made to draw the reactance diagram. **(08 Marks)**

b. A 300MVA, 20KV 3 phase generator has a reactance of 20%. The generator supplies two motors M_1 and M_2 over a transmission line of 64KM as shown in one line diagram in Fig.Q.2(b).

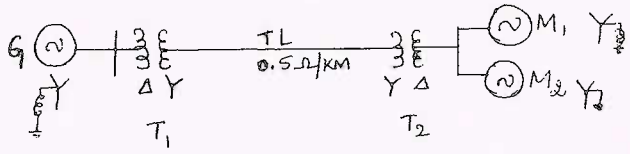


Fig.Q.2(b)

Ratings:

T_1 : 350MVA 230 KV-Y/20KV-Δ, X = 10%

T_2 : Composed of three single phase transformers each rated $\underset{Y}{127}/\underset{\Delta}{13.2}$KV, 100MVA with reactance of 10%

M_1 : 200MVA, 13.2 KV X″ = j0.2pu

M_2 : 100MVA, 13.2 KV X″ = j0.2pu

Select the generator ratings as base and draw the reactance diagram with all reactances marked in pu. **(08 Marks)**

Module-2

3 a. Explain the transients occurring on a transmission line on the occurrence of a short circuit. Obtain the expression for maximum momentary current. **(06 Marks)**

b. A 25MVA, 11KV generator with $X''_d = 20\%$ is connected through a transformer, line and a transformer to a bus that supplies three identical motors as shown in Fig.Q.3(b). Each motor has $X''_d = 25\%$ and $X'_d = 30\%$ on a base of 5MVA, 6.6KV. The three phase rating of the step-up transformer is 25MVA, 11/66 KV with a leakage reactance of 10% and that of step-down transformer is 25MVA, 66/6.6KV with X = 10%. The bus voltage of the motors is 6.6KV when a three-phase fault occurs at point F. Calculate:

i) The subtransient current in the fault
ii) The subtransient current in the breaker B
iii) The momentary current in breaker B and
iv) The current to be interrupted by breaker B in five cycles.

X of transmission line is 15% on a base of 25MVA, 66KV. Assume that the system is on no load when the fault occurs.

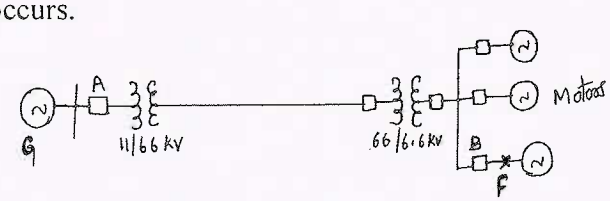


Fig.Q.3(b) **(10 Marks)**

OR

4 a. With the help of oscillogram of short circuit current, of a synchronous generator, operating on no load, distinguish between subtransient, transient and steady state periods. Prove that $X''_d < X'_d < X_d$. **(08 Marks)**

b. A 25MVA, 13.2KV synchronous generator is connected to a synchronous motor of same rating. Both have a transient reactance of 15%. The line connecting them has a reactance of 10% on the machine base. The motor is drawing a power of 18MW at 0.8 pf lead, at 12.9KV, when a short circuit occurs at its terminals, find the subtransient currents in the motor, generator and at fault points. **(08 Marks)**

Module-3

5 a. What are symmetrical components? Obtain the expression for symmetrical components interms of unbalanced phasor of voltages and currents. **(06 Marks)**

b. What are sequence impedances and sequence networks? Explain the sequence impedances of a synchronous generator. **(06 Marks)**

c. In a 3 phase system supplying power to a Y load, the line currents when the neutral of the supply is not connected to the neutral of the load are $I_a = 20\angle 0°\,A$ and $I_b = 20\angle -100°\,A$. When the neutrals are connected, the current through the neutral wire is found to be $12\angle -30°\,A$. Determine the line currents under this situation. **(04 Marks)**

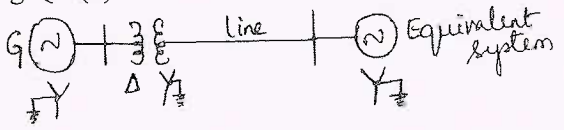
OR

6 a. Determine the relation between the symmetrical components of voltages on either side of a star-delta transformer. **(08 Marks)**

b. Explain the effect of neutral in 3 phase system with 3 wire and four wire. **(04 Marks)**

c. A 250MVA, 11KV, 3 phase generator is connected to a large system through a transformer and a line as shown in Fig.Q.6(c).

Fig.Q.6(c)



The parameters on 250MVA base are as follows:
Generator: $X_1 = X_2 = 0.15$pu $X_0 = 0.1$pu
Transformer: $X_1 = X_2 = X_0 = 0.12$pu
Line: $X_1 = X_2 = 0.25$pu $X_0 = 0.75$pu
Equivalent system: $X_1 = X_2 = X_0 = 0.15$pu. Draw the sequence network diagrams for the system and indicate all per unit values. **(04 Marks)**

Module-4

7 a. Define faults. Classify the unsymmetrical faults with its frequency of occurrence. **(04 Marks)**

b. Derive expression for fault currents if double line to ground fault occurs through fault impedance Z_f on a power system. **(08 Marks)**

c. A three phase generator with an open circuit voltage of 400V is subjected to an LG fault through a fault impedance of j2Ω. Determine the fault current if $z_1 = j4\Omega$, $z_2 = j2\Omega$ and $z_0 = j1\Omega$. Repeat the problem for LL fault. **(04 Marks)**

OR

8 A synchronous motor is receiving 10MW of power at 0.8pf lag at 6KV. An LG fault takes place at the mid point of the transmission line as shown in Fig.Q.8. Find the fault current. The ratings of the generator, motor and transformer are as follows.
Generator: 20MVA, 11KV, $X_1 = 0.2$pu, $X_2 = 0.1$pu, $X_0 = 0.1$pu
Transformer T_1: 18MVA, 11.5Y-34.5KV, X = 0.1pu
Transmission line: $X_1 = X_2 = 5\Omega$ $X_0 = 10\Omega$
Transformer T_2: 15MVA 6.9Y – 34.5Y KV X = 0.1pu
Motor: 15MVA, 6.9KV, $X_1 = 0.2$pu, $X_2 = X_0 = 0.1$pu.

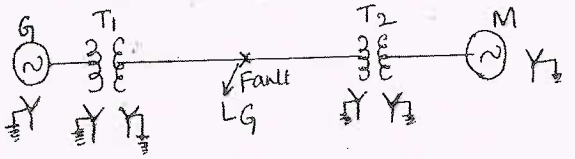


Fig.Q.8

Draw all the sequence network. **(16 Marks)**

Module-5

9 a. Derive the power angle equation of a non-salient pole synchronous machine. **(08 Marks)**

b. Find the steady state stability limit of a system consisting of a generator of equivalent reactance 0.5pu connected to an infinite bus through a series reactance of 1pu. The terminal voltage of the generator is held at 1.2pu and voltage of the infinite bus is 1.0pu. **(04 Marks)**

c. Define: i) Steady state stability and ii) Transient state stability. **(04 Marks)**

OR

10 a. Write short notes on: i) Equal area criterion ii) Swing curve **(08 Marks)**

b. A loss free alternator supplies 50MW to an infinite bus, the steady state stability limit being 100MW. Determine if the alternator will remain stable if the input to the prime mover of the alternator is abruptly increased by 40MW. **(08 Marks)**

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CBCS SCHEME

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15EE63

Sixth Semester B.E. Degree Examination, Dec.2019/Jan.2020
Digital Signal Processing

Time: 3 hrs. Max. Marks: 80

Note: *Answer any FIVE full questions, choosing ONE full question from each module.*

Module-1

1 a. Find 4 point DFT of x(n) ={1, −2, 3, 4} and plot magnitude and phase response. **(06 Marks)**

b. If $x_1(n) = \{2, 3, 1, 1\}$ and $x_2(n) = \{1, 3, 5, 3\}$, find $x_3(n) = x_1(n)$ ④ $x_2(n)$ use matrix method **(06 Marks)**

c. Prove the time reversal property of DFT. **(04 Marks)**

OR

2 a. Perform circular convolution of $x_1(n) = \{2, 1, 2, 1\}$ and $x_2(n) = \{1, 2, 3, 4\}$ using circular shift method. **(05 Marks)**

b. Find linear convolution using DFT for the given sequence x(n) = {1, 2, 3} h(n) = {1, 2, 2, 1}. **(06 Marks)**

c. Find the IDFT of the given sequence x(k) = {3, 2 + j, 1, 2 − j}. **(05 Marks)**

Module-2

3 a. Find the 8-point DFT of sequence x(n) = {1, 1, 1, 1, 0, 0, 0, 0} using DIT FFT radix 2 algorithm. Draw signal graph. **(08 Marks)**

b. Develop a Decimation in Frequency FFT algorithm for N = 8. Draw signal flow graph. **(08 Marks)**

OR

4 a. Develop a decimation in time algorithm FFT of N = 8 draw signal flow graph. **(08 Marks)**

b. Calculate 8-point DFT of sequence x(n) = {1, −1, −1, −1, 1, 1, 1, −1}, using DIF − FFT radix -2 algorithm. **(08 Marks)**

Module-3

5 a. Design an analog Chebyshev with following specification.
Passband : 1db for $0 \le \Omega \le 10$ rad/sec
Stopband attenuation : −60 db for $\Omega \ge 50$ rad/sec. **(10 Marks)**

b. The system function of an analog filter is given as $H_a(s) = \frac{1}{(s+1)(s+2)}$. Obtain H(z) using impulse invariant method take sampling frequency as 5 samples/sec. **(06 Marks)**

OR

6 a. Design a low pass Butterworth filter using bilinear transformation method to meet the following specification take T = 2sec
Passband ripple ≤ 1.25dB
Passband edge = 200 Hz
Stopband attenuation ≥ 15dB
Stopband edge = 400Hz
Sampling frequency = 2KHz **(10 Marks)**

b. Prove the following transformation relation for impulse invariant transform.

$$\frac{s+a}{(s+a)^2+b^2} = \frac{1-e^{aT}(\cos bT)z^{-1}}{1-2e^{-aT}(\cos bT)z^{-1}+e^{-2aT}z^{-2}}$$ **(06 Marks)**

Module-4

7 a. Compare bilinear transformation with impulse invariance transformation. (04 Marks)

b. Write a note on frequency warping. (06 Marks)

c. Determine Direct form – I and II for 2nd order filter given by
$y(n) = 2b \cos w_0\, y(n-1) - b^2 y(n-2) + x(n) - b \cos w_0\, x(n-1)$ (06 Marks)

OR

8 a. Obtain the Cascade form realization for given system.

$$H(z) = \frac{(z-1)(z-2)(z+1)z}{\left(z-\frac{1}{2}-\frac{1}{2}j\right)\left(z-\frac{1}{2}+\frac{1}{2}j\right)\left(z-\frac{1}{4}j\right)\left(z+\frac{1}{4}j\right)}$$ (08 Marks)

b. Design a second order lowpass digital Butterworth filter with cutoff frequency 1KHz and sampling frequency of 10^4 samples/sec by linear transformation. (08 Marks)

Module-5

9 a. Given the FIR filter with following deference equation
$y(n) = x(n) + \frac{2 \cdot x}{5}(n-1) + \frac{3}{4}x(n-2) + \frac{1}{3}x(n-3)$. Draw direct Form – I and lattice structure. (08 Marks)

b. Using frequency sampling method, design a band pass filter with following specification determine the filter coefficient for N = 7, sampling frequency F = 8000Hz, cutoff frequency $f_{c_1} = 1000\text{Hz}$, $f_{c_2} = 3000\text{Hz}$ (08 Marks)

OR

10 a. Realise the following system function in cascade form
$H(z) = 1 + \frac{3}{4}z^{-1} + \frac{17}{8}z^{-2} + \frac{3}{4}z^{-3} + z^{-4}$ in direct form I and cascade form. (08 Marks)

b. Design the symmetric FIR lowpass filter whose desired frequency response is given as

$$H_d(\omega) = \begin{cases} e^{-j\omega\alpha}, & \text{for } |\omega| \le \omega_c \\ 0, & \text{otherwise} \end{cases}$$

The length of filter should be 7 and ω_c = 1 rad/sample use rectangular window. (08 Marks)

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CBCS SCHEME

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17EE54

Fifth Semester B.E. Degree Examination, Aug./Sept.2020
Signals and Systems

Time: 3 hrs. Max. Marks: 100

Note: ***Answer any FIVE full questions, choosing ONE full question from each module.***

Module-1

1 a. Define signals and system. Explain classification of signals. **(06 Marks)**

b. State whether the following signals given are periodic or not. If periodic find the fundamental period.

i) $x(t) = (\cos(2\pi t))^2$

ii) $x(n) = \cos(\frac{1}{5}\pi n)\sin(\frac{1}{3}\pi n)$. **(06 Marks)**

c. Sketch and label for each of the following for the given signal x(t) and y(t) shown in Fig.Q1(c)(i), Fig.Q1(ii).

i) x(t) y(t – 1)

ii) x(t – 1) y(–t)

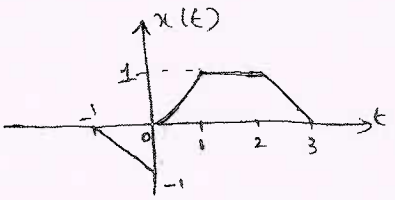

Fig.Q1(C)(i)

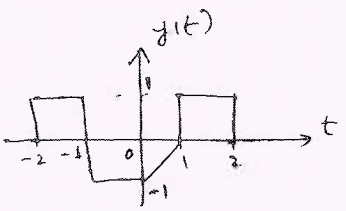

Fig.Q1(C)(ii) **(08 Marks)**

OR

2 a. Find out the even and odd component of the following signal.

i) $x(t) = (1 + t^3)\cos^3(10t)$

ii) $x(t) = 1 + t + 3t^2 + 5t^3 + 9t^4$

iii) $x(t) = \cos(t) + \sin(t) + \sin(t)\cos(t)$. **(06 Marks)**

b. For the trapezoidal pulse x(t) shown Fig.Q2(b) find the total energy.

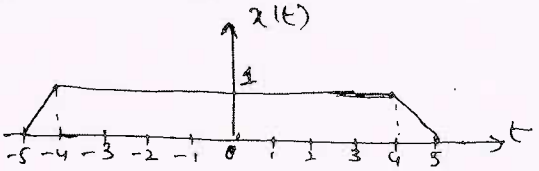

Fig.Q2(b) **(06 Marks)**

c. Determine whether the system y(t) = x(t/2) is

i) Linear ii) Time invariant iii) Causal iv) Stability. **(08 Marks)**

Module-2

3 a. Evaluate the discrete time convolution sum of signal $y(n) = (\frac{1}{2})^n u(n-2) * u(n)$. **(08 Marks)**

b. Consider a LTI system with unit impulse response $h(t) = e^{-t}$. If the input applied to this system is $x(t) = e^{-3t}\{u(t) - u(t-2)\}$ find the output y(t) of the system. **(08 Marks)**

c. Find the step response for the LTI system represented by the impulse response $h(n) = (\frac{1}{2})^n u(n)$. **(04 Marks)**

OR

4 a. Find the forced response for the system described by

$$\frac{d^2y(t)}{dt^2} + 5\frac{dy(t)}{dt} + 6y(t) = 2x(t) + \frac{dx(t)}{dt} \text{ with input } x(t) = 2e^{-t}u(t). \quad \textbf{(08 Marks)}$$

b. Sketch the direct form – I and direct form II implementations for the difference equation :
$y(n) + \frac{1}{2}y(n-1) - y(n-3) = 3x(n-1) + 2x(n-2)$. **(08 Marks)**

c. Determine a discrete – time LTI system characterized by impulse response $h(n) = (\frac{1}{2})^n u(n)$ is
i) stable ii) causal. **(04 Marks)**

Module-3

5 a. Find the Fourier transform of $x(t) = e^{-a|t|}$; $a > 0$. Draw its spectrum. **(06 Marks)**

b. Find the inverse Fourier transform of $X(j\omega) = \frac{-j\omega}{(j\omega)^2 + 3j\omega + 2}$. **(06 Marks)**

c. The impulse response of a continuous time LTI system is given by $h(t) = \frac{1}{RC}e^{-t/RC}u(t)$.
Find the frequency response and plot the magnitude and phase response. **(08 Marks)**

OR

6 a. State and prove the following properties in continuous time Fourier transform :
i) Linearity ii) Time shift iii) Convolution. **(08 Marks)**

b. Find the frequency response and the impulse response of the system described by the differential equation : $\frac{d^2y(t)}{dt^2} + \frac{5dy(t)}{dt} + 6y(t) = \frac{-dx(t)}{dt}$. **(08 Marks)**

c. Find the Fourier transform of unit step function. **(04 Marks)**

Module-4

7 a. State and prove : i) frequency shift ii) Parseval's theorem in discrete time domain. **(10 Marks)**

b. Find the DTFT of the signal $x(n) = \alpha^n u(n)$; $|\alpha| < 1$. Draw the magnitude spectrum. **(05 Marks)**

c. Find the inverse DTFT of the signal $X(e^{j\Omega}) = 1 + 2\cos\Omega + 3\cos 2\Omega$. **(05 Marks)**

OR

8 a. Obtain the frequency response and the impulse response of the system having the output
$y(n) = \frac{1}{4}(\frac{1}{2})^n u(n) + (\frac{1}{4})^n u(n)$ for the input $x(n) = (\frac{1}{2})^n u(n)$. **(10 Marks)**

b. Find the difference equation description for the system having impulse response :
$h(n) = \delta(n) + 2(\frac{1}{2})^n u(n) + (-\frac{1}{2})^n u(n)$. **(05 Marks)**

c. Find the frequency and the impulse response of the system described by the difference equation : $y(n) + \frac{1}{2}y(n-1) = x(n) - 2x(n-1)$. **(05 Marks)**

Module-5

9 a. What is Z–transform? Mention properties of Region Of Convergence (ROC). **(04 Marks)**

b. Find the Z–transform of the signal using appropriate properties.

i) $x(n) = 3.2^{n}u(-n)$

ii) $x(n) = n\sin\left(\frac{\pi}{2}n\right)u(-n)$. **(08 Marks)**

c. Find the discrete –time sequence x(n) which has Z – transform,

$$x(z) = \frac{-1+5z^{-1}}{\left(1-\frac{3}{2}z^{-1}+\frac{1}{2}z^{-2}\right)} \text{ with ROC; } |z|>1.$$ **(08 Marks)**

OR

10 a. A causal system has input $x(n) = \delta(n) + \frac{1}{4}\delta(n-1) - \frac{1}{8}\delta(n-2)$ and output $y(n) = \delta(n) - \frac{3}{4}\delta(n-1)$. Find the impulse response of the system. **(08 Marks)**

b. Solve the difference equation, y(n) + 3y(n–1) = x(n) with x(n) = u(n) and the initial condition y(–1) = 1. **(08 Marks)**

c. Determine whether the system described is causal and stable $H(z) = \frac{2z+1}{z^2+z-\frac{5}{16}}$. **(04 Marks)**

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CBCS SCHEME

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15EE52

Fifth Semester B.E. Degree Examination, Aug./Sept.2020
Microcontroller

Time: 3 hrs. Max. Marks: 80

Note: Answer any FIVE full questions, choosing ONE full question from each module.

Module-1

1 a. Sketch PSW register. Also, explain its flag bits. **(06 Marks)**

b. Explain any four addressing modes of 8051 with examples. **(06 Marks)**

c. With a neat block diagram, explain the RAM memory space allocation in the 8051. **(04 Marks)**

OR

2 a. With a neat block diagram, explain the various features of 8051 microcontroller. **(08 Marks)**

b. What are stack? Explain the PUSH and POP Instructions with examples. **(06 Marks)**

c. What are SFR'S? List any four bit and byte SFR'S and their addresses. **(02 Marks)**

Module-2

3 a. Define assembler directives. Explain the functions of various assembler directives in 8051 Microcontroller. **(06 Marks)**

b. Explain the following instructions:
(i) Div AB (ii) DA A (iii) SWAP A (iv) MOVC A, @A+DPTR **(06 Marks)**

c. Write an assembly language program to convert packed BCD number to two ASCII Numbers. **(04 Marks)**

OR

4 a. Explain the different types of conditional and unconditional jump instructions of 8051. **(06 Marks)**

b. Write an ALP to check if the character string of length 5, stored in RAM locations 50 H onwards is a palindrome, if it is palindrome, display output character 'Y' to port P1. **(06 Marks)**

c. Classify the CALL Instruction in 8051. Explain each one. **(04 Marks)**

Module-3

5 a. Explain the bit status of TMOD register. **(06 Marks)**

b. Write an ALP to generate a square wave of frequency 1 kHz on pin P1.2 using Timer 0, Mode 2. Assume that crystal frequency of 8051 is 22 MHz. **(06 Marks)**

c. Explain different Data types in 8051C. **(04 Marks)**

OR

6 a. A switch is connected to pin P1.2. Write an 8051C program to monitor SW and create the following frequencies on pin P1.7.
SW = 0 ; 500 Hz
SW = 1 ; 750 Hz
Use timer 0, mode 1 for both of them. **(06 Marks)**

b. Write a C program for counter 0 in Mode 1 to count the pulses and display the THO and TLO registers on P2 and P1 respectively. Assume that a 1 Hz external clock is being fed in to pin P3.4. **(06 Marks)**

c. Explain the different logical operations supported by 8051 C. **(04 Marks)**

Module-4

7 a. Explain the bit status of SCON special function register. **(06 Marks)**

b. Write an 8051 C program to send two messages "Normal Speed" and "High Speed" to the serial port. Assuming that SW (Switch) is connected to pin P2.0, monitor its status and set the baud rate as follows:
SW = 0 ; 28,800 baud rate
SW = 1 ; 56K baud rate
Assume that XTAL = 11.0592 MHz for both cases. **(06 Marks)**

c. Explain the 9 pins of RS232. **(04 Marks)**

OR

8 a. Explain the different interrupts of 8051 along with their vector addresses. **(06 Marks)**

b. Explain the activation of external hardware interrupts using level-triggered interrupt and edge triggered interrupt method. **(10 Marks)**

Module-5

9 a. Explain the various pins of ADC0808 chip with a pin diagram. **(08 Marks)**

b. With a neat circuit diagram, explain the connection of 8051 to ADC 0848 and temperature sensor. **(08 Marks)**

OR

10 a. A switch is connected to pin P2.7, write a C program to monitor the status of SW and perform the following :
(i) If SW = 0; the stepper motor moves clockwise
(ii) If SW =1 ; the stepper motor moves counter clockwise **(06 Marks)**

b. Draw a circuit DC motor connected using a Darlington transistor. **(04 Marks)**

c. Explain the four modes of operation 8255 along with control word format. **(06 Marks)**

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CBCS SCHEME

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15EE53

Fifth Semester B.E. Degree Examination, Aug./Sept. 2020
Power Electronics

Time: 3 hrs. Max. Marks: 80

Note: ***Answer any FIVE full questions, choosing ONE full question from each module.***

Module-1

1 a. With neat circuit diagrams and waveforms, explain the operation of various types of power electronic circuits. **(08 Marks)**

b. With neat sketch, explain the reverse recovery characteristics. **(04 Marks)**

c. What are the peripheral effects of power electronic system? **(04 Marks)**

OR

2 a. Explain the function of a freewheeling diode, in a switched RL load circuit. Draw the circuit diagram and waveforms. **(07 Marks)**

b. Explain an ideal characteristic of switches. **(05 Marks)**

c. The reverse recovery time of a diode is trr = 3 μs and the rate of fall of the diode current is $\frac{di}{dt} = 30 \frac{A}{\mu s}$. Determine (i) the storage charge Q_{RR} and (ii) the peak reverse current I_{RR}. **(04 Marks)**

Module-2

3 a. With a neat sketch, explain the switching characteristics of POWER MOSFET. **(06 Marks)**

b. The bipolar transistor shown in Fig. Q3 (b) is specified to have β in the range of 8 to 40. The load resistance $R_C = 10\,\Omega$. The DC supply voltage is V_{CC} = 200 V and the input voltage to the base circuits is $V_B = 10$ V. If $V_{CE(sat)}$ = 1 V, $V_{BE(sat)}$ = 1.5 V.
Calculate (i) The value of R_B that result in saturation with an ODF of 5
(ii) Forced beta B_f
(iii) Power loss P_T of the BJT. **(06 Marks)**

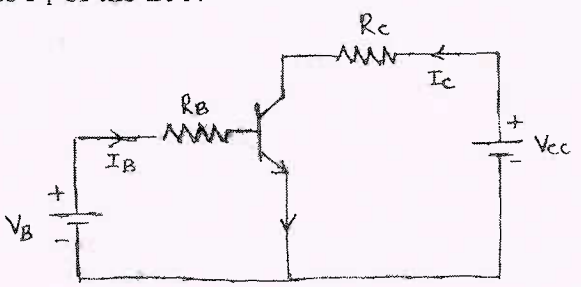

Fig. Q3 (b)

c. Write short note on Safe Operating Area (SOA) or switching limits of BJT. **(04 Marks)**

OR

4 a. Explain with necessary circuit diagram, any three of base drive control circuit for BJT. **(09 Marks)**

b. With neat sketch explain steady state (V-I) characteristics of n-channel IGBT. **(04 Marks)**

c. Discuss the needs and methods for providing isolation of gate/base circuits from power circuit with necessary circuit diagrams. **(03 Marks)**

Module-3

5 a. With neat sketch, explain the static V-I characteristics of an SCR. What are the significance of latching current, holding current and break over voltage. **(06 Marks)**

b. With the help of two transistor model derive an expression for the anode current of the thyristor. **(06 Marks)**

c. Mention and explain the various methods of turn-on used in thyristors. **(04 Marks)**

OR

6 a. How many SCRs are required in a series string to withstand a DC voltage of 3500 volts in steady state, if the SCRs have steady state voltage rating of 1000 V and steady state derating factor of 30%? Assuming maximum difference in leakage current of SCRs to be 10 mA. Calculate the value of voltage sharing resistance to be used. Draw the circuit showing the SCRs and the voltage sharing resistance. **(06 Marks)**

b. Write short note on $\frac{di}{dt}$ and $\frac{dv}{dt}$ protection of thyristor. **(04 Marks)**

c. With the help of circuit diagram and waveforms explain the UJT triggering to turn on the SCR. Write its necessary equations. **(06 Marks)**

Module-4

7 a. With the help of circuit diagram and waveforms, explain the working of single-phase full converter with highly inductive load. **(08 Marks)**

b. A single phase fully controlled bridge rectifier is fed from 230 V, 50 Hz supply. The load is highly inductive. Find the average load voltage and current if the load resistance is 10 Ω and firing angle is (α) 45°. **(08 Marks)**

OR

8 a. The single phase dual converter is operated from a 120 V, 60 Hz supply and the load resistance is R = 10 Ω. The circulating inductance is L_r = 40 mH; delay angles are $\alpha_1 = 60°$ and $\alpha_2 = 120°$, calculate the peak circulating current and the peak current of converter 1. **(08 Marks)**

b. With circuit diagram and relevant waveforms explain three phase full wave converter with inductive loads. Write its necessary equations. **(08 Marks)**

Module-5

9 a. With circuit diagram and quadrant operation, explain four quadrant choppers. **(07 Marks)**

A dc chopper shown in Fig. Q9 (b) has a resistive load of 10 Ω and the input voltage V_S = 200 V when the chopper switch is ON, its voltage drop is 2 V and the chipping frequency is 1 kHz. If the duty cycle is 50% determine (i) Average output voltage (ii) RMS output voltage (iii) The chopper efficiency (iv) The effective input resistance of the chopper. **(05 Marks)**

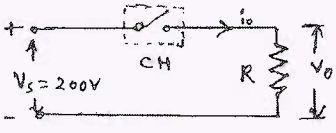

Fig. Q9 (b)

b. Mention the various performance parameters for the step-up and step-down choppers. **(04 Marks)**

OR

10 a. With relevant waveform explain sinusoidal pulse width modulation. **(04 Marks)**

b. The single phase full bridge inverter has a resistive load of R = 2.4 Ω and the DC input voltage of V_S = 48 volts. Determine (i) rms output voltage at the fundamental frequency (ii) The output power (iii) The peak and average current of each transistor. **(04 Marks)**

c. With the help of neat diagram and waveform explain the operation of 120° mode of 3-phase inverter with star connected R-load. **(08 Marks)**

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15EE54

Fifth Semester B.E. Degree Examination, Aug./Sept. 2020
Signals and Systems

Time: 3 hrs. Max. Marks: 80

Note: ***Answer any FIVE full questions, choosing ONE full question from each module.***

Module-1

1 a. Distinguish between :
i) Continuous Time Signals and Discrete Time Signals
ii) Even Signals and Odd Signals
iii) Periodic and Non-Periodic Signals. **(06 Marks)**

b. Check whether the signals given below are periodic. If periodic find the fundamental period
i) $x(t) = \cos t + \sin \sqrt{2}\, t$
ii) $x(n) = \cos \frac{\pi}{3} n + \sin \frac{\pi}{4} n$. **(06 Marks)**

c. A system has an input output relation given by $y(t) = \frac{d}{dt}\left[e^{-t} x(t)\right]$. Determine whether the system is : i) memory-less ii) stable iii) linear iv) causal. **(04 Marks)**

OR

2 a. A triangular pulse signal is shown in Fig.Q2(a) sketch x(3t) + x(3t + 2).

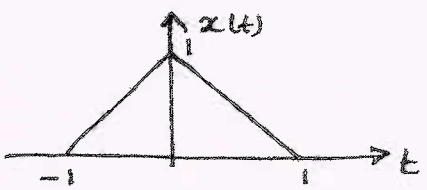

Fig.Q2(a) **(04 Marks)**

b. The signals x(n) and y(n) are as shown in Fig.Q2(b) sketch x(n + 2) y(n – 2).

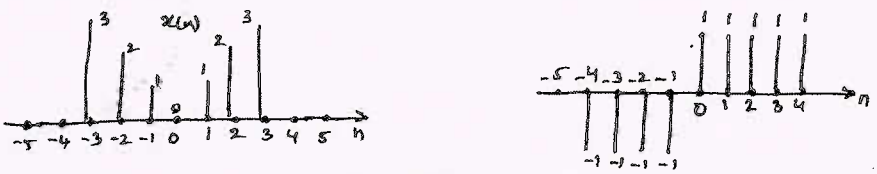

Fig.Q2(b) **(04 Marks)**

c. Find the even and odd components of the signal shown in Fig.Q2(c).

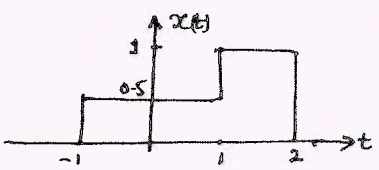

Fig. Q2(c) **(05 Marks)**

d. The input – output relationship of a discrete time system is $y[n] = \sum_{k=-\infty}^{n} x(k+2)$. Check whether the system is : i) memory-less ii) causal. **(03 Marks)**

Module-2

3 a. Evaluate $y(n) = x(n) * n(n)$ where x(n) and h(n) are shown in Fig.Q3(a).

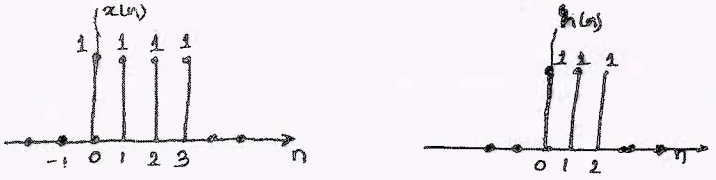

Fig.Q3(a) **(06 Marks)**

b. Show that linear time invariant systems is BIBO stable if and only if :

$$\sum_{k=-\infty}^{\infty} |h(k)| < \infty .$$ **(04 Marks)**

c. Draw the direct from – I and direct form – II realizations for the system with input – output relationship $4\frac{d^3y(t)}{dt^3} - 3\frac{dy(t)}{dt} + y(t) = x(t) + \frac{dx(t)}{dt}$. **(06 Marks)**

OR

4 a. For a system the input $x(t) = e^{-3t}[u(t)-u(t-2)]$ and the inpulse response $h(t) = e^{-t}u(t)$. Determine the output y(t) using convolution integral. **(06 Marks)**

b. Determine the homogeneous solution for the system described by the difference equation :

$y[n] - \frac{1}{4}y[n-1] - \frac{1}{8}y[n-2] = x[n] + x[n-1]$ with $y(-y) = 0$ and $y(-2) = 1$. **(06 Marks)**

c. Evaluate the step response of the system : $n(t) = e^{-2t}\,u(t-1)$. **(04 Marks)**

Module-3

5 a. State and prove convolution property of Fourier transform. **(05 Marks)**

b. Use the defining equation for continuous time Fourier transform to evaluate the frequency domain representation of $x(t) = e^{-4|t|}$. **(05 Marks)**

c. Find the frequency response and impulse response of the system having input $x(t) = e^{-t}\,u(t)$ and output $y(t) = e^{-2t}\,u(t) + e^{-3t}\,u(t)$. **(06 Marks)**

OR

6 a. Evaluate the Fourier transform of the continuous time signal x(t) shown in Fig.Q6(a).

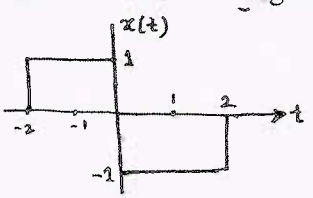

Fig.Q6(a) **(05 Marks)**

b. Determine the frequency response and impulse response for system described by the differential equation :

$$\frac{d^2y(t)}{dt^2} + \frac{5dy(t)}{dt} + 6y(t) = \frac{-d}{dt}x(t) .$$ **(05 Marks)**

c. Determine the time domain signal corresponding to $x(j\omega)$ shown in Fig.Q6(c).

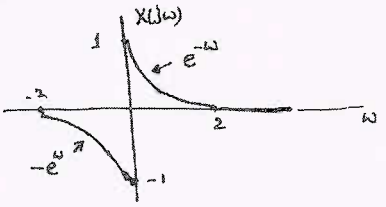

Fig.Q6(c) **(06 Marks)**

Module-4

7 a. State and prove Parsevals theorem for discrete domain. **(05 Marks)**

b. Determine the frequency response and impulse response for system described by the difference equations : $y[n] + \frac{1}{2}y(n-1] = x[n] - 2x[n-1]$. **(06 Marks)**

c. Evaluate discrete time Fourier transform of the signal $x[n] = [\frac{1}{3}]^n u(n+2)$. **(05 Marks)**

OR

8 a. Evaluate the Fourier transform of the signal

$$x(n) = \cos\left(\frac{\pi}{4}n\right)\left(\frac{1}{2}\right)^n u(n-2)$$ **(06 Marks)**

b. Find the frequency response and impulse response of the system having input $x[n] = (\frac{1}{2})^n u(n)$ and output $y[n] = \frac{1}{4}(\frac{1}{2})^n u(n) + (\frac{1}{4})^n u(n)$. **(06 Marks)**

c. Determine the difference equation description for the system with frequency response.

$$H(e^{j\Omega}) = 1 + \frac{e^{-j\Omega}}{(1-\frac{1}{2}e^{-j\Omega})(1+\frac{1}{4}e^{-j\Omega})}.$$ **(04 Marks)**

Module-5

9 a. Define RoC. List the properties of RoC. **(05 Marks)**

b. Determine the Z-transform of the signal $x[n] = (\frac{1}{4})^n [u(n) - u(n-5)]$. **(05 Marks)**

c. Determine the transfer function and impulse response representations of the system represented by the difference equations :

$$y[n] - \frac{4}{5}y[n-1] - \frac{16}{25}y[n-2] = 2x[n] + x[n-1].$$ **(06 Marks)**

OR

10 a. Determine the Z-transform of the signal

$$x(n) = \begin{cases} (\frac{1}{3})^n; & n \geq 0 \\ (\frac{1}{2})^{-n}; & n < 0 \end{cases}$$

Give the region of convergence. **(05 Marks)**

b. The pole zero plot for x(z) is an shown in Fig.Q10(b). Find the transfer function and identify all the ROCs.

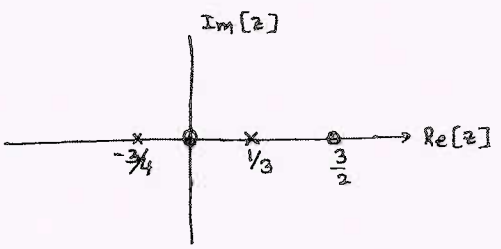

Fig.Q10(b) **(06 Marks)**

c. Determine whether the system with transfer function :

$$H(z) = \frac{2z+3}{z^2 + z - \frac{5}{16}}$$

is : i) causal and stable

ii) minimum phase. **(05 Marks)**

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CBCS SCHEME

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15EE61

Sixth Semester B.E. Degree Examination, Aug./Sept.2020
Control Systems

Time: 3 hrs. Max. Marks: 80

Note: Answer any FIVE full questions, choosing ONE full question from each module.

Module-1

1 a. Define control systems. Explain with examples open loop and closed loop systems. List the merits and demerits of open loop and closed loop systems. **(08 Marks)**

b. For the mechanical system shown in Fig.Q1(b), find the transfer function $\frac{X_2(s)}{F(s)}$.

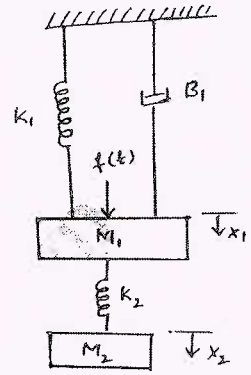

Fig.Q1(b) **(08 Marks)**

OR

2 a. Find the transfer function, for the electromechanical system shown in Fig.Q2(a), i.e. $\frac{X(s)}{E(s)}$.

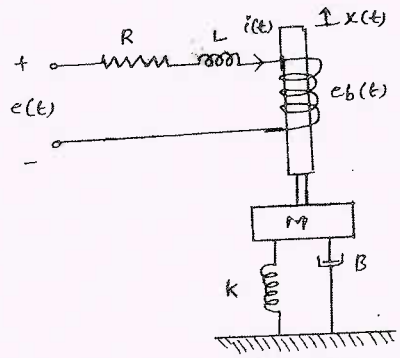

Fig.Q2(a) **(08 Marks)**

b. Show that two systems shown in Fig.Q2(b)(i) and (ii) are analogous systems by comparing their transfer functions.

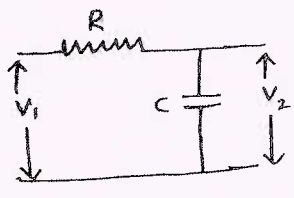

Fig.Q2(b)(i)

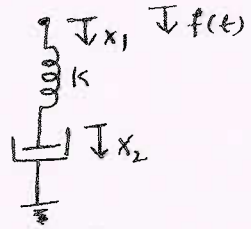

Fig.Q2(b)(ii) **(08 Marks)**

Module-2

3 a. What is block diagram representation. For the negative feedback control system, starting from the fundamentals show that the closed loop transfer function $M(s)=\frac{Ng.Dh}{(Dg.Dh+Ng.Nh)}$ where $G(s)=\frac{Ng}{Dg}$; $H(s)=\frac{Nh}{Dh}$. **(08 Marks)**

b. Find $\frac{C(s)}{R(s)}$ for the system shown in Fig.Q3(b) using block diagram reduction rules.

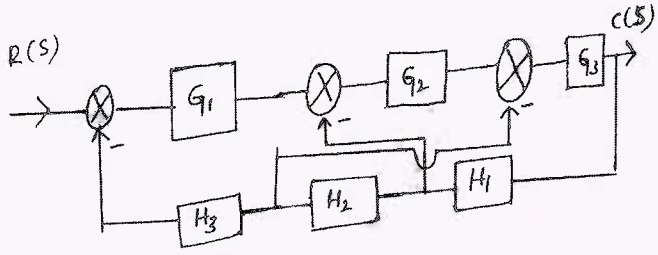

Fig.Q3(b) **(08 Marks)**

OR

4 a. Using Maron's gain formula, find the gain of following system in Fig.Q4(a).

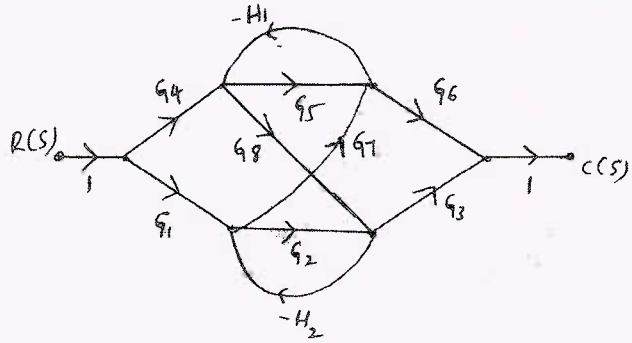

Fig.Q4(a) **(08 Marks)**

b. Draw the signal flow graph of electrical network in the Fig.Q4(b).

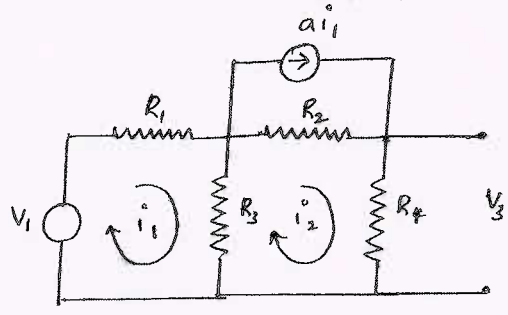

Fig.Q4(b) **(08 Marks)**

Module-3

5 a. Draw the sketch of underdamped second order system, with unit step input, show the various specifications on it and define them. **(08 Marks)**

b. An unity feedback system has $G(s)=\frac{20(1+s)}{s^2(2+s)(4+s)}$, calculate its steady state error coefficients and error when applied input $r(t)=40+2t+5t^2$. **(08 Marks)**

OR

6 a. A unity feedback system control system has $G(s)=\frac{K(s+13)}{s(s+3)(s+7)}$ using Routh's criterion, calculate the range of K for which the system is (i) stable (ii) has its closed loop, poles more negative than –1. **(08 Marks)**

b. What are the two special cases of Routh's array? How there can be handled and also explain the concept of relative stability analysis? **(08 Marks)**

Module-4

7 a. What are the general steps to solve the problems on root locus? **(06 Marks)**

b. Draw the approximate root locus diagram for a closed loop system, whose transfer function is given by $G(s).H(s)=\frac{K}{s(s+5)(s+10)}$. Comment on stability. **(10 Marks)**

OR

8 a. Sketch the bodeplot for transfer function $G(s)=\frac{Ks^2}{(1+0.2s)(1+0.02s)}$, determine the value K for the gain cross-over frequency 5 rad/sec. **(10 Marks)**

b. Briefly explain (i) Gain margin G.M. (ii) Phase margin P.M and also what should be the values of gain margin GM and phase margin P.M. **(06 Marks)**

Module-5

9 a. State the mapping theorem, explain any two cases. **(06 Marks)**

b. Sketch the Nyquist plot for the system with $G(s)H(s)=\frac{1+0.5s}{s^2(1+0.1s)(1+0.02s)}$, comment on stability. **(10 Marks)**

OR

10 a. Fig.Q10(a) shows PD controller used for the system, determine the value T_D so that the system will be critically damped. Calculate its settling time.

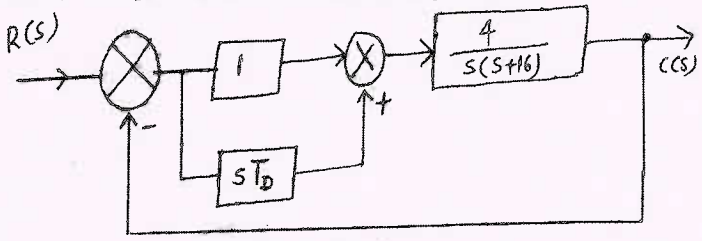

Fig.Q10(a) **(08 Marks)**

b. Explain the effect of PD and PI controllers on performance of second order system. **(08 Marks)**

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CBCS SCHEME

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15EE63

Sixth Semester B.E. Degree Examination, Aug./Sept.2020
Digital Signal Processing

Time: 3 hrs. Max. Marks: 80

Note: Answer any FIVE full questions, choosing ONE full question from each module.

Module-1

1 a. Determine IDFT using DFT is $X(k) = (\underset{\uparrow}{7}, -2-j, 1, -2+j)$ **(05 Marks)**

b. State and prove symmetry property for a real valued sequence. **(05 Marks)**

c. For the sequence x(n) = (4, 3, 2, 1), determine the 6-point DFT of the sequence x(n). **(06 Marks)**

OR

2 a. Given $x_1(n) = \cos\left(\frac{2n\pi}{N}\right)$ and $x_2(n) = \sin\left(\frac{2n\pi}{N}\right)$ for $0 \le n \le N-1$, calculate N point circular convolution of $x_1(n)$ and $x_2(n)$. **(08 Marks)**

b. If h(n) = (1, 1, 1) and $x(n) = (\underset{\uparrow}{1}, 2, 0, -3, 4, 2, -1, 1, -2, 3, 2, 1)$ determine the convolution of x(n) and h(n). Use overlap save method and consider 5 samples in each partition of x(n). **(08 Marks)**

Module-2

3 a. Find the 8-point DFT of the sequence $x(n) = (\underset{\uparrow}{1}, 2, 3, 4, 4, 3, 2, 1)$ using decimation in time FFT method. List all the stage calculations in a table. **(08 Marks)**

b. Calculate the 4-point circular convolution of x(n) and h(n) using radix-2 decimation in frequency-FFT method. Given x(n) = (1, 1, 1, 1) and h(n) = (1, 0, 1, 0). **(08 Marks)**

OR

4 a. Explain the algorithm of decimation in time-FFT. Assume length of x(n) = 8. **(08 Marks)**

b. Calculate the 8-point DFT of x(n) where x(n) = (1, 2, 1, 0, 0, 0, 0. 0). Use decimation in frequency method. Show the results of each stage in a table. **(08 Marks)**

Module-3

5 a. Explain the theory of Bilinear Transformation (BT) and also explain frequency warping introduced by BT. **(10 Marks)**

b. Let $H_a(s) = \frac{s+a}{(s+a)^2+b^2}$ be a causal second order function. Show that H(z) is given by ,

$H(z) = \frac{1-e^{-at}\cos bT.z^{-1}}{1-2\cos bTe^{-aT}z^{-1}+e^{-2aT}z^{-1}}$, if impulse invariance method is used. **(06 Marks)**

OR

6 a. A Butterworth lowpass filter has $K_P = -1$ dB at $\Omega_P = 4$ rad/sec,

b. $K_S = -20$ dB at $\Omega_P = 8$ rad/sec, calculate $H_a(s)$ of Butterworth filter for above specifications. **(10 Marks)**

c. State merits and demerits of IIR filters. **(06 Marks)**

Module-4

7 a. Design a digital Chebyshev-I filter that satisfies :

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

and $|H(w)| \le 0.2$ for $0.6\pi \le w \le \pi$

Use impulse invariant transformation and assume T = 1 second. **(12 Marks)**

b. $H(z) = \dfrac{1}{1 - \frac{1}{16}z^{-2}}$, for this function draw the cascade form structure. **(04 Marks)**

OR

8 a. A digital low pass filter has:

$20 \log|H(w)|_{w=0.2\pi} \ge -1.9328$ dB

and $20 \log|H(w)|_{w=0.6\pi} \le -13.9794$ dB

The filter must have maximally flat frequency response. Find H(z) for above specification. Use impulse Givariance method. Assume T = 1 second. **(10 Marks)**

b. Draw the direct form-I and direct form-II structure for $H(z) = \dfrac{2z^2 + z - 2}{z^2 - 2}$. **(06 Marks)**

Module-5

9 a. A lowpass filter has

$H_d(e^{jw}) = H_d(w) = e^{-j2w}$, for $|w| < \pi/4$

$= 0$, for $\pi/4 < |w| < \pi$

Calculate the filter coefficients $h_d(n)$ and h(n), if w(n) is a rectangular window, given by

$w(n) = 1$ for $0 \le n \le 4$

$= 0$ otherwise **(10 Marks)**

b. Compare different types of window functions based on transition width, stopband attenuation and window function. **(06 Marks)**

OR

10 a. A lowpass filter has the response

$H_{do}(w) = H_d(e^{jw}) = e^{j3w}$ for $0 < w < \pi/2$

$= 0$ for $\pi/2 < w < \pi$

is e^{j3w}

Calculate h(n) sing frequency sampling technique. Assume N = 7. **(10 Marks)**

b. Calculate the coefficients K_m of the lattice filter, if the FIR filter is given by :

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

Draw the II order lattice structure. **(06 Marks)**

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