VIDYA ACADEMY OF SCIENCE AND TECHNOLOGY

TECHNICAL CAMPUS, KILIMANOOR

(A Unit of Vidya International Charitable Trust)

Accredited by NAAC with B++ Grade

S5 –ELECTRONICS AND COMMUNICATION ENGINEERING

QUESTION BANK

SUBJECTS

1.ECT301-LINEAR INTEGRATED CIRCUITS

2.ECT303-DIGITAL SIGNAL PROCESSING

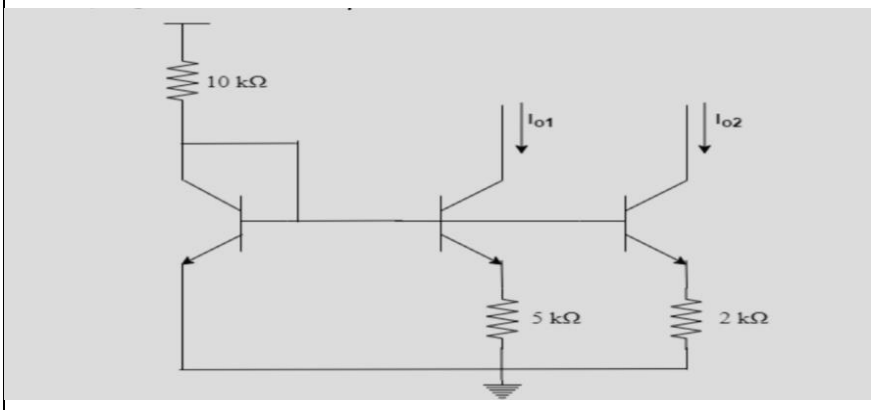
3.ECT305-ANALOG AND DIGITAL COMMUNICATION

4.ECT307-CONTROL SYSTEMS

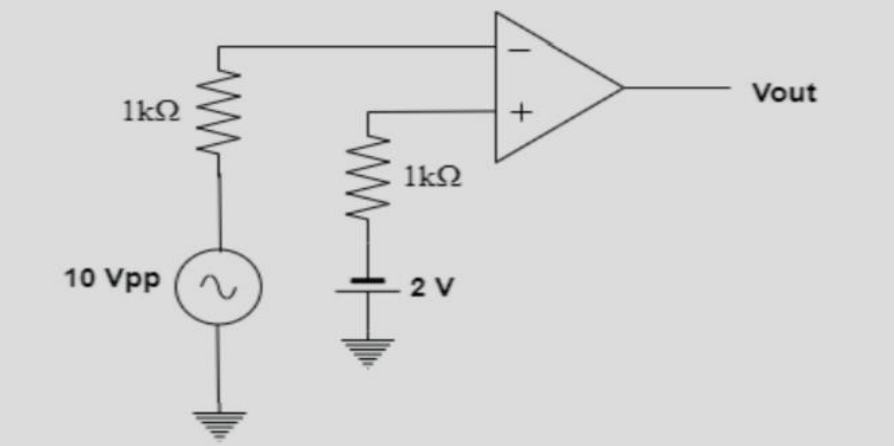
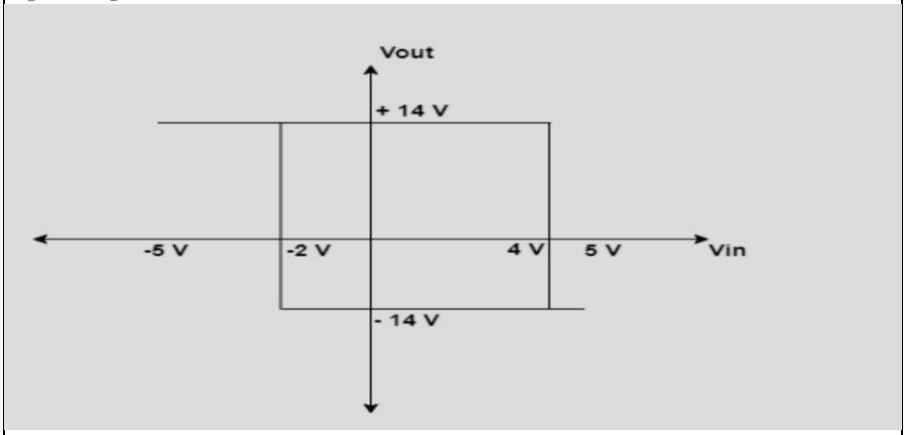
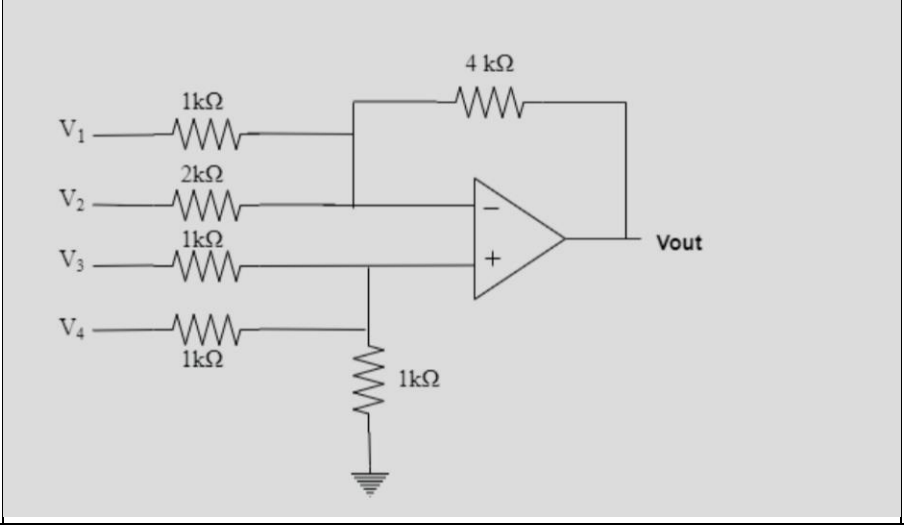
5.HUT310-MANAGEMENT FOR ENGINEERS

6.MCN301- DISASTER MANAGEMENT

ECT 301: LINEAR INTEGRATED CIRCUITS
QUESTION BANK

Qn. No	MODULE- 1	Marks	Year
1	Define the parameter CMRR of an op-amp. Given that an operational amplifier produces an output voltage of 50 mV when the input voltages V1 and V2 are equal to10V and output voltage of 10V when V1 = 10 mV and V2 = 20mV. Determine the CMRR in dB.	3	KTU Dec 2021
2	Draw the ideal and practical voltage transfer characteristics of an op-amp and explain the difference.	3	KTU Dec2021
3 a	Analyse the differential amplifier circuit using BJT and derive an expression for differential mode gain and common mode gain.	7	KTU Dec2021
b	Draw the circuit diagram of a Wilson current source and derive an expression for output current in terms of the reference current.	7	KTU Dec2021
4a	1. Define Slew rate and derive the expression for maximum input frequency at which an undistorted signal is obtained in terms of slew rate. 2. Define Input offset voltage and Input offset current,	7	KTU Dec2021
b	Determine the values of current Io1 and Io2 in the figure given below. Assume VBE = 0.7 V, VT = 25 mV and β=125. 	7	KTU Dec2021
5	Draw and list the functions of 741 IC pins	3	KTU Dec 2020
6	Draw the block diagram of an op-amp and explain the necessity and implementation of each block	10	KTU Dec2020
7	Compare the parameters of an ideal op amp and a practical op amp ?	7	KTU Dec2020
18	Define slew rate. What causes slew rate? Derive the equation for maximum input frequency at which an undistorted signal is obtained in terms of slew rate	6	KTU Dec2020
19	Define the following terms (a)CMRR (b)Slew rate (c)PSRR	7	KTU Dec2020

8	What is the principle of operation of Wilson current mirror and its advantages? Deduce the expression for its output current..	10	KTU Dec 2019
9	Derive the expressions for gain, input impedance, output impedance and frequency response of the above configuration	10	KTU Dec 2019
10	Explain the effect of slew rate and bandwidth on circuit performance.	7	KTU Dec 2019
11	Derive the differential mode gain of balanced output differential amplifier	10	KTU Dec 2019
12	How a constant current bias circuit can be used to improve the CMRR of a differential amplifier?	7	KTU Dec 2019
13	Define slew rate with its unit. What is its effect at the output signal? How the virtual ground is different from actual ground?	8	KTU Dec 2019
14	A differential amplifier has a common mode gain of 0.05 and difference mode gain of 1000.Calculate the output voltage for two signals V1 = 1mV and V2 = 0.9Mv	3	KTU Dec 2018
15	Derive CMRR, input resistance and output resistance of a dual input balanced output differential amplifier configuration.	7	KTU Dec 2018
16	Draw the equivalent circuit of an operational amplifier. Explain voltage transfer characteristics of an operational amplifier.	6	KTU Dec 2018
17	Explain the following properties of a practical op-amp (i) Bandwidth (ii) Slew rate (iii) Input offset voltage (iv) Input offset current	8	KTU Dec 2018

Qn. No	MODULE – 2	Marks	Year
1	Design an inverting amplifier for a closed loop voltage gain of 10.	3	KTU Dec 2021
2	Draw the input-output waveforms for the circuit shown in figure below. 	3	KTU Dec 2021
3 a	Derive an expression for voltage gain, input resistance and output resistance of a voltage series feedback amplifier.	7	KTU Dec 2021
b	Design a circuit to obtain the following transfer characteristics. Draw the input output waveforms also. 	7	KTU Dec 2021
4 a	Analyze the circuit given below and derive an expression for the output voltage. 	7	KTU Dec 2021

b	Draw the circuit of a Half wave Precision rectifier and explain its working	7	KTU Dec 2021
5	Design an op-amp based circuit to implement the function, Vo =2Va +3Vb	6	KTU-DEC 2020
6	With suitable diagram and equation, explain how the average of signals can be achieved by using an op-amp circuit.	6	KTU-DEC 2020
7	With suitable diagram explain how the voltage series feedback is implemented in op-amp based circuits	5	KTU-DEC 2020
8	Explain with suitable diagram how voltage shunt feedback is implemented in op-amp based circuits and derive the following characteristics (i) Closed loop voltage gain (ii)Input resistance, (iii) Output resistance (iv)Bandwidth	10	KTU-DEC 2020
9	Draw and explain the circuit diagram of an instrumentation amplifier and derive the output equation.	10	KTU-DEC 2020
10	Design a circuit to obtain an output voltage of -(a+2b+5c)	5	KTU-DEC 2020

11	Draw the block diagram of four types of feedback configurations for opamp	3	KTU Dec 2019
12	Derive the expressions for gain, input impedance, output impedance and frequency response of the voltage series feedback configuration	10	KTU Dec 2019
13	Derive the voltage gain of inverting and noninverting amplifier.	8	KTU Dec 2019
14	Design a non-inverting amplifier for a gain of 11	3	KTU Dec 2018
15	Design a full wave rectifier to rectify an ac signal of 0.2V peak to-peak. Explain its principle of operation.	3	KTU Dec 2018
16	Draw the circuit diagram of a differential instrumentation amplifier with a transducer bridge and show that the output voltage is proportional to the change in resistance.	7	KTU Dec 2018
17	Explain the working of an inverting Schmitt trigger and draw its transfer characteristics	7	KTU Dec 2018

18	Draw and explain the circuit diagram of a log amplifier and derive the output equation	7	KTU-DEC 2019
19	Draw and explain the working of a practical differentiator circuit including frequency response analysis.	8	KTU-DEC 2019
20	Explain the working of a precision full wave rectifier with a neat diagram.	8	KTU-DEC 2019
21	Draw the circuit of antilog amplifier and derive the output voltage.	7	KTU-DEC 2019
22	State the limitations of ideal differentiator. How can this be eliminated in practical differentiator?	7	KTU-DEC 2018
23	Draw the circuit of voltage to current converter as well as current to voltage converter with load and explain its operation.	6	KTU-DEC 2018
24	Design a Schmitt trigger circuit for different UTP and LTP magnitudes	6	KTU-DEC 2018
25	Explain in detail the working of Schmitt Trigger and explain the transfer characteristics.	7	KTU-DEC 2018
26	Draw the circuit of a temperature compensated logarithmic amplifier and show that it provides temperature independent logarithmic output	8	KTU-DEC 2018

Qn. No	MODULE – 3	Marks	Year
1	Draw the circuit diagram of a triangular wave generator using op-amp.	3	KTU-Dec 2021
2	Design a first order high pass filter for a cut off frequency of 1kHz and maximum gain of 11.	3	KTU-Dec 2021
3 a	Draw the circuit diagram of a Wein bridge oscillator using op-amp and derive an expression for frequency of oscillations.	7	KTU-Dec 2021
b	Draw the circuit diagram of a Band Pass filter and derive an expression for the transfer function.	7	KTU-Dec 2021
4 a	Design a circuit to generate a square wave of frequency 2 kHz and amplitude 10 Vpp using op-amp. Assume that the duty cycle is equal to 50%.	7	KTU-Dec 2021
b	Derive the transfer function of a second order Butterworth low pass filter.	7	KTU-Dec 2021
5	Derive the expression for frequency of oscillation for triangular wave generator and explain.	7	KTU-DEC 2020
6	.With the help of a neat diagram derive the frequency of oscillation for RC phase shift oscillator	8	KTU-DEC 2020
7	.Derive the frequency of oscillation of Wien bridge oscillator using opamp and explain	7	KTU-DEC 2020
8	Design an op-amp based astable multi-vibrator for a duty cycle of 75%and draw the waveforms at different points.	8	KTU-DEC 2019
9	Draw and explain the circuit of a square/saw tooth wave generator using op-amps.	8	KTU-DEC 2019
10	Draw a second order active high pass filter and derive the expression for its cutoff frequency	8	KTU-DEC 2019

11	Design a first order low pass filter with a cut-off frequency of 2KHz..	7	KTU-DEC 2019
14	Design a 50Hz Notchfilter Derive the expression for gain of Notch filter	7	KTU-DEC 2018
15	Design a second order Butterworth low-pass filter with an upper cutoff frequency of 1kHz	8	KTU-DEC 2018
16	Derive the frequency of oscillation of an RC phase shift oscillator using op-amp. Also explain its working with suitable diagram.	7	KTU-DEC 2018
17	Explain how a free running square wave form can be obtained using op amps	8	KTU-DEC 2018
18	Design a second order Butterworth Low Pass Filter with fH= 2KHz.	7	KTU DEC 2018
19	Draw the circuit of monostable multivibrator using opamp.	7	KTU-DEC 2018
20	Derive the equation for frequency of oscillation (f0) of a Wein Bridge oscillator	7	KTU-DEC 2018
21	Design a Wein Bridge oscillator for f0 = 1KHz. Derive the equation for the transfer function of a first order wide Band Pass filter.	7	KTU-DEC 2018
22	Derive the design equations for a second order Butterworth active low pass filter.	7	KTU-DEC 2018
23	Design a circuit to generate 1KHz triangular wave with 5V peak.	7	KTU-DEC 2018

Qn. No	MODULE – 4	Marks	Year
1	Draw and list the functions of 555 timer IC pins.	3	Dec 2021
2	Explain the terms (i) Pull in time (ii) Capture range and (iii) Lock range with respect to a PLL.	3	Dec 2021
3 a	With a neat functional diagram and waveforms, explain the working of a monostable multivibrator using 555 timer IC.	7	Dec 2021
b	With block diagram, explain the working a phase locked loop.	7	Dec 2021
4 a	Explain the block diagram of a voltage-controlled oscillator. (7) b)	7	Dec 2021
b	Discuss in detail any 3 applications of PLL.	7	Dec 2021
5	Draw and explain the working of a PLL and describe the importance of lock range and capture range.	10	DEC 2019
6	Discuss in detail any two applications of PLL.	5	DEC 2019
7	Write a short note on IC723 based voltage regulators.	5	DEC 2019
8	Explain in detail the working of monostable and astable multivibrator using 555.	10	DEC 2019
9	Explain how a monostable multivibrator can be implemented with 555 IC with relevant waveforms and functional diagram. Derive an expression for pulse width. Mention 3 applications of PLL	8	DEC 2019
10	Give the block diagram of IC566 VCO and explain its operation.	6	DEC 2018
11	Discuss in detail any two applications of PLL	3	DEC 2018
12	. What is the principle of VCO?.	3	DEC 2018
13	Design a circuit to multiply the incoming frequency by a factor of 5 using 565 PLL.	8	DEC 2018
14	With the help of internal diagram explain the monostable operation of timer IC 555. Draw the input and output waveforms. Derive the equation for pulse width.	6	DEC 2018
15	Design a monostable multi-vibrator for a pulse duration of 1ms using IC555		DEC 2018
16	Explain the operation of Phase Locked Loop. What is lock range and capture range?		DEC 2018

Qn. No	MODULE – 5	Marks	Year
1	Define the terms (i) Resolution (ii) Settling time and (iii) Monotonicity with respect to a DAC.	3	Dec 2021
2	Explain the terms (i) Line regulation and (ii) Load regulation for a regulated power supply.	3	Dec 2021
3a	Explain the working of a flash type analog to digital converter.	7	Dec 2021
b	Explain how current fold back and current boosting are done using IC723 voltage regulator.	7	Dec 2021
4 a	Explain the working of a successive approximation type ADC.	7	Dec 2021
b	Explain the working of a weighted resistor type DAC. Mention its drawbacks.	7	Dec 2021
5	With suitable diagram explain the working of a flash convertor.	10	Dec 2019
6	Draw and explain the working of a binary ladder type D/A convertor.	10	Dec 2019
7	List and explain at least five important specifications of D/A and A/D convertors.	10	Dec 2019
8	Derive the output voltage for a 4 bit R-2R ladder D/A converter	10	Dec 2019
9	Explain the working of successive approximation type A/D converters	7	Dec 2019
10	List the disadvantages of weighted resistor type DAC.	5	Dec 2019
11	Explain the method of current boosting in voltage regulator IC's.	10	Dec 2018
12	Explain how current boosting is achieved using IC723.	7	Dec 2018
13	Why is a current fold back protection circuit used in regulators? Explain with suitable diagrams.	8	Dec 2018
14	With a neat circuit diagram explain the working of a weighted resistor D/A converter. Discuss how digital signal is converted into analog signal in a weighted resistor DAC.	7	Dec 2018
15	Define the following terms with respect to DAC (i)Resolution (ii)Linearity (iii) Full scale output voltage K2 Differentiate between line and load regulations	8	Dec 2018
16	Explain the working of R-2R ladder type DAC. In a 10 bit DAC, reference voltage is given as 15V. Find analog output for digital input of 1011011001.	7	Dec 2018
17	Explain how short circuit, fold back protection and current boosting are done using IC723 voltage regulator.	7	Dec 2018
18	With a functional diagram, explain the principle of operation of Successive approximation type ADC.	7	Dec 2018
19	With a neat circuit diagram, explain the operation of a 3-bit flash converter.	7	Dec 2018

ECT303 DIGITAL SIGNAL PROCESSING

MODULE 1			
Sl.No.	**Questions**	**Marks**	**KTU, Year**
1	What are the methods of filtering long sequence? Explain.	3	KTU 2021 December
2	Give any three properties of DFT	3	KTU 2021 December
3	Using an example elaborate the working of Overlap Save method while filtering a long sequence with small sequence	7	KTU 2021 December
4	Differentiate between Overlap methods and normal filtering	7	KTU 2021 December
5	Explain how DFT can be used as a linear Transformation	7	KTU 2021 December
6	Calculate the DFT of [3, 19, 6 , 15]. Also plot the magnitude and phase response	7	KTU 2021 December
7	Derive the relationship of DFT to Z-transform?	3	KTU July 2019
8	Find the circular convolution of two sequences x1(n)={1, 2, 2,1,3},x2(n)={2,-1,3,1,1}	3	KTU July 2019
9	How will you perform linear convolution using circular convolution? Find the linear convolution of the given sequences x(n) = {2, 9,7, 4} and h(n) = {1, 3, 1, 2} using circular convolution?	8	KTU July 2019
10	Explain the following properties of DFT a) Linearity b) Complex conjugate property c) Circular Convolution d) Time Reversal	6	KTU July 2019
11	The first eight points of 14-point DFT of a real valued sequence are {12, -1+j3, 3+j4, 1-j5, -2+j2, 6+j3, -2-j3, 10} i) Determine the remaining points ii) Evaluate x[0] without computing the IDFT of X(k)? iii) Evaluate IDFT to obtain the real sequence?	8	KTU July 2019
12	Explain with appropriate diagrams, the overlap-add method for filtering of long data sequences using DFT?	6	KTU July 2019

13	Comment on the relationship between DTFT and DFT	3	KTU 2020 December (2015 scheme)
14	State Circular frequency shift property of DFT? 4 –point DFT of the signal x(n) ={a, b, c, d} is X(K). Find the IDFT of X(K-2) ?	5	KTU 2018 December (2015 scheme)
15	Derive the relationship of DFT to Z-transform.	3	KTU 2018 December (2015 scheme)
16	Explain, how DFT and IDFT can be expressed as Linear Transformation	3	KTU 2018 December (2015 scheme)
17	Find the circular convolution of x[n] = {1, 2, -1, 3, 4} and h[n] = {2, -1, 4, 1, 3}	5	KTU 2018 December (2015 scheme)
18	Explain overlap add method for filtering of long data sequences.	4	KTU 2018 December (2015 scheme)
19	Show that, if x[n] is a real and even sequence, then its DFT X[k] is also real and even.	3	KTU 2018 December (2015 scheme)
20	Find linear convolution of x[n] = {2, 3, -1} and h[n] = {1, -1, 2}, using circular convolution	5	KTU 2018 December (2015 scheme)
21	Explain how to compute linear convolution of two sequences of length N1 and N2 using DFT.	7	KTU 2020 September (2015 scheme)
22	Explain overlap and add method for filtering of long data sequences.	4	KTU 2020 September (2015 scheme)
23	Prove that N point DFT is periodic with period N	3	KTU 2020 September (2015 scheme)
24	Find the 4 point circular convolution of sequences x1(n) = {2,1,2,1} with x2(n) = {1,2,3,4}	8	KTU 2020 September (2015 scheme)
25	Explain about the efficient computation of DFT of a 2N- point real sequence	5	KTU 2019 May
Module -II			

1	Calculate the 4- point DFT of cos(pi*n)	3	KTU 2021 December
2	Find Circular time reversal of [8, 5, 3, 1]	3	KTU 2021 December
3	Derive the Decimation in Time algorithm for Fast Fourier transform	7	KTU 2021 December
4	Find the DFT of [3,4,8,1]	7	KTU 2021 December
5	Illustrate the procedure for finding IDFT using radix-2 FFT algorithm	5	KTU 2021 December
6	Find the IDFT of [15,21,2,13]	9	KTU 2021 December
7	Illustrate the basic butterfly computation used in decimation in time radix-2 FFT algorithm?	3	KTU July 2019
8	Bring out the computational advantage of performing an N-point DFT using radix-2 FFT compared to direct method?	3	KTU July 2019
9	Compute the 8 point DFT of x(n) = {2,1,-1,3,5,2,4,1} using radix-2 decimation in time FFT algorithm	9	KTU July 2019
10	Bring out how a 2N point DFT of a 2N point sequence can be found using the computation of a single N point DFT.	5	KTU July 2019
11	Find the 8 point DFT of a real sequence x(n)={1,2,2,2,1,0,0,0,0} using radix-2 decimation in frequency algorithm	9	KTU July 2019
12	Bring out how N-point DFT of two real valued sequences can be found by computing a single N-point DFT.	5	KTU July 2019
13	Find the DFT of the sequence {1, 2, 3, 4, 4, 3, 2, 1} using DIT algorithm	7	KTU DEC 2018
14	What do you mean by in place computation of DFT?	3	KTU DEC 2018
15	Describe the steps involved in radix 2 DIT FFT algorithm.	5	KTU DEC 2018
16	Find the number of complex multiplications involved in the calculation of a 1024 point DFT using (i) direct	3	KTU DEC 2018

	computation(ii) radix-2 FFT algorithm		
17	Explain, how N point DFTs of two real-valued sequences can be found by computing a single N point DFT.	4	KTU DEC 2018
18	Find 8 point DFT of x[n] = {2, 1, -1, 3, 5, 2, 4, 1} using radix-2 decimation in time FFT algorithm	10	KTU DEC 2018
19	Explain, how a 2N point DFT of a 2N point real-valued sequence can be found by computing a single N point DFT.	4	KTU DEC 2018
20	Find the 8 point DFT of the sequence x(n) ={1,2,3,4,4,3,2,1} using DITFFT radix 2 algorithm.	8	KTU DEC 2018
21	Find the 8-point DFT of the real sequence x(n) = {1,2,2,2,1,0,0,0} using decimation in frequency FFT algorithm.	8	KTU DEC 2018
22	Find the 8-point DFT of the sequence {2, 0,2,0, 2, 0, 2, 0} using 4-point DFTs.	5	KTU MAY 2019
23	Given at g(n) ={1, 0, 1, 0} and h(n) = {1, 2, 2, 1} find the 4 point DFTs of these sequences using a single 4 point DFT.	6	KTU MAY 2019
24	Describe the steps involved in radix 2 DIT FFT algorithm	5	KTU MAY 2019
25	Find the DFT of the sequence {1, 2, 3, 4, 4, 3, 2, 1} using DIT algorithm	7	KTU MAY 2019
26	What do you mean by in place computation of DFT?	3	KTU MAY 2019
27	Compute 8-point DFT of the sequence x(n)= {0.5,0.5,0.5,0.5,0,0,0,0} using DITFFT algorithm.	8	KTU MAY 2019
28	Explain how N point DFTs of two real sequences can be found using by computing a single DFT. Illustrate with the sequences	8	KTU MAY 2019
29	Derive Decimation In Time (DIT) FFT algorithm for 8 point DFT and draw the signal flow graph.	8	KTU MAY 2019
30	If x (n) = {1, 2, 3, 4}. Find DFT [DFT(x (n))] without calculating DFT?		KTU 2019 May
Module -III			

1	Explain the design steps of IIR filter using Butterworth Approximation	3	KTU 2021 December
2	What is the advantages of frequency sampling technique in FIR filter design	3	KTU 2021 December
3	Design a digital Butter worth low pass filter satisfying the constraints Using bilinear Transformation, T=1 Sec	10	KTU 2021 December
4	What is Gibb's phenomenon?	4	KTU 2021 December
5	Design a maximally flat analog filter of order 2 with cut-off frequency 0.6 rad/sec	4	KTU 2021 December
6	Design a digital lowpass filter and implement the above question using Impulse Invariance method.	10	KTU 2021 December
7	Determine the frequency response of a linear phase FIR filter given by the difference equation y(n)=0.15x(n)+0.25x(n-1)+x(n-3). Also find the phase delay	3	KTU July 2019
8	An all pole analog filter is given by the transfer function H(s)=1 /(s2+5s+6). Find out the transfer function H(z) of the equivalent digital filter using impulse invariance method. Use T=1s	3	KTU July 2019
9	Design a linear phase FIR low pass filter having length M = 15 and cut-off frequency ωc= πn/N) /6. Use Hamming window.	10	KTU July 2019
10	Prove that if z1 is a zero of an FIR filter, then 1/z1 is also a zero?	4	KTU July 2019
11	Design a digital Butterworth low pass filter with ωp = π /6, ωs = π /4, minimum pass band gain = -2 dB and minimum stop band attenuation = 8 dB. Use bilinear transformation.(Take T= 1s)	10	KTU July 2019
12	What is warping effect in bilinear transformation and how it can be eliminated?	4	KTU July 2019
13	Prove that, if z1 is a zero of a linear phase FIR filter, then 1/z1 is also a zero.	5	KTU DEC 2018
14	Design a linear phase FIR low pass filter having length M = 15 and cut-off frequency ωc = π/6. Use Hamming window.	10	KTU DEC 2018
15	Explain the design of linear phase FIR filters by the frequency sampling method.	9	KTU DEC 2018
16	Explain the frequency transformations in the analog domain	6	KTU DEC 2018

17	Find the response of the signal x(n) = 2Cos(π/2)n when applied to an FIR filter with impulse response h(n) = {1,3,1}.	5	KTU DEC 2018
18	A second order linear phase FIR filter has a zero at z = 1⁄2. Obtain the magnitude and phase response of the filter.	5	KTU DEC 2018
19	Explain the significance of linear phase FIR filter and comment on its impulse response?	4	KTU DEC 2018
20	Determine the frequency response of FIR filter defined by y(n) = 0.25x(n) + x(n - 1) + 0.25x(n - 2). Calculate the phase delay and group delay?	5	KTU DEC 2018
21	Why can't we use impulse invariance technique for implementing digital highpass filter?	4	KTU DEC 2018
22	Describe the steps involved in the design of digital Butterworth bandpass filter?	5	KTU MAY 2019
23	Design a linear phase FIR low pass filter with cut off frequency of 2 kHz and sampling rate of 8 kHz with a filter length 11 using Hanning window.	10	KTU MAY 2019
24	Design a Butterworth low pass digital IIR filter witha pass band edge frequency of0.25π with a ripple not exceeding 0.5 dB and a minimum stop band attenuation 15dB with a stop band edge frequency of 0.55π. Use bilinear transformation.	10	KTU MAY 2019
25	What is warping effect in bilinear transformation method and how can we eliminate it?	5	KTU MAY 2019
26	An all pole analog filter have transfer function H(s) = 1/(s2+5s+6). Find H(z) by impulse invariance method.Assume T=1sec.	10	KTU MAY 2019
27	Design a digital Butterworth low pass filter with ωp = π/6, ωs = π/4, minimum pass band gain = -2dB and minimum stop band attenuation = 8dB. Use bilinear transformation. (Take T = 1)	10	KTU MAY 2019
28	Derive the equation for cutoff frequency in Butter worth filter?	5	KTU MAY 2019
Module -IV			
1	What is Cascade implementation of IIR filter?	3	KTU 2021 December
2	What is a linear phase filter? What conditions are to be satisfied by an FIR flter in order to have linear phase?	3	KTU 2021 December

3	Obtain the Direct form-I ,Direct form-II cascade and parallel form realization of y[n]= - 0.1 y[n-1] + 0.2 y[n-2] + 3 x[n] + 3.6 x[n-1] + 0.6x[n-2]	10	KTU 2021 December
4	Find the impulse response of a filter given by Does this represent a linear phase realization? Comment	4	KTU 2021 December
5	Represent the output of a signal being upsampled by a factor of 3, then down sampled by a factor of 12 followed by upsampled by a factor of 4	7	KTU 2021 December
6	Explain what is aliasing in Multi-rate signal processing. What is the use of Anti-aliasing filter? Explain.	7	KTU 2021 December
7	Obtain the cascade form realization of the third order IIR filter transfer function given by	3	KTU July 2019
8	Prove that a factor of L upsampler is a linear-time varying system.	3	KTU July 2019
9	Derive and draw the direct form-I, direct form-II and cascade form realization of the given filter, whose difference equation is given as $y(n)=0.1\,y(n-1)+0.2\,y(n-2)+3\,x(n)+3.6\,x(n-1)+0.6\,x(n-2)$	9	KTU July 2019
10	Differentiate between anti-aliasing and anti-imaging filters.	5	KTU July 2019
11	Draw the transposed direct form II Structure of the system given by the difference equation y(n)=05.y(n-1)-0.25y(n-2)+x(n)+x(n-1)	5	KTU July 2019
12	Find the lattice structure implementation of FIR filter h[n] = {1, 0.5, 0.75, -0.6}	6	KTU DEC 2018
13	Draw the block diagram of TMS320C67XX and briefly explain the function of each block.	9	KTU DEC 2018
14	Draw the direct form realization of linear phase FIR filter h[n] = {1, 0.5, 0.25, -0.5, 0.8, -0.5, 0.25, 0.5, 1} using minimum multipliers.	5	KTU DEC 2018
15	Realize the system function using minimum number of Multipliers H(z) = (1 + z-1) (1 + 0.5z-1 + 0.5z-2 + z-3)	5	KTU DEC 2018
16	Obtain the transposed directform II structure for the System y(n) = 0.5y(n - 1) - 0.25y(n - 2) + x(n) + x(n - 1)	5	KTU DEC 2018
17	Find the lattice structure implementation of FIR filter h(n) = {1, 13/24, 5/8, 1/3}	8	KTU DEC 2018
18	Determine a direct form realization of the FIR filter with the following filter function using minimum number of multipliers. h(n)={1,2,3,4,3,2,1}	6	KTU MAY 2019

19	Find the lattice structure implementation of the FIR filter with H(z) = 1,0.5,0.75, −0.6	10	KTU MAY 2019
20	Let a signal x(n) = 0.5^nu(n) is decimated by 2. What happens to its spectrum?	5	KTU MAY 2019
MODULE -V			
1	Give any three differences between DSP processor and general purpose microprocessors.	3	KTU 2021 December
2	Write down any three applications of DSP Processor.	3	KTU 2021 December
3	In detail, explain the architecture of DSP Processor TMS 320C6713	7	KTU 2021 December
4	Illustrate the quantisation noise in ADC	7	KTU 2021 December
5	List out the advantages and disadvantages of floating point DSP Processors	7	KTU 2021 December
6	Explain the usage of a DSP Processor for any two day to day applications.	7	KTU 2021 December
7	Differentiate between Harvard architecture and Von-Nuemann Architecture used in processors?	3	KTU July 2019
8	Express the fraction 7/8 and -7/8 in sign-magnitude, two's compliment and one's compliment format?	3	KTU July 2019
9	With the help of a functional block diagram, explain the architecture of TMS320C67xx DSP processor?	10	KTU July 2019
10	What are the prominent features of TMS320C67xx compared to its predecessors	4	KTU July 2019
11	Explain how to minimize the effect of finite word length in IIR digital filters?	7	KTU July 2019
12	Explain the round off error models used in FFT algorithms?	7	KTU July 2019
13	Give the output of decimation by M system in time domain. Explain output frequency spectrum. What is the importance of low pass filtering prior to down sampling?	10	KTU DEC 2018

14	How does a floating-point number represented in a processor? Explain the operations of addition and multiplication of two floating point numbers with examples.	10	KTU DEC 2018
15	Write short notes on any two finite word length effects in DSP systems with examples.	10	KTU DEC 2018
16	A signal x(n) is obtained by sampling analog signal x(t) at twice the Nyquist rate. If we wish to down sample x(n) by a factor 4, obtain the bandwidth of the decimation filter required for supressing aliasing distortion.	5	KTU MAY 2019
17	How up sampling and down sampling by a factor of 3 affect the frequency spectrum of a signal x(n) with frequency spectrum $X(e^{j\omega})$ What is the need of low pass filter prior to down sampling?	5	KTU MAY 2019
18	With an example illustrate the error introduced by truncation and rounding in fixed point representation of numbers.	8	KTU MAY 2019

QUESTION BANK

S5 ELECTRONICS AND COMMUNICATION ENGINEERING (2019 SCHEME)

ECT 305-ANALOG AND DIGITAL COMMUNICATION

QUESTIONS
COMPILED BY
DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING
VIDYA ACADEMY OF SCIENCE & TECHNOLOGY TECHNICAL CAMPUS, KILIMANOOR

ECT 305 ANALOG AND DIGITAL COMMUNICATION

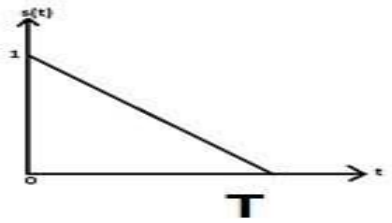
MODULE I

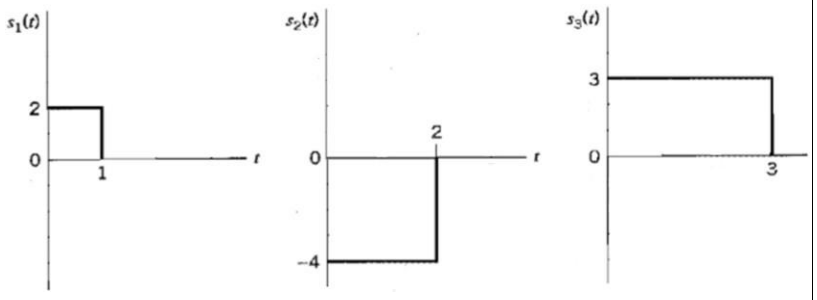
Sl. No.	Questions	Marks	KTU, Year
1	Compare AM, DSB-SC and SSB-SC modulation schemes with respect to bandwidth and system complexity.	3	KTU 2021December
2	With suitable block diagram explain the generation of wideband FM using narrow band FM.	3	KTU 2021December
3	Derive the modulation index of AM wave in terms of Vmax and Vmin . A sinusoidal carrier signal of peak amplitude 5 V and frequency 100 kHz is amplitude modulated by a 5 kHz signal of peak amplitude 3 V. Plot the modulated wave with Vmax and Vmin indicated also calculate modulation index.	6	KTU 2021December
4	An AM signal signal $s(t)= 10(1 + 0.8 \cos(2\pi 10^3 t))\cos(2\pi 10^6 t)$ is radiated to free space by an antenna having the resistance of 1Ω. Draw the spectrum of s(t) Also calculate the power and bandwidth.	8	KTU 2021December
5	With supporting equations and block diagram, explain the SSB-SC modulated signal generation.	6	KTU 2021December
6	A carrier wave of frequency 100 MHz is frequency modulated by a sinusoidal wave of amplitude 20 volts and frequency 100 kHz. The frequency sensitivity of the modulator is 25kHz per volt. Determine the approximate bandwidth of the FM signal, using Carson's rule. What will happen to bandwidth if modulating signal amplitude and frequency are doubled?	8	KTU 2021December
7	What are the needs for analog modulations.	3	Model question
8	Give the model of FM signal and plot its spectrum	3	Model question
9	Give the mathematical model of AM signal and explain its spectrum.	10	Model question
10	If a sinusoidal is amplitude modulated by the carrier $5\cos 2\pi 300t$ to a depth of 30 %, compute the power in the resultant AM signal.	4	Model question
11	Explain how SSB is transmitted and received.	10	Model question

12	Compute the bandwidth of the narrow band FM signal with modulating signal frequency of 1kHz and index of modulation 0.3	4	Model question
13	A carrier signal is frequency modulated by a sinusoidal carrier and frequency deviation is 50KHz. Determine the modulation index and Bandwidth when the message frequency is i)f_m=500KHz,ii) f_m=500Hz	8	Model question
14	Differentiate between DSBSC and SSB. Compare their parameters	8	Model question
15	A carrier signal $c(t)=20\ cos(2\pi*10^6t)$ is modulated by a message signal $m(t)=5cos(2\pi*10^4t)+2cos(8\pi*10^3t)$ to generate a DSB signal. Sketch the spectrum and calculate the bandwidth, Power and modulation efficiency.	6	Model question

MODULE II

SL. No	Questions	Marks	KTU,YEAR
1	Describe the concept of mutual information. Write the expressions for the same.	3	December 2021
2	Let X be a continuous random variable with the following probability density function $f(x) = \{ ke^{-4x} x \geq 0$; 0 otherwise. Find the value of the constant k.	3	December 2021
3	Find entropy of a binary memoryless source emitting two equally probable messages	4	December 2021
4	Define autocorrelation function of a random process and state its properties. Also show that the autocorrelation function $Rx(\tau)$ contains a constant component equal to A^2 if a random process X(t) contains a dc component equal to A.	10	December 2021
5	Derive the expression for differential entropy of a Gaussian random variable X with mean μ and variance σ^2.	4	December 2021
6	Discuss the properties of power spectral density of a WSS process. Find power spectral density of the WSS random process if its autocorrelation function is given by $Rx(\tau) = e^{-\alpha\|\tau\|} \|\infty < r < \infty$	10	December 2021
7	In a game a six faced die is thrown. If 1 or comes the player gets Rs.30, if 3 or 4 the player gets Rs 10, if 5 comes he losses Rs 30 and in the event of 6 he loses Rs 100.Plot the CDF and PDF of the gain and loss	3	Model Question
8	Give the conditions for WSS	3	Model Question
9	Compute the entropy of Gaussian random variable	10	Model Question
10	Give the relation between autocorrelation and power spectral density of a WSS	4	Model Question
11	Test whether the random process $X(t)=A\cos(2\pi ft + \theta)$ is WSS if θ is uniformly distributed in the interval $[-\pi, \pi]$	10	Model Question
12	Explain mutual information. Give its relation with self information	4	Model question

	MODULE III		
1	Discuss any one non uniform quantization methods?	3	December 2021
2	Discuss the need of regenerative repeater in PCM system.	3	December 2021
3	With suitable block diagram explain differential pulse code modulation transmitter system. How does it differ from PCM and delta modulation?	8	December 2021
4	The input to the delta modulator is a sinusoidal signal whose frequency varies from 500 Hz to 5000 Hz. The sampling rate is 4 times the Nyquist rate. The signal peak amplitude is 1 V. Determine the step size when the sampling frequency is 1000 Hz.	6	December 2021
5	A stationary process X(t) has the following values for its autocorrelation functions Rx (0) =1,Rx(1)=0.8,Rx(2) = 0.6 and Rx(3) = 0.4 Calculate the coefficients of an optimum linear predictor involving the use of 2 unit delays.	14	December 2021
6	Compute the step size for a delta modulator without slope overload if the input is Acos ($2\pi 120t$).	3	Model Question
7	State Source coding theorems I and II.	3	Model Question
8	A WSS process with autocorrelation $Rx(\tau)= e^{-\alpha\|\tau\|}$ is applied to an LTI system with impulse response $h(t)=e^{-\beta t}$ with $\|\alpha\|>0$ and $\|\beta\|>0$.Find theoutput power specral density.	10	Model Question
9	Give the conditions for stationary in the strict sense	4	Model Question
10	Find an orthonormal basis set for the set of signals $s1(t)=A\sin(2\pi f_0 t)$; $0<=t<=T$ and .$s2(t)=A\cos(2\pi f_0 t)$; $0<=t<=T$ where f0=m/T where m is an integer	7	Model Question
11	Plot the above signal constellation and draw the decision region on it. Compute the probability of error.	7	Model Question
	MODULE IV		
1	State the Nyquist criterion for distortionless baseband transmission in the absence of noise	3	December 2021
2	The input to the matched filter is given below.  Determine the impulse response of the matched filter	3	December 2021

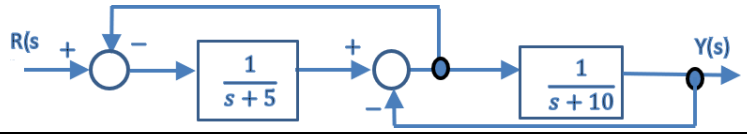
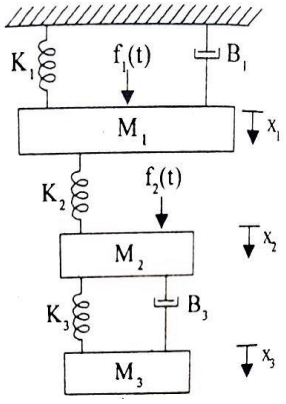
3	Consider the signals S1(t),S2(t) and S3(t)given below. Find the orthonormal basis for these set of signals using Gram-Schmidt orthogonalization procedure 	14	December 2021
4	With the help of neat diagram derive the impulse response and frequency response of duobinary encoder.	14	December 2021
5	Give the Nyquist criterion for zero ISI.	3	Model question
6	Give the Mathematical model of ISI.	3	Model question
7	Compute the probability of error for maximum likely hooddetection of binary transmission.	8	Model question
8	Explain the term matched filter. Plot the BER-SNR curve for a matched filter receiver.	6	Model question
9	Design a zero forcing equalizer for the channel that is characterized by the filter taps {1,0.7,0.3}	8	Model question
10	Explain partial response signaling.	6	Model question

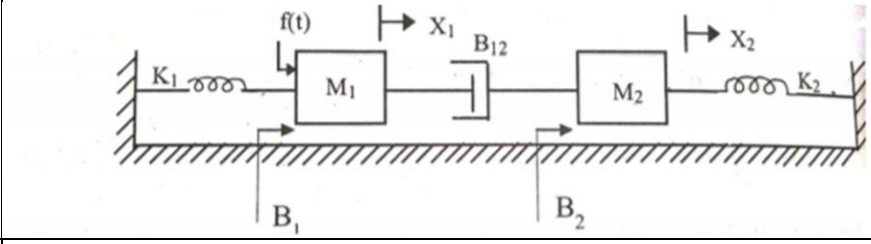
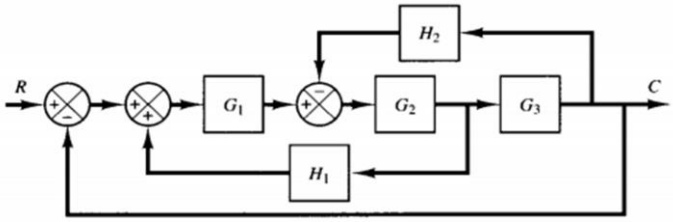
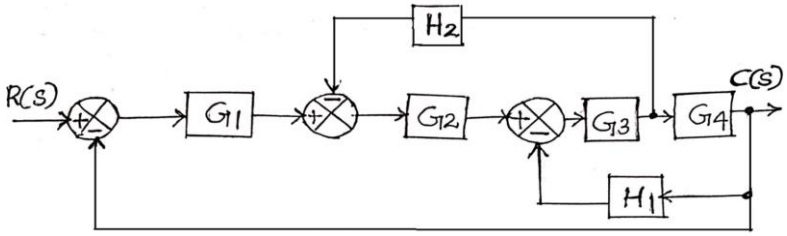
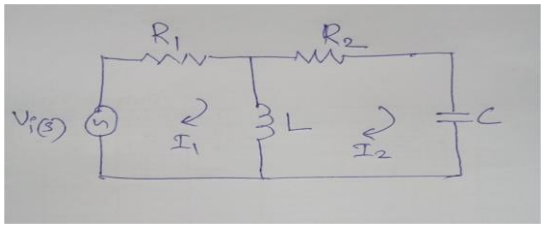
	MODULE V		
1	Draw the block diagram of a coherent binary PSK receiver.	3	December 2021
2	Draw the BER v/s SNR plot for the BPSK system and explain the graph.	3	December 2021
3	Derive the expression for probability of error in BPSK.	14	December 2021
4	Draw the constellation diagram for QPSK modulation and explain the generation and detection of QPSK signals with the help of block diagrams.	14	December 2021
5	Plot BER against SNR for a BPSK system.	3	Model Question
6	Draw the signal constellation of a QPSK system with and with out AWGN	3	Model Question
7	For a shift keying system defined by $s(t)=A_c k\sin(2\pi fct)+-A k\sin(2\pi fct)$. Plot the signal constellation. Compute the probability of error.	14	Model Question
8	Derive the probability of error for a QPSK system with Gray coding	10	Model Question
9	Draw the BER-SNR plot for a QPSK system.	4	Model Question

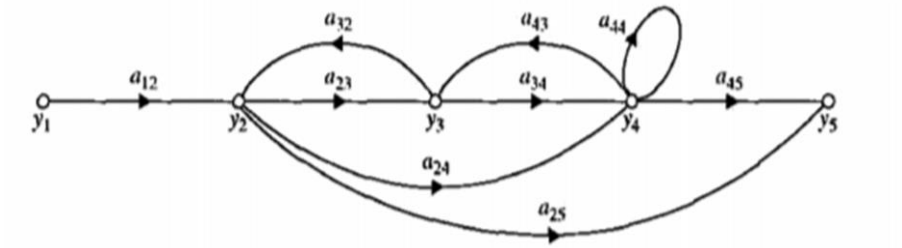
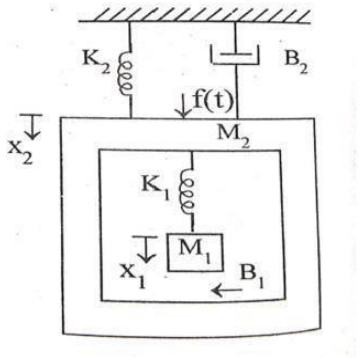
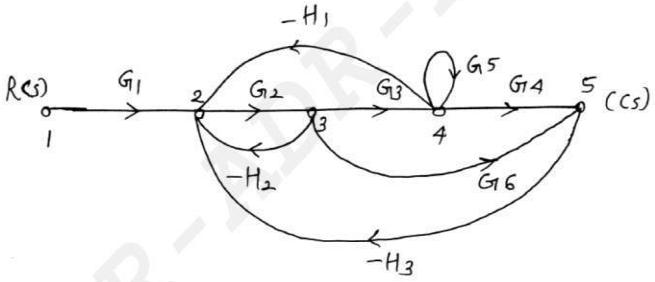
ECT307- CONTROL SYSTEMS

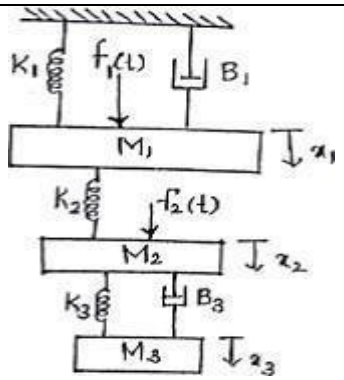
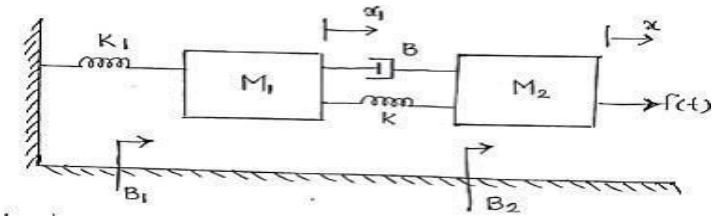
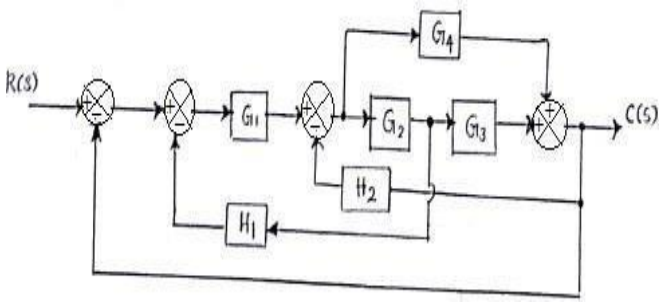
QUESTION BANK

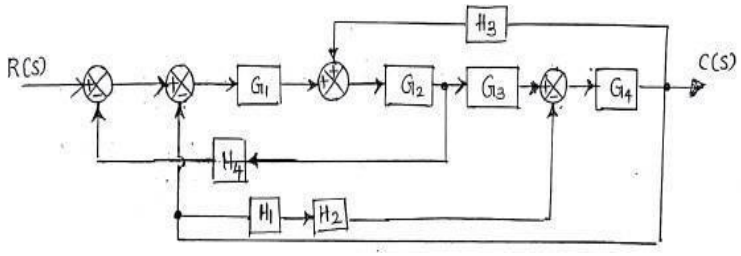
Subject : ECT307 Control Systems

MODULE I			
Sl. No	**Questions**	**Marks**	**KTU (Month/Year)**
1	Compare open loop and closed loop control systems. Give one example to both.	3	KTU DEC 2021 KTU DEC 2017
2	Draw the signal flow graph for the following set of algebraic equations: $x_1 = ax_0 + bx_1 + cx_2$ $x_2 = dx_1 + ex_3$	3	KTU DEC 2021 MODEL
3	a) Find the transfer function of the system using the direct block diagram reduction method 	7	KTU DEC 2021
	b) Draw the signal flow graph for the system in question 3(a) and obtain the gain using Mason's Formula	7	KTU DEC 2021
4	a)Draw the schematic of a second-order spring-mass-damper (SMD) system and obtain its transfer function. Draw the Force current and force voltage analogy circuits of the SMD system.	7	KTU DEC 2021
	b)Find the differential equation governing the mechanical system shown in fig. Draw the corresponding Force-Voltage analogous circuit 	7	KTU DEC 2021

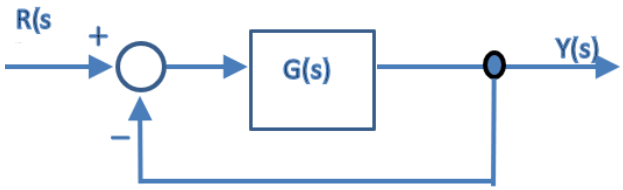
5	a) Draw the signal flow graph for the following set of algebraic equations. $x_2=x_1+ax_5$, $x_3=bx_2+cx_4$, $x_4=dx_2+ex_3$, $x_5=fx_4+gx_3$, $x_6=x_5$. Hence find the overall transfer function using Masons gain formula (9) $x_2=x_1+ax_5$, $x_3=bx_2+cx_4$,$x_4=dx_2+ex_3$,$x_5=fx_4+gx_3$, $x_6=x_5$. Hence find the overall transfer function using Masons gain formula b) Determine the transfer function of the system $X_2(s)/F(s)$ 	9 6	KTU DEC 2021 (2015 scheme)
6	Reduce the block diagram using the block reduction technique and find C(s)/R(s) 	8	KTU DEC 2021 (2015 scheme)
7	a)Determine the overall transfer function C(s)/R(s) for the system using block reduction technique  b)Find the transfer function $I_2(s)/V_i(s)$ the electrical system 	8 7	KTU AUG 2021

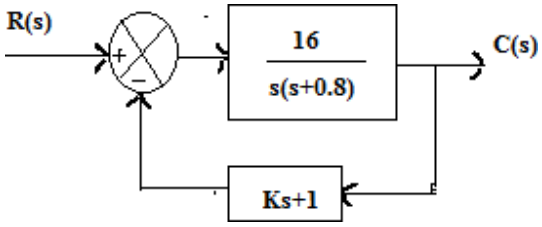
8	Determine the overall transfer function $Y_5(s)/Y_1(s)$ for the signal flow graph using Masons gain formula 	7	KTU AUG 2021
9	Determine the transfer function X1(s)/F(s) for the system shown below. 	8	KTU DEC 2020
10	Find the transfer function using Mason's gain equation 	10	KTU SEP 2020, KTU DEC 2019 MODEL
11	Draw the signal flow graph for the following sets of algebraic equation $x1 = ax0 + bx1 + cx2$, $x2 = dx1 + ex3$, $x3 = fx0 + gx2$, $x4 = hx3$	5	KTU DEC 2018
12	Convert the elements of rotational mechanical system to electrical system by torque current analogy	5	KTU APR 2018
13	Write the differential equations governing the mechanical system in the figure. Draw the force voltage and force current electrical analogous circuits	5	KTU APRIL 2018

			
14	Basic Components of feedback control system	5	KTU DEC 2017
15	Write the differential equations governing the mechanical system in the figure and determine the transfer function. 	5	KTU Dec 2017 MODEL
16	Convert the block diagram to signal flow graph and determine the Transfer function using Mason's gain formula. 	10	KTU Dec 2017

17	Using block diagram reduction technique find the transfer function C(s)/R(s) for the system shown in fig. 	10	KTU Dec 2017

MODULE II

1	Distinguish between Order of a system and Type of a system.	3	KTU DEC 2021
2	Draw the response of an underdamped second order system with complex poles on the left half of s-plane showing the rise time, peak overshoot, and settling time	3	KTU DEC 2021
3	a) Define position, velocity and acceleration error constants for a unity feedback control system. b) For the second order system with complex poles on the left half of s-plane, derive the expression for rise time, settling time, and steady state error parameters	7 7	KTU DEC 2021
4	a) Find the response of a system with transfer function $T(s)$= 1/(s+1)(s(+3) when subjected to unit step input. b) For the system in the block diagram, $G(s)$= 10/s2+14s+50  Find the steady state error values for unit step and unit ramp inputs.	7 7	KTU DEC 2021
5	a) Open loop transfer function of a unity feedback system is $G(s)$ =10/s(s+5)(s(+10). Determine the steady state error and error constants for the input r(t)= 5 + 10t+ 6t^2 b) Derive an expression for time response of a critically damped second order system to impulse input	8 7	KTU DEC 2021 (2015 scheme) MODEL
6	Explain various time domain specifications with neat sketch and mention the corresponding equations also.	7	KTU DEC 2021 (2015 scheme)
7	Find damping ratio and natural frequency of oscillation of a second order system whose closed loop transfer function is given by C(s)/R(s) = 9/ s^2+6s+9	3	KTU DEC 2021 (2015 scheme)
8	a)What are the four types of system based on the value of damping? Derive an expression for time response of second order under damped system to step input. b) For an open loop transfer function with unity feedback $G(s)$ =k(s+5)/s(s+6)(s(+7)(s+9).	10 5	KTU AUG 2021 MODEL

9	A positional control system with velocity feedback is shown in figure .What is the response c(t) to the unit step input. Given that $\zeta = 0.5$. Also calculate rise time, peak time, maximum overshoot and settling time 	5	KTU DEC 2020, KTU APRIL 2018
10	Derive an expression for time response of second order critically damped system to step input.	7	KTU DEC 2020
11	Derive an expression for rise time of a second order system.	5	KTU SEP 2020 MODEL
12	Derive the response of under damped second order system for unit step input	5	KTU SEP 2020 KTU Dec 2018, KTU Dec 2017
13	Explain frequency domain specifications	6	KTU DEC 2019, KTU July2017
14	The unity feedback system is characterised by an open loop transfer function G(s) =k/ $s(s+10)$ .Determine the gain K so that the system will have a damping ratio of 0.5 for this value of K. Determine the settling time, peak overshoot, rise time and peak time for a unit step input.	7	KTU DEC 2019 MODEL
15	Calculate the resonant peak and resonant frequency for second order system for wn= 0.5 and 8 rad/s	4	KTU APRIL2018
16	Derive the relation between generalized error and static error coefficient	4	KTU APRIL 2018
17	Derive the response of first order system for unit step input	10	KTU Dec 2017
18	Obtain the unit ramp response of system	8	KTU Dec 2017
19	Explain the effect of location of roots in s plane	6	KTU Dec 2017

MODULE III

1	What is the criterion on the roots of the characteristic equation for the stability? How is it connected to the BIBO stability?	3	KTU DEC 2021
2	State the angle and magnitude criteria that roots of the characteristic equation must be satisfied.	3	KTU DEC 2021

3	a) A system has characteristic equation, $s^3 + 3s^2 + (K + 1)s + 4 = 0$. Find the range of K for the stable system. b) For a system having open loop transfer function, $$G(s)H(s) = \frac{K}{(s + 1)(s + 3)(s + 6)}$$ Plot the root locus stating the steps	7 7	KTU DEC 2021
4	a) Explain the effect of adding a pole to a second order system. b) Write the general transfer functions of P, PI and PID controllers. Explain their role in a control system design	7 7	KTU DEC 2021 KTU AUG 2021
5	Construct Routh array and determine the stability of the system represented by the characteristic equation $S^6+2S^5+S^4+2S^3+S^2+2s+1=0$.Comment on the location of roots in s plane	8	KTU DEC 2021 (2015 Scheme) MODEL
6	Sketch the root locus whose open loop transfer function is $G(s)$= K/s(s+1.5)(s+4) and comment on the stability of the system.	8	KTU DEC 2021 (2015 Scheme)
7	Explain the effect of adding poles and zeros in stability of system with the aid of root locus technique	5	KTU AUG 2021
8	a) The characteristic equation is $S^4+S^3+5S^2+4S+4=0$. Using R H criteria, determine the stability of the system and comment on location of roots in s plane b)Sketch the root locus for $G(s)$ =k/(s+1)(s^2+2s+2) and comment on the stability of the system	5 10	KTU AUG 2021
9	Using Routh Hurwitz Criterion, determine the no of roots in the right half of s plane. $S^4 + 2S^3 + 10S^2 + 20S + 5=0$	5	KTU DEC 2018 MODEL
10	Write short notes on phase margin and gain margin	5	KTU APRIL2018
11	What is root locus? What are the information's obtained from it?	4	KTU APRIL2018
12	Sketch the root locus for a system G(s).H(s)= K/s(s+2)(s^2 +2s+2)	10	KTU July2017 MODEL
13	A positional control system with velocity feedback is shown in figure .What is the response c(t) to the unit step input. Given that $\zeta = 0.5$. Write the TF of PID Controller	5	KTU Dec 2017

MODULE IV

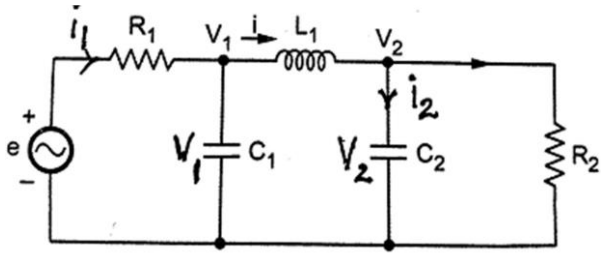
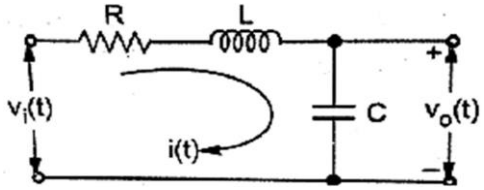
1	Write and explain the transfer function for a first order phase lag compensator. State the function of a phase lag compensator in a control system.	3	KTU DEC 2021

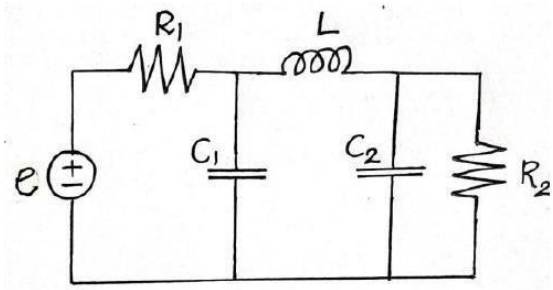
2	Draw the s-plane contour used for mapping, for stability analysis, to the plane of open-loop transfer function. G(S)H(S) = 1/S(S+1) Explain the choice of the contour	3	KTU DEC 2021
3	Using the Nyquist contour, analyse the following system to obtain the limit of *K* for the stability. The system has the open-loop transfer function $G(S)H(S) = K/\ s(\tau_1 s + 1)(\tau_2 s + 1)$.Find the expression for gain margin of the system. Determine phase margin of the system from the graph plotted.	14	KTU DEC 2021
4	a) State Cauchy's argument principle with the conditions to be applied on the contour of mapping. State the Nyquist criterion of stability on the open loop transfer function of a control system. b) Draw the bode plots of the system with open loop transfer function $G(S)H(S) = K/s(s + 1)(s + 2)$. Explain how the plot can be used for analyzing the stability of the system.	7 7	KTU DEC 2021
5	a) Sketch the root locus whose open loop transfer function $G(s)$ =K/ s(s+1.5)(s+4) and comment on the stability of the system. b) Explain frequency domain specification with the help of bode plot and state the condition for stability	12 3	KTU DEC 2021 (2015 Scheme)
6	Describe the design procedure of lead compensator	7	KTU DEC 2021 (2015 Scheme)
7	Sketch the bode plot for $G(S) = \frac{100\,(1+0.1s)}{s(1+0.2s)(1+0.3s)}$ Find gain margin and phase margin and hence comment on the stability of the system	12	KTU AUG 2021
8	Construct the Nyquist plot for a system whose open loop transfer function is $G(s)H(s)$ = K/ s(s+2)(s+10). Determine the range of K for which closed loop system is stable	6	KTU AUG 2021
9	State and explain Nyquist stability criterion	5	KTU AUG 2021 KTU DEC 2019 KTU July 2017 MODEL
10	Compare P, PI, PID Controllers	5	KTU Sep 2020, KTU DEC 2018 MODEL
11	Plot the bode diagram for the following transfer function and find the gain margin and phase margin G(s) = 10/ S(1+0.4S)(1+0.1S)	10	KTU DEC 2018 MODEL

12	Describe the design procedure of a lead compensator	7	KTU DEC 2018
13	Draw the Nyquist plot for the system whose open loop transfer function is G(s)H(s) = k/ s(s+2)(s+10). Determine the range of k for which the closed loop system is stable.	8	KTU DEC 2018
14	List the steps of bode plot of lead compensator	5	KTU APRIL2018

MODULE V

1	Give two advantages for using state variable representation of systems.	3	KTU DEC 2021
2	In a system represented by the state vector differential equation, let **A** is the coefficient matrix of the state variable vector. Then, if **A** = $\begin{bmatrix} 0 & 1 \\ -1 & -1 \end{bmatrix}$, find the characteristic roots of the system.	3	KTU DEC 2021
3	a) Let T(S) = 1 / $s^2 + 20s + 100$ is the transfer function of a system. Draw its signal flow graph in phase variable form. Also represent the system in the state variable form. b) Find the state transition matrix of a system represented by two state variables and having state coefficient matrix, A= $\begin{bmatrix} 0 & 6 \\ -1 & -5 \end{bmatrix}$	7 7	KTU DEC 2021
4	a) A single-input single-output system has the matrix equations $\dot{\mathbf{x}} = \begin{bmatrix} 0 & 1 \\ -3 & -4 \end{bmatrix} \mathbf{x} + \begin{bmatrix} 0 \\ 1 \end{bmatrix} u$ $y = [10 \quad 0]\mathbf{x}$. Determine the transfer function using the signal flow mode b) A system characterised by the transfer function $\frac{Y(s)}{U(s)} = \frac{2}{s^3 + 6s^2 + 11s + 6}$ Find the state and output equation in matrix form and also test the controllability and observability of the system	7 7	KTU DEC 2021 MODEL

5	a) Consider the system with state equation $\dot{X}1 = 0\ 1\ 0\ X1 + 0$ $\dot{X}2 = 0\ 0\ 1\ X2 + 0$ U. Estimate state controllability $\dot{X}3 = -6\ -11\ -6\ X3 + 1$ by Gilbert Test b)What are the properties of state transition matrix . Find the time response of a system whose A= $\begin{matrix}1 & -1\\ 0 & -2\end{matrix}$ and X(0) = $\begin{matrix}0\\1\end{matrix}$ c)Obtain the state model of given electrical system 	8 7 3	KTU DEC 2021 (2015 Scheme) MODEL
6	a) Obtain the state model of given electrical network  b) List out the properties of state transition matrix. Determine state transition matrix for A= $\begin{matrix}1 & 2\\ 0 & 1\end{matrix}$	6 7	KTU AUG 2021 MODEL
7	a) Consider a system with state space model is $\square = \begin{matrix}0 & 1 & 0\\ 0 & 0 & 1\\ -1 & -2 & -3\end{matrix} \square + \begin{matrix}0\\5\\1\end{matrix} \square$; $\square = [1\ \ 3\ \ 4]\square + [0]\square$ .Check whether the system is controllable and observable.	10	KTU AUG 2021
8	List out the advantages of using state space approach.	5	KTU AUG 2021
9	Obtain state model in phase variable form whose transfer function is given by $\frac{C(s)}{R(s)} = \frac{2s2+3s+S}{s3+2s2+11s+2}$	5	KTU AUG 2021
10	Find the time response of the system given below. $\dot{X} = AX$ $A = \begin{bmatrix}0 & 1\\ -2 & 0\end{bmatrix}$; $x(0) = \begin{bmatrix}1\\1\end{bmatrix}$; $y = [1\ \ -1]\begin{bmatrix}x1\\x2\end{bmatrix}$	7	KTU DEC 2020

11	A system is represented by the differential equation y''+3y'+2y = r''+2r'+2r. Obtain a state model in controllable canonical form. Draw the state diagram.	7	KTU SEP 2020
12	Obtain the state model for the given transfer function $$\frac{Y(s)}{U(s)} = \frac{1}{s^2 + s + 1}$$	8	KTU SEP 2020
13	Obtain the state space representation of the electrical system. 	5	KTU DEC 2019
14	Determine the controllability and observability of the given system. $$\begin{bmatrix}\dot{x}\\ \dot{y}\end{bmatrix} = \begin{bmatrix}-0.5 & 0\\ 0 & -2\end{bmatrix}\begin{bmatrix}x\\ y\end{bmatrix} + \begin{bmatrix}0\\ 1\end{bmatrix}u(t)$$ $$y(t) = [0 \;\; 1]\begin{bmatrix}x\\ y\end{bmatrix}$$	5	KTU DEC 2019
15	What is transfer function of a control system? Derive the expression for transfer matrix.	7	KTU DEC 2018

MCN 301 DISASTER MANGEMENT

QUESTION BANK

(Common for all branches)

MODULE 1			
SL.NO	**QUESTIONS**	**MARK**	
1	What is the mechanism by which stratospheric ozone protects earth from harmful UV rays?	3	KTU 2021
2	What are green house gases? Explain the mechanism of green house effect which causes globalwarming.	7	MODEL
3	Write short notes on Indian Monsoon	6	MODEL
4	What is biosphere? What are the components of biosphere?	3	KTU 2021
5	How are rocks formed? How are they classified?	6	MODEL
6	What are the different layers of atmosphere? Explain with suitable figure	14	KTU 2021
7	What are the differrent components of hydrosphere? Explain.	14	MODEL
8	What are disasters? What are their causes?	7	KTU 2021
9	Explain the different types of cyclones and the mechanism of their formation	7	KTU 2021
10	Explain the following terms in the context of disaster management (a) exposure (b) resilience (c)disaster risk management (d) early warning systems (e) damage assessment (f) crisis counselling (g) needs assessment	7	KTU 2021
MODULE 2			
1	What is hazard mapping? What are its objectives?	3	KTU 2021
2	What is participatory hazard mapping? How is it conducted? What are its advantages?	8	KTU 2021
3	Explain the applications of hazard maps	10	MODEL
4	Define vulnerability assessment. Explain the types of vulnerabilities and the approaches to assess them	4	MODEL
5	What are the different data requirements in hazard mapping?	10	MODEL
6	Explain the process of hazard mapping using GIS in detail	4	MODEL
7	What are the applications of hazard maps?	6	KTU 2021
8	Explain briefly the concept of disaster risk.	3	KTU 2021
MODULE 3			

1	What are the approaches and procedures to disaster risk assessment? (qualitative and quantitativemethods)	3	MODEL
2	List the strategies for disaster risk management 'before', 'during' and 'after' a disaster	3	MODEL
3	What is disaster preparedness? Explain the components of comprehensive disaster preparedness strategy.	14	MODEL
4	What are the objectives of disaster response?	3	KTU 2021
5	Write short notes on different types of disaster response.	7	KTU 2021
6	What is disaster prevention? Distinguish it from disaster mitigation giving examples	4	MODEL
7	Define the term relief. List any 3 International relief organisations	3	KTU 2021
8	What is disaster mitigation? Explain its different types of mitigation measures	7	MODEL
9	Briefly explain the process of disaster risk management which involves prevention, mitigation and preparedness	14	KTU 2021
10	What is the significance of disaster risk reduction when compared to disaster risk management	7	MODEL
11	Explain the different disaster risk management framework	14	MODEL
MODULE 4			
1	Explain capacity building in the context of disaster management	7	KTU 2021
2	Write short notes on capacity strengthening for reducing risk.	3	MODEL
3	Explain in detail about the structural and non-structural measures in capacity building	14	MODEL
4	Briefly explain the levels of stakeholder participation in the context of disaster risk reduction .	14	KTU 2021
5	How are stakeholders categorized? What are the key steps involved in identifying them	3	MODEL
6	Explain the importance of communication in disaster management.	14	KTU 2021
7	What are the steps to effective disaster communication? What are the barriers to communication?	7	KTU 2021
8	Explain the benefits and costs of stakeholder participation in disaster management.	14	KTU 2021
9	How are stakeholders in disaster management identified?.	7	MODEL
10	Explain the concept of crisis counselling in detail.	6	MODEL
MODULE 5			

1	Explain the salient features of the National Policy on Disaster Management in India	7	KTU 2021
2	Briefly explain the legislations in India on disaster management.	3	MODEL
3	Write a short note on disaster management act 2005	3	MODEL
4	Explain the guiding principles and priorities of action according to the Sendai Framework for Disaster Risk Reduction	7	KTU 2021
5	What are Tsunamis? How are they caused.	10	MODEL
6	What are the common disaster types in India? Briefly explain any two	7	KTU 2021
7	Explain the earthquake zonation of India	7	KTU 2021

QUESTION BANK

S5 ELECTRONICS AND COMMUNCATION ENGINEERING

QUESTIONS COMPLIED BY
DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING
VIDYA ACADEMY OF SCIENCE AND TECHNOLOGY
TECHNICAL CAMPUS KILIMANOOR

MODULE 1

Sl No	Question		Marks
1	Management is getting things done through others.Elobarate	Model qn	3
	Comment on true nature of management. Is it science or art.	Model qn	3
2	a) Explain System approach to management b) Describe roles of a manager	Model qn, KTU DEC 2021	10 4
3	a) Explain 14 principles of administrative management. b) Explain different managerial skills	Model qn	10 4
4	What are the different levels of management?	KTU DEC 2021	3
5	What is scientific management?	KTU DEC 2021	3
6	Explain the importance of delegation in management.	KTU DEC 2021	3
7	How are changes in the external environment compensated in the systems approach?	KTU DEC 2021	4
8	2) a) Explain Task and Responsibilities of a professional Manager. b) Explain the importance of management in an organisation.	KTU DEC 2021	8 6

MODULE 2

1	What are the planning premises, explain its classification	Model qn	10
2	Distinguish between strategy and policy. How can be policies be effective	Model qn	4
3	a)Explain 3 motivational theories b) Describe Managerial grid	Model qn	9 5
4	Planning is looking ahead and controlling is looking back. Comment with examples	Model qn	3
5	Explain the process of communication	Model qn	3
6	Explain the hierarchy of objective	Model qn	3
7	Explain the mission, goals, strategy, programmes and procedures of an organisation with suitable examples.	KTU DEC 2021	8
8	Differentiate between strategic and tactical decisions.	KTU DEC 2021	6

9	a) Illustrate the different types of organisation structures. (8) b) Explain the factors governing the selection of organisation structures.	KTU DEC 2021	8 6

MODULE 3

1	**Explain the type of decisions**	Model qn paper	3
2	Describe the economic man model	Model qn paper	3
3	a) Modern forest management uses controlled fires to reduce fire hazards and to simulate new forest growth.Management has the option to postpone or plan a burning.In a specific forest tract,if burning is postponded a general administrative cost of Rs, 300 is incurred .I a controlled burning is planned,there is a 50% chance that good weather will prevail and burning will cost Rs.3200.The results of burning may be either successful with probability 0.6 or marginal with probability 0.4.Successful excitation will result in an estimated benefit of Rs.6000 and marginal execution will provide 3000/- in benefits.i) Develop a decision tree for the problem.ii)Analyse the decision tree and determine the optimal course of action. b) Student tuition of ABC university is $100 per semester credit hou.The education dept. supplements the university revenue by matching student tuition,$ per $.Average class size for typical 3 credit course is 50 students.Labour cost are $ 4000 per class,material cost are $ 20 per student and overhead cost are $25000?- per class. a) Determine the total factor productivity b) Instructor dekiver lecture 14 hr per week and semester lasts for 15 week what is the labour productivity.	Model qn paper	14
4	sales volume will take on any other magnitude in future. Find the expected monetary valu 16. a) An ice-cream retailer buys ice cream at a cost of Rs. 13 per cup and sells it for Rs. 20 per cup; any remaining unsold at the end of the day, can be disposed at a salvage price of Rs. 2.5 pe cup. Past sales have ranged between 13 and 17 cups per day; there is no reason to believe tha EOL, if the sales history has the following probabilities: **Market Size** 13 14 15 16 17 **Probability** 0.10 0.15 0.15 0.25 0.35	Model qn paper	9
5	b) At Modem Lumber Company, Kishore the president and a producer of an apple crates sold t growers, has been able, with his current equipment, to produce 240 crates per 100 log currently purchases 100 logs per day, and each log required 3 labour hours to process. He believes that he can hire a professional buyer who can buy a better quality log at the same cost. If this is the case, he increases his production to 260 crates per 100 logs. His labour hours will increase by 8 hours per day. What will be the impact on productivity (measured in crates per labour-hour) if the buyer is hired? What is the growth in productivity in this cas	Model qn paper	5

6	17. a) A project has the following list of activities and time estimates: **(a)** Draw the network. (b) Show the early start and early finish times. (c) Show the critical path. **(10)**	Model qn paper	10
7	b) An opinion survey involves designing and printing questionnaires, hiring and training personnel, selecting participants, mailing questionnaires and analysing data. Develop the precedence relationships and construct the project network. **(4)**	Model qn paper	4
8	18. a) The following table shows the precedence requirements, normal and crash times, and normal and crash costs for a construction project: Draw the network. (b) Determine the critical path. (c) Determine the optimal duration and the associated cost. **(10)** b) Differentiate between CPM and PERT. **(4)**	Model qn paper	10 4
9	a) The producer of an apple crates company produces 270 crates per 100 logs with his current equipment. He currently purchases 100 logs per day, and each log required 3 labour hours to process. He believes that he can hire a professional buyer who can buy a better quality log at the same cost. If this is the case, he increases his production to 290 crates per 100 logs. His labour hours will increase by 8 hours per day. What	KTU DEC 2022	10

Activity	Time (Days)	Immediate Predecessors
A	1	-
B	4	A
C	3	A
D	7	A
E	6	B
F	2	C, D
G	7	E, F
H	9	D
I	4	G, H

Activity	Immediate Predecessors	Required Time (Weeks)		Cost (Rs.)	
		Normal	Crash	Normal	Crash
A	-	4	2	10,000	11,000
B	A	3	2	6,000	9,000
C	A	2	1	4,000	6,000
D	B	5	3	14,000	18,000
E	B, C	1	1	9,000	9,000
F	C	3	2	7,000	8,000
G	E, F	4	2	13,000	25,000
H	D, E	4	1	11,000	18,000
I	H, G	6	5	20,000	29,000

<table>
<tr><td></td><td>will be the impact on productivity (measured in crates per labour-hour) if the buyer is hired? What is the growth in productivity in this case?
b) b) Explain decision making under uncertainty.</td><td></td><td>4</td></tr>
<tr><td>10</td><td>a) A cell phone manufacturer has invented a 3D phone. The company wants to take decision whether to manufacture the phone, take royalty from another manufacturer, or sell rights of the invention and take a lump sum amount of ₹50,000. The profits associated and probability of these alternatives is given in the table below. Represent the problem as a decision tree and suggest a decision to maximise profits.
<table>
<tr><th rowspan="2">Demand</th><th colspan="2">Manufacture the phone</th><th colspan="2">Take royalty</th></tr>
<tr><th>Probability</th><th>Profit (₹)</th><th>Probability</th><th>Profit (₹)</th></tr>
<tr><td>High</td><td>0.25</td><td>200,000</td><td>0.25</td><td>60,000</td></tr>
<tr><td>Medium</td><td>0.4</td><td>50,000</td><td>0.4</td><td>40,000</td></tr>
<tr><td>Low</td><td>0.35</td><td>-10,000</td><td>0.35</td><td>20,000</td></tr>
</table>
b) b) Explain the different models of decision-making behaviour</td><td>KTU DEC 2022</td><td>7

4</td></tr>
<tr><td></td><td>How can we improve the productivity of an organisation?</td><td>KTU DEC 2022</td><td>3</td></tr>
<tr><td></td><td>List out the steps in rational decision-making.</td><td>KTU DEC 2022</td><td>3</td></tr>
</table>

MODULE 4

<table>
<tr><td>1</td><td>19. a) What is meant by market segmentation and explain the process of market segmentation (8)
b) The Honda Co. in India has a division that manufactures two-wheel motorcycles. Its budgeted sales for Model G in 2019 are 80,00,000 units. Honda's target ending inventory is 10,00, 000 units and its beginning inventory is 12, 00, 000 units. The company's budgeted selling price to its distributors and dealers is Rs. 40, 000 per motorcycle. Honda procures all its wheels from an
10
outside supplier. No defective wheels are accepted. Honda's needs for extra wheels for replacement parts are ordered by a separate division of the company. The company's target ending inventory is 3,00,000 wheels and its beginning inventory is 2,00,000 wheels. The budgeted purchase price is Rs. 1,600 per wheel.
(a) Compute the budgeted revenue in rupees.
(b) Compute the number of motorcycles to be produced.
Compute the budgeted purchases of wheels in units and in rupees.? (6)</td><td>Model qn</td><td>6</td></tr>
<tr><td>2</td><td>Explain the concept of crashing and dummy activity</td><td>Model qn</td><td>3</td></tr>
<tr><td>3</td><td>Differentiate qualitative and quantitative methods in forecasting</td><td>Model qn</td><td>3</td></tr>
<tr><td>4</td><td>17 a) A project consists of 7 activities and the three time estimates are as follows:</td><td>KTU DEC 2022</td><td>10</td></tr>
</table>

	<table><tr><th rowspan="2">Activities</th><th colspan="3">Duration in weeks</th></tr><tr><th>t_o</th><th>t_m</th><th>t_P</th></tr><tr><td>A</td><td>2</td><td>6</td><td>10</td></tr><tr><td>B</td><td>4</td><td>6</td><td>12</td></tr><tr><td>C</td><td>2</td><td>3</td><td>4</td></tr><tr><td>D</td><td>2</td><td>4</td><td>6</td></tr><tr><td>E</td><td>3</td><td>6</td><td>9</td></tr><tr><td>F</td><td>6</td><td>10</td><td>14</td></tr><tr><td>G</td><td>1</td><td>3</td><td>5</td></tr></table> The sequence of activities is as follows: • Activities A and B start at the beginning of the project. • When A is completed C and D start. • Ecan start when B and D are finished. F can start when B, C and D are completed and is the final activity. • G can start when F is finished and is the final activity. i. What is the expected time of the duration of the project? ii. Identify the critical path of the project. iii. Calculate the probability that project will be completed in 23 weeks. b) Write notes on Fulkerson's rule of numbering events.		4
5	a) The following table shows the precedence requirements, normal and crash times, and normal and crash costs for a project. The indirect costs are ₹ 70/day. <table><tr><th rowspan="2">Activity</th><th colspan="2">Required Time (days)</th><th colspan="2">Cost (₹)</th></tr><tr><th>Normal</th><th>Crash</th><th>Normal</th><th>Crash</th></tr><tr><td>1-2</td><td>8</td><td>6</td><td>100</td><td>200</td></tr><tr><td>1-3</td><td>4</td><td>2</td><td>150</td><td>350</td></tr><tr><td>2-4</td><td>2</td><td>1</td><td>50</td><td>90</td></tr><tr><td>2-5</td><td>10</td><td>5</td><td>100</td><td>400</td></tr><tr><td>3-4</td><td>5</td><td>1</td><td>100</td><td>200</td></tr><tr><td>4-5</td><td>3</td><td>1</td><td>80</td><td>100</td></tr></table> b) Draw the network. ii. Determine the critical path. iii. Determine the optimal duration and the associated cost after crashing. (10) b) Differentiate between activity and event in a project network.	KTU DEC 2022	10
6	Explain the dummy activity in a project network.	KTU DEC 2022	3

MODULE 5

1	20. a) a) "Human Resource Management policies and principles contribute to effectiveness, continuity and stability of the organization". Discuss. (b) What is a budget? Explain how sales budget and production budgets are prepared? **(10)** b) Distinguish between the following: (a) Assets and Liabilities (b) Production concept and Marketing concept (c) Needs and Wants (d) Design functions and Operational control functions in operations **(4)**	KTU DEC 2022	6
2	a) What are intellectual property rights? Explain the business importance of patents.	KTU DEC 2022	7

3	b) Explain the various interrelationships between the following functional areas. (i) Production and Marketing (ii) Production and Finance (iii) Production and Personnel.	KTU DEC 2022	7
4	a) Explain the process of market segmentation. How is the marketing mix related to market segmentation?	KTU DEC 2022	10
5	Operations management is process of planning, organizing and controlling the activities of a production function". Explain.	KTU DEC 2022	4
6	Differentiate between needs, wants, and demands.	KTU DEC 2022	3
7	Define entrepreneurship.	KTU DEC 2022	3