S6 CSE QUESTION BANK

COMPUTER SCIENCE & ENGINEERING

Index

INDUSTRIAL ECONOMICS AND FOREIGN TRADE

(HUT 300)

MODULE 1			
1	Why does an economic problem arise? What are the basic economic problems?	7	KTU Dec 2021
2	Explain Production possibility curve?	3, 7	KtuDec2021
3	Explain consumer equilibrium? Explain consumer surplus? Explain producer surplus?	3	KTU Dec2021
4	a. What should be percentage change in price a product if the sale is to be increased by 50% and its price elasticity of demand is2 b. A consumer purchases 50 units of commodity× when its price is Rs.8/- per unit. In the next month he purchased 60 units at the same price. this was due to an increase in the price of another commodity y from Rs.10 to 12. Calculate cross elasticity of demand and interpret the result. c. Define the cross elasticity of demand a tea manufacturing company was able to sell 800kg of the price of coffee was Rs 70 per kg. Later they were able to sell 9000 kg when the price of coffee became Rs80 per kg. Calculate the cross elasticity of demand for tea. Are the commodities substitute or complimentary? d. Define price elasticity of demand. A company producing soft drink is selling its product for Rs.22. It sells 1000 units, and then increases the price to Rs.24. Now sales fall to 900 units. What is the price elasticity of soft drink? Is the demand elastic or inelastic? Why? e. What is cross elasticity of demand? Suppose cross elasticity of demand betweenX and Y is 0.5. If there is a 50 percent change in the price of Y, what will be the percentage change in the quantity demanded of X?	7	KTU DEC 2022
5	a. Demand function of a product is given as D = 50-2p and supply function S + 20 + 3p. What will be the equilibrium price	3	KTU Dec 2022

	and quantity of the product. b. The demand function of a product is given as D = 60 - 2P and the supply function S = 30 + 4P. Estimate equilibrium price and equilibrium quantity. Also find the excess supply when Price equals Rs.6?		
6	a. Explain Dead weight loss. b. Suppose the govt. imposes a tax on a commodity where the tax burden is met by the consumers. Draw diagram and explain dead weight loss. Mark consumer surplus, producer surplus, tax revenue and dead weight loss in the diagram c. What is deadweight loss of a tax? Examine the consumer and producer surplus before and after a tax with the help of a diagram.	7	KTU, KTU Dec 2022
7	What are the merits and demerits of Joint stock companies?	7	Dec2021
8	a. Prepare a utility schedule showing units of consumption, total utility and marginal utility. Point out any three limitation of the law. b. Draw total utility and marginal utility curves and derive the three relations between marginal utility and total utility.	7	KTU Dec 2022
9	How is elasticity of demand measured according to the percentage method? How is the measurement of elasticity of demand useful for the government.	7	KTU
MODULE 2			
1	In the production function θ = 2L½ K ½If L + 36 how many units of capital one needed to produce 60 units of output.	3	Dec-2021
2	a. In the short run AVC <P <AC. Will the firm produce or shut down? Give reason ? b. Explain shut down point in the short run with the help of diagram	3	Dec-2021
3	Define Isoquants and properties, Explain Isocost line, Explain Expansion path, Explain Cobb-Douglas production function	7	Dec-2021
4	Differentiate explicit cost and implicit cost, Explain Sunk cost	3	Dec-2022
5	Explain Profit Volume Ratio. (PV Ratio), What is margin of safety? What happens when margin of safety is low?	3	KTU, Dec 2021

6	What are internal and external economics of scale.	7	Dec-2022
7	Suppose monthly fixed cost of a firm is Rs.40000 and its monthly total variable cost is Rs.60000. If the monthly sales is Rs.120000 estimate contribution and break even sales. ii. If the firm wants to get a monthly profit of Rs.40000 what should be the sales? iii. The total cost function of a firm is given as TC=100+50θ- θ2+ θ3. Find marginal cost when output equals 5 units. b. The total sales of a manufacturing firm are Rs.20000 in this year. Its variable costs one Rs.8000 where its fixed costs are Rs.6000 for that year. Find out the break-even point of this firm. c. Suppose a firm pays Rs.10000 as monthly rent and Rs.10000 as interest payment.Its monthly expenditure on raw materials is Rs.40000 and it get monthly sales revenue of Rs.80000. The price of one unit of output is Rs.40. Estimate i) PV Ratio ii) Break even sales iii) Break-even output iv) Profit earned v) Margin of safety	7	Dec 2022
8	Explain Law of variable Proportions with a diagram.	7	Dec-2021
9	Explain marginal Revenue and Average Revenue in perfect competition and imperfect competition with graph	7	Dec-2022
10	What are the advantages of large-scale production? Explain producer equilibrium with the help of a diagram.	7	Dec-2021
11	Explain producer equilibrium with the help of isoquants and is cost line. What is expansion path.	7	KTU Dec 2022
12	Explain Returns to scale OR Long run production function, Represent it using a figure.	7	KTU Dec 2022
13	The total cost function of firm is given as TC=500+5Q 4Q2+Q3. Estimate TVC, TFC and MC when output equals 10 units.	7	KTU Dec 2022
MODULE 3			
1	What is collusive oligopoly? What is non-price competition under Oligopoly? Give examples of non-price competition under oligopoly? Explain linked demand curve model.	7	KTU Dec 2021
2	What is Predatory pricing? What is Price skimming?	7	Dec-2021

3	Explain the equilibrium of a firm earning supernormal profit under monopolistic competition.	3	Dec-2021
4	Make comparison between monopoly and perfect competition.	7	Dec-2022
5	What is inelastic demand?	3	Dec 2022
6	Suppose AC>Price>AVC. Will a producer produce or shutdown in the short run? Give reason.	3	KTU Dec 2022
7	Why a firm under perfect competition is called a price taker?	3	KTU Dec 2022
8	Explain Price rigidity under oligopoly with the help of kinked demand curve. Why price is rigid under oligopoly?	7	KTU Dec 2022
9	a. With the help of a diagram explain equilibrium under monopolistic competition. b. What are the features of Monopolistic competition, Suppose a firm under monopolistic competition is getting supernormal profit. Draw a diagram and explain this situation	7	KTU Dec 2022
10	Distinguish between monopoly and Oligopoly/ Monopoly and perfect competition	7	Dec-2022
11	Make a comparison between monopoly and monopolistic competition. Draw figures showing the determination of equilibrium under both.	7	KTU Dec 2022
12	Explain cost plus and going rate pricing.	7	KTU Dec 2022
MODULE 4			
1	What are important economic activities under primary	3	Dec-2021
2	Explain the GNP Deflator.	3	Dec-2021
3	Explain demand pull inflation , Explain cost push inflation	7	Dec-2022
4	Distinguish between a bond and a share?	3	Dec-2022
5	Distinguish between NSE and BSE , Distinguish between NIFTY and SENSEX	7	Dec-2022
6	Distinguish between Demat Account and Trading Account	3	Dec-2022
7	Distinguish between final goods and intermediate goods.	3	Dec 2022
8	a. GDP of a country = 1500 crores, Depreciation =150 Crores	7	Dec-2021

	NFIA= 50 crores. Estimate GNP,NDP and NNP b. Estimate GDPmp. GNPmp and National income. Private consumption expenditure - 2000 (in 1000 crores) Govt. Consumption - 500 ,NFIA - (300) ,Investment - 800 Net Export – 700, Depreciation - 400 Net internal tax – 300 c. From the given below estimate Gross National Product, Net National Product and National Income. GDP - 5000 (in 100 billion) NFIA - 50 Indnet - 70 Subsidies- 20 Depreciation- 30 d. From the data given below estimate the NDP using Item Rs Consumption Expenditure 3000 Investment Expenditure 2000 Govt. Expenditure 700 Exports 600 Imports 300 Intermediate consumption 2000 Wages and Salaries 2000 Rent 500 Interest 500 Profit 1000 e. How is national income estimated according to the income method? Estimate NDP and NNP from the given data (all figures in Rs. Crores). Wages and salaries = 800, Rent = 300, Depreciation = 200, Interest = 400, Net Indirect tax = 400, NFIA = 100, Profit = 400. f. Suppose the national income of a country is Rs1000 and depreciation equals Rs300. If NFIA equals Rs (-400) and Indirect Taxes equals Rs300, estimate NNP, NDP, GDP and GNP (all figures in Rs. Crores).		Dec 2022
9	Distinguish between money market and capital market ?	7	Dec 2021
10	What is monetary policy? What are the monetary policy measures?	7	KTU Dec 2022
	MODULE 5		
1	What is free trade? What is Devaluation? Explain the J-curve effect? Suppose the sum of elasticity of export and import is	7	KTU Dec

	less than one. What will be the effect of devaluation? What are the merits of quota restrictions? What are the arguments in favour of free trade? What are the tariff barriers? Explain its impact on the economy.		2021
2	Explain Marshall- Learner condition.	3	Dec-2021
3	How is National income estimated under Product method and expenditure method, income method	7	Dec-2021
4	What are the monetary and fiscal policy measures to control inflation?	3	KTU Dec 2021
5	What is international trade? List out the advantages of foreign trade ? What are the disadvantages of foreign trade? Examine the effects of quotas on international trade.	7	KTU Dec 2022
6	What do you mean by labour augmenting technical progress?	3	KTU Dec 2022
7	What is a Trading account? Point out any three items coming under unilateral transfers account. What is balance of payments?	3	KTU Dec 2022
8	Examine the comparative cost theory. Point out any two criticisms against this theory. Explain absolute advantages theory with the help of an example	7	KTU Dec 2022
9	What is protection? State any five arguments in favour of protection.	7	KTU Dec 2022
10	Evaluate the success or failure of devaluation when the demand for import is more elastic or less elastic.	7	KTU Dec 2022

CST 302 COMPILER DESIGN

MODULE 1

1.	Scanning of source code in compilers can be speed up using Input Buffering Explain.	3	Dec 19
2.	Specify the analysis and Synthesis part of Compilation?	3	Model KTU
3.	Explain compiler writing tools.	5	JUNE 22
4.	Explain the working of different phases of a compiler. Illustrate with a source language statement. Position=initial+rate*60	10	JUNE 22
5.	Write a regular expression to denote the language of all strings of a's and b's with an even number of a's followed by an odd number of b's	3	JULY 21
6.	Distinguish between front end and back end of a compiler	3	JULY 21
7.	Draw the transition diagram for the regular definition,	3	April18
8	Find the number of tokens in the following C Code Int main() { int a,b,c;c=a+b;printf("%d",c); }	3	KTU Model
8.	Define the terms tokens, lexemes and patterns with examples	3	JULY 21
9.	Is the grammar (S)S(S)S/€ ambiguous? Justify your answer	3	April18
10	Explain the importance of sentinels in input buffering used in lexical analysis	3	JUNE 22
11	Explain Bootstrapping with example	4	April14
12	Find the lexemes in the following programming statement. sum = a * (b -10) ; Define tokens and patterns for the above statement.	4	JUNE 22
13	Explain the need of Translator	3	April14

14	Explain the role of transition diagrams in recognition of tokens.	7	JUNE 22

MODULE 2

1	Find the FIRST and FOLLOW of the following grammar S->aABe A->Abc/b B->d	5	KTU Model
2	Find FIRST set and FOLLOW set of each nonterminal in the following grammar E → E A E | (E) | - E | id A → + | *	3	KTU JUNE22
3	a) Design a recursive descent parser for the grammar E->E+T|T T->;T*F|F F->(E)|Id	5	KTU Model
4	Design a recursive descent parser for the grammar S->cAd, A->ab/b	4	KTU Model
5	Define LL(1)Grammar?	3	April 2018
6	a) Show that the grammar S -> iCtSeS | iCtS | b , C -> a is ambiguous. b) Eliminate ambiguity from the above grammar.	5 4	KTU JUNE 22
7	What are viable prefixes?	3	KTU JUNE 22
8	What are the different parsing conflicts in the SLR parsing table?	3	JUNE 22
9	Write Non-recursive predictive parsing algorithm.	6	KTU JUNE22

MODULE 3

1.	a. Construct the LR(0) set of items and the it GOTO function for the grammar S->SS+|SS*|a b. Is the grammar SLR ?justify your answer	3	May19
2.	Explain bottom-up evaluation of s-attributed definitions.	3	May19
3.	Explain the main action in a shift reduce parser.	3	May19
4.	What are different parsing conflicts in SLR parsing table?	3	May19
5	Construct canonical LR(0) collection of items for the grammar below. S → L = R | R L → * R | id R → L Prove that this grammar is not SLR(1).	9	KTU JUNE22
6	What is handle pruning? Indicate the handles in the reduction of the sentence aaabbb to the start symbol using the grammar S → aABb , A → aA | a , B → bB | b	7	KTU JUNE22
7	Derive LR (1) parsing table for following grammar S → Aa | bAc | Bc | bBa A → d B → d	7	KTU JUNE22
8	Write all moves by the LR parser for parsing the input 'bdc'. [use the parsing table created in question number	5	KTU JUNE22
9	c)What are annotated parse tree? Give examples	3	KTU JUNE22
10	Explain operator grammar and operator precedence parsing.	3	May19
11	Differentiate between synthesized attributes and inherited attributes with an example.	3	KTU JUNE22

13.	Demonstrate the identification of handles in operator precedence parsing?	3	April18
14.	Design a Syntax Directed Definition for a Desk calculator that prints the result	3	April18

MODULE 4

1.	Define the following and show an example for each. i). Three-address code iii). Triples	6	Dec19 KTU 2021
2	Write the SDD for a simple type declaration and draw the annotated parse tree for the declaration float a, b, c.	7	KTU JUNE22
3	With an SDD for a desk calculator, write the steps involved in the bottom up evaluation for the expression (3*5) –2.	7	KTU JUNE22
4.	Explain different code optimization techniques available in local and global optimization?	10	Dec19 KTU 2021
5	Explain static allocation and heap allocation strategies.	7	KTU JUNE22
6	Construct the DAG and three address code for the expression a+a*(b-c)+b*(b-c)+b	7	KTU JUNE22
7.	Explain different stack allocation strategies with suitable example	10	Dec19 KTU 2021
8	What is the role of activation record in compiler design?	3	KTU JUNE22
9.	How is storage organization and management done during run-time.	4	Dec19 KTU 2019
10	Construct the syntax tree and then draw the DAG for the statement e= (a*b) + (c-d) * (a*b)	5	April18 KTU 2021
11	Explain static allocation and heap allocation strategies	10	April18 & 2019
12	With an example each explain the following loop optimization techniques (i)Code motion (ii) Induction variable elimination and (iii) strength reduction	10	April18 KTU 2021

13	a) Explain any two issues in the design of a code generator. b) Explain the optimization of basic blocks	5 5	April18 KTU 2021
14	Write syntax directed definitions to construct syntax tree and three address code for assignment statements	10	April18 KTU 2021

MODULE 5

1.	Explain different code optimization techniques available in local and global optimization?	10	Dec19 KTU 2021
2.	How is storage organization and management done during run-time?	4	Dec19
3.	Design a type checker for simple arithmetic operations	3	May19
4.	How the optimization of basic blocks is done by a compiler?	6	Dec19 KTU 2021
5.	Write the Code Generation Algorithm	3	May19
6	Generate target code sequence for the following statement d=(a-b)+(a-c)+(a-c)	9	KTU Model
7	Describe the Principal Sources of Optimization.	7	KTU Model
8	With suitable example of a basic block, explain the code-improving transformations of a basic block.	7	KTU JUNE22
9	Discuss the code optimization techniques available in local optimization?	5	KTU Model
10	With suitable examples explain loop optimization techniques With suitable example of a basic block, explain the code-improving transformations of a basic block.	7	KTU Model
11	Explain issues in design of a code generator	6	KTU JUNE22
12	Write the code generation algorithm. Using this algorithm generate code sequence for the expression x = (a – b) + (a + c) + (a + c)	7	

CST 372 DATA AND COMPUTER COMMUNICATION

MODULE 1			
Sl. No	**Questions**	**Marks**	**KTU Month/Year**
1	Define simplex, half duplex and full duplex transmission mode. Give one example for each.	3	DEC 17, APR 18 MAY 19 JUNE 22
2	List and explain different factors which determine the performance of communication in a network?	3	DEC 17 APR 18 DEC 20
3	List various impairments and explain how they affect informationcarrying capacity of a communication link?	4 9 9	DEC 17 MAY 19 DEC 20
4	Signal to Noise Ratio is often given in decibels. Assume SNR db=36 and thechannel bandwidth is 2Mhz. Calculate theoretical channel capacity?	5	APR 18
5	Describe about time domain and frequency domain concept of a signal in a system. A periodic signal has a Bandwidth of 20 Hz. The highest frequency is 60 Hz. Draw the spectrum if the signal contains all frequencies of same amplitude.	3 8	DEC 18 JUNE 22
6	Differentiate attenuation and Delay Distortion.	3	DEC 18
7	Discuss time domain and frequency domain concept of a signal. Draw thefrequency domain plot of a periodic signal.	3	MAY 19
8	Define Channel Capacity. Calculate the appropriate bit rate and signal levelsfor a channel with 100 Mhz bandwidth and SNR of 255.	5	MAY19 DEC 20
9	Determine the maximum data rate for a channel having a bandwidth of 2MHzif i) SNRdB is 0 dB ii) SNRdB is 10dB	6	DEC 2020
10	Consider a noiseless channel with a bandwidth of 3000 Hz transmitting a signalwith two signal levels. Calculate the maximum bit rate	3	DEC 2020

11	What are the important characteristics of a periodic analog signal? If a periodicsignal is decomposed into five sine waves with frequencies of 250, 300, 600, 700, and 950 Hz, what is its bandwidth?	3	DEC 2020
12	How can we say that a signal is periodic or non-periodic if its frequencydomain plot is given?	3	DEC 2020
13	How Nyquist theorem applied for a noiseless channel? We need to send 265 kbps over a noiseless channel with a bandwidth of 20 kHz. How many signal levels do we need?	3	JUNE 22
14	What is the thermal noise level of a channel with a bandwidth of 10 KHz carrying 1000 Watts of power operating at 50^{o}C?	4	JUNE 22
15	How capacity of a system is determined in the presence of noise? We have a channel with a 1MHz bandwidth. The SNR for this channel is 63. Then calculate channel capacity.	6	JUNE 22

MODULE 2

Sl.No	Questions	Marks	KTU Month/Year
1	For a parabolic reflective antenna with a diameter of 6m, operating at12 GHz. Calculate the antenna gain? Given effective area= 56π.	5 3	DEC 17 JUNE 22
2	Explain the wireless propagation techniques	5,3,5 5	DEC 17, 18,19 SEP 20
3	Compare terrestrial and satellite microwave transmission.	4 3	MAY 19 JUNE 22
4	Explain the working principle of parabolic reflective antenna with suitable diagrams.	5 5	MAY 19 DEC 20
5	Explain terrestrial microwave and satellite microwave transmission	6	DEC 20
6	With the help of suitable diagrams, differentiate multi-mode and single-modeoptical fibres. How are the rays propagated in step-index and graded-index multi-modefibres?	9	DEC 20 & SEP20
7	What are the three major classes of guided media.	9	DEC 20
8	Explain the construction and working of optical fibre cable using suitable diagrams.	10	JUNE 22
10	For multicast communications which type of wireless transmission waves are suitable? Justify your answer	3	DEC 20

11	Describe about the physical properties and transmission characteristics of coaxial cable and twisted pair cable.	8	JUNE 22
12	Compare the different wireless propagation methods used in unguided media.	6	JUNE 22

MODULE 3

Sl. No		Marks	KTU/KU Month/Year
1	Give the significance of delta modulation over pulse code modulation during the process of transforming analog data in to digital signal.	3, 6,8	DEC 17, MAY 19 JUNE 22
2	Show the equivalent analog sine-wave pattern of the bit string 00110101using amplitude shift keying, frequency shift keying and phase shift keying	3	DEC 17
3	For the bit stream 11000110010, sketch the wave form for each of the code of NRZ-I.NRZ-L, Bipolar-AMI, Pseudoternary, Manchester, Differential Manchester.	5 4	DEC 17 DEC 20
4	Explain the modulation technique used in Asymmetric Digital Subscriber Line (ADSL) and cable modems	4	DEC 17
5	State Sampling theorem. With help of suitable diagrams, explain the process of transforming analog data in to digital signal using Pulse Code Modulation technique	5 3 9 8	DEC 17 SEP 20 DEC 20 JUNE 22
6	Describe BFSK and QPSK. Given the bit pattern 101110001. Encode the stream using BFSK and QPSK	5	DEC 20
7	Convert the bit stream 101010 into analog signals by using ASK, BFSK and BPSK.	3 6	DEC 20 JUNE 22
8	Explain the techniques to convert analog data to analog signal with suitable diagrams.	6	JUNE 22
9	Differentiate amplitude modulation and frequency modulation	8	DEC 18

10	Encode the bit stream 10101010 into the following line codingschemes assuming that the last signal level has been negative: i) NRZ-I ii) NRZL iii) Manchester iv) Differential Manchester v) Bipolar AMI Pseudoternary	6	MAY 19
11	Convert the bit stream 101010 in to analog signals by using ASK,Binary FSK and Binary PSK	3	MAY 19
12	A band pass signal has a bandwidth of 4MHz. To convert to digital signal, whatis the minimum sampling rate required for this signal?	3	DEC 20
13	Encode the bit stream 10010110 using NRZ-L and NRZ-I.	3	JUNE 22
14	Describe about QAM.	3	JUNE 22

MODULE 4			
Sl. No	**Questions**	**Marks**	**KTU/KU Month/Year**
1	What type of multiplexing is preferred in optical fiber communication?Justify your answer	3 3	DEC 17, APR 18 JUNE 22
2	Explain different types of TDM with suitable diagrams	5 8	DEC 17 &19 JUNE 22
3	Draw the SONET frame format and explain the features of SONET.	5 6	DEC 17 & 19 JUNE 22
4	With suitable example explain the working principle of Code division multiplexing for CDMA technology.	6	JUNE 22
5	With a neat Sketch discuss the various steps involved in PCM	5	DEC 17
6	Given the bit pattern 101110001. Encode the stream using BFSK and QPSK.	5	DEC 18
7	Explain frequency division multiplexing. How is interference avoided by using FDM?	5 6	DEC 18 MAY 19

8	Discuss Digital Carrier Systems.	3	MAY 19
9	Discuss WDM & SDM.	5	MAY 19
10	Explain Direct sequence spread spectrum with sufficient figures.	5 8	DEC 17 JUNE 22
11	Explain the datagram approach for packet switching network. What is the significance of packet size in packet switching network?	5 5	DEC 17 &19 SEP 20
12	Discuss Frequency hopping spread spectrum technique	10 5	MAY 19 DEC 19 & 20
13	Describe about analog carrier system.	3	JUNE 22

MODULE 5			
Sl. No	**Questions**	**Marks**	**KTU/KU Month/Year**
1	What do you meant by single bit error and burst error	3	APR 18
2	Explain asynchronous and synchronous transmission using suitable figures.	5 4, 8 6	DEC 17 MAY 19, 22 SEP 20
3	What are the different architectural components in public communication network? Explain its working principle.	5	DEC 18
4	The data to be transmitted is given below. If it is send with odd parity, what will be the parity bit generated? a) 11010 b) 000000 c) 01010000	3	JUNE 22
5	In a CRC error-detecting scheme, choose divisor polynomial P: x 4 + x + l. Encode the bits 10010011011	7	DEC 18 & 17
7	How errors are detected using parity checking? What are the limitations of parity checking?	5	MAY 19
8	Using CRC, given the data word 1010011110 and the divisor 10111 i. Show the generation of the codeword at the sender site Show the checking of the codeword at the receiver site Given the data word 1001001111 and the devisor 10111, show the generationof the CRC codeword at the sender site using binary division.	10 10 5	MAY 19 DEC 20 DEC 18
9	Explain the datagram approach for packet switching network. What is the significance of packet size in packet switching network? With a neat sketch, describe the structure of a packet switch.	5 5 6	DEC 17 &19 SEP 20 JUNE 22
10	Differentiate Datagram and Virtual-circuit packet switched networks.	5, 7 5, 8	DEC 17 &19,18 MAY 19, 22
11	What is Circuit switching? Explain the three phases in Circuit switching with suitable diagrams	10	MAY 19 JUNE 22
12	With the help of a neat block diagram, explain the structure of a packet switch.	5	MAY 19
13	Define Hamming distance. Find the hamming distance for the following pairs of data:(101010, 111000), (111110, 010101), (111010, 000010) and (110011, 001100)	5 4, 6 6	DEC 17 MAY 19, 22 DEC 20

CST 304 COMPUTER GRAPHICS & IMAGE PROCESSING

MODULE 1			
Sl. No	**Questions**	**Marks**	**KTU/Year**
1	What do you understand by the aspect ratio and resolution of a display screen in a raster scan display?	4	Dec' 18 Aug' 21
2	Explain the architecture of raster graphics system with suitable diagrams. / Describe simple raster scan system and draw its architecture.	6 / 4	May 2019 Dec 20
3	Explain the working of a random scan display system with suitable diagram. Differentiate between raster scan and random scan display systems.	6	Dec 2018, June 2022
4	1, Explain the working of a beam penetration CRT. 2. Explain the components and working of colour CRT with suitable diagrams. 3. With a suitable figure, describe the shadow masking techniques in CRT. / With a suitable diagram, explain the working of a shadow mask CRT display	3	Dec 2018
5	Scan convert the line segment with end points (30, 20) and (15, 10) using DDA line drawing algorithm .	4	Dec' 19 Sep 2020, June 2022
6	Explain Bresenham's line drawing algorithm.	4	Aug '21
7	What is the purpose of a frame buffer in a display system?	2	Dec'19

8	1. Generate the points between the end points of a line viz (2, 2) and (9, 6) by using Bresenham's line drawing algorithm. 2. Rasterize the line segment from pixel coordinate (1, 1) to (8, 5) using Bresenham's line drawing algorithm. 3. Indicate what raster locations would be chosen by Bresenham's algorithm while scan converting a line from (5, 5) to (13, 9). 4. Digitize a line with end points (35, 40) and (43, 45) using Bresenham's algorithm	5	Sep' 20, June 2022, May 19
9	Write the midpoint circle drawing algorithm.	4	Dec' 19
10	1. Generate 4 pixel positions of a circle in the first quadrant with radius r=10 centered on the origin, using the midpoint circle algorithm. 2. Use midpoint circle drawing algorithm to plot a circle whose radius =20 units and center is (50, 30).	4	Dec' 20, June 2022
11	Explain the working principle of a Refresh CRT monitor with suitable diagrams.	4	Dec 2019
12	Write a note on any two interactive graphics input devices.	3	Dec'19 Sep'20 Dec' 20
13	Explain the working of a delta-delta shadow mask CRT.	4	May 2019
14	How many bits are required for 1024×1024 raster with each pixel being represented by 24 bits ?	3	June 2022

S.No	**MODULE 2**		
1	Write the flood fill algorithm for filling a polygon.	4	Dec 2018
2	Compare Boundary and flood fill algorithm.	4	Dec 20

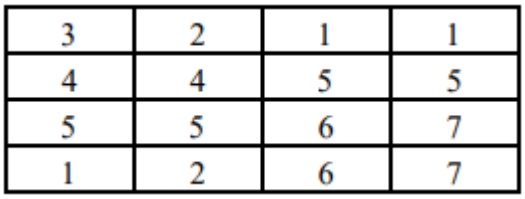
3	1. Write the boundary fill algorithm for filling a polygon using eight connected approaches. 2. Explain the boundary fill algorithm using 4-connected approach.	4	Dec'19, June 2022, May 2019
4	Write the scan line algorithm for filling a polygon. / Explain with illustration the scan line algorithm to fill the interior of a polygon.	4/5	Dec'18 Aug '21, June 2022
5	1. Given a triangle A (20, 10), B (80, 20), C (50, 70). Find the co ordinates of vertices after each of the following transformation. (a) Reflection about the line x=y. (b)Rotation of the triangle ABC about vertex A in clockwise direction for an angle 90 degree. 2. A triangle ABC with coordinates A (0, 0), B (6, 5), C (6, 0) is scaled with scaling factors Sx=2 and Sy=3 about the vertex C (6, 0). Find the transformed coordinate points. 3. Perform a 45 degree rotation of a triangle ABC having the vertices at A(0,0) B(10,10) and C(50,20) i. About the origin ii About an arbitrary point P(-10,-10) 4. Describe the transformation which reflects a 2-D object about a line L which has a y- intercept (0, b) and an angle of intersection theta degree w.r.t. to the x axis. 5. Show that transformation matrix for a reflection about the line y=x is equivalent to a reflection relative to the x axis followed by a counter clockwise rotation of 90 degree. 6. a) Perform the following transformations on a point (6, 4) i) Translate by tx = −2 and ty = 4 ii) then, Scale by sx = 2 and sy = 1 and Rotate by 90o in clockwise direction. Determine the final coordinates of the transformed point.	4	Dec 2018, Dec2019
6	Show that the composition of two rotation is additive by concatenating the matrix representation for R(Θ1) and R(Θ2)	4	Dec 2019

7	What do you mean by homogeneous coordinate system? What is its significance?	4	May2019
8	Describe the relevance and various methods of inside-outside test used in polygon filling.	3	Sep' 20
9	Explain the non-zero winding number rule to identify interior regions of a polygon.	3	May' 19, DEC 20, June 2022
MODULE 3			
1	Given a clipping window A (-20,-20), B (40,-20), C (40, 30) and D (- 20, 30). Using Cohen Sutherland line clipping algorithm, find the visible portion of the line segment joining the points P (-30, 20) and Q(60,-10).	6	Dec 2018
2	Derive an equation for window to viewport transformation by specifying the sequence of basic transformations involved.	3	Dec 2018
3	How does Cohen Sutherland algorithm determine whether a line is visible, invisible or a candidate for clipping based on the region codes assigned to the end points of the line?	4	Dec 2019
4	Explain the window to viewport coordinate transformation and also derive the scaling factors during the transformation.	5	Dec 2019, June 2022
5	Define the terms window, viewport and windowing transformation in the context of 2D viewing with suitable diagrams.	4	May2019
6	Explain the concept of point clipping in 2D.	2	May2019

7	Explain the Cohen Sutherland line clipping algorithm with suitable Examples	6	May 2019, June 2022
8	Which are the steps involved in window to viewport coordinate transformation in 2D?	4	Sep2020
9	Cohen Sutherland algorithm can totally reject a line in the first step itself. Justify.	4	Dec2020
10	Use Cohen Sutherland algorithm to clip the line segment joining the points P(40,80) and Q(120,30) against a clipping window with corners at A(20,20), B(60,20), C(60,40) and D(20,40).	6	Dec2020
11	Draw and explain the two dimensional viewing pipeline.	3	Dec2020
12	Let ABCD be a rectangular window with A(20, 20), B(90, 20), C(90, 70), D(20,70). Find the region codes for the end points and use Cohen – Sutherland algorithm to clip the line with end points P1(10,30), and P2(80,90).	5	Aug 21
13	Explain Sutherland Hodgeman polygon clipping algorithm with illustrations. / Explain the Sutherland Hodgeman algorithm for polygon clipping with an example.	5/9	Dec'18 Sep'20, June 2022
14	Explain the Depth Buffer method for visible surface detection	6	June 2022
15	Distinguish between parallel and perspective projections. What is the principal vanishing point?	6	June 2022

MODULE 4			
1	Explain any three applications of digital image processing	6	June 2022
2	Define 4-adjacency, 8-adjacency and m-adjacency. Explain using an example for each.	8	June 2022
3	Explain the process of convolution with an example.	8	June 2022
4	With a neat diagram, explain the fundamental steps in Digital Image Processing.	6	June 2022
5	Explain the Prewitt and Sobel edge detectors	6	June 2022
6	Describe the basic concepts of sampling and quantization with a neat sketch.	4	Sep' 20, June 2022
7	What do you mean by histogram of a digital image? Discuss on the histogram of four basic image types.	4	May' 19, June 2022
8	Explain histogram matching with an example.	8	Sep' 20
9	What is edge detection? Explain any one edge detection technique in digital image processing.	4	Dec' 19 Aug' 21
10	How edge detection is performed in digital images using (i) Sobel operator (ii) Prewitt operator. What are the advantages of Sobel operator over Prewitt operator? / Explain the Robert's, Prewitt's and Sobel's edge detectors.	6	May' 19 Aug' 21 Dec' 18 Dec' 20

MODULE 5			
1	What do you understand by correlation and convolution operations in case of image processing?	4	Dec' 18 Aug' 21
2	What is mean by convolution? Give applications of 2D convolution in the field of image processing.	4	Dec' 19
3	Describe the concept of spatial convolution.	4	Dec' 20, June 2022
4	What do you understand by the following terms with respect to pixels. Neighbours, Adjacency, Connectivity.	4	Dec' 18 Sep' 20
5	Define the following terms related to pixel of an image: i) pixel neighbourhood ii) digital path iii) connected set	4	May' 19
6	Explain the fundamental steps in Digital Image Processing with a neat diagram? / Explain the components of a general purpose digital image processing system with a neat diagram.	8 / 6	Dec' 18 May' 19 Aug' 21, June 22
7	Describe Histogram and also the type of information which obtained from a gray level histogram.	4	Dec' 19
8	Discuss the role of histogram equalization in a digital image. / Describe histogram equalization and discuss the role of histogram equalization in a digital image.	2 / 4	May'19 Aug' 21 Dec' 20
9	Consider the image segment shown below. 3 1 2 **1 (q)** 2 2 0 2 1 2 1 1 **(p)1** 0 1 2 i) Compute the lengths of shortest 4, shortest 8 and shortest m paths between pixels p and q where V= {0, 1}. If a particular path does not exist between these two points, explain why.	6	Dec' 19
10	Consider the image segment and compute the length of the shortest 4-,8- and m-path between p and q by considering two set of values for V	8	Sep' 20

	(i) V={0,1,2} (ii) V= {1,2} If a particular path does not exist explain the reason for the above two cases of V. 3 4 1 2 0 0 1 0 4 2(q) 2 2 3 1 4 (q)3 0 4 2 1 1 2 0 3 4		
11	Consider the image segment shown below 0 1 2 1 (y) 1 2 0 2 1 2 1 1 (x) 1 0 1 2 Compute the lengths of shortest 4-path, shortest 8-path and shortest m path between pixels x & y, where V= {0, 1}. Explain why no particular path exists between these two points, if there is no path.	6	Aug' 21
12	Derive the linear equation for a 3D object and test whether the coordinates are inside or outside the plane.	4	Dec' 20
13	Explain the following region based segmentation methods. i) Region Growing ii) Region Splitting and Merging	8	June 2022
14	Explain the following grey level transformation functions. i) Image negatives ii) Gamma Transformation	6	June 2022
15	What is histogram equalization? Also, apply the histogram equalization method on the following 3 bit image  3 2 1 1 4 4 5 5 5 5 6 7 1 2 6 7	8	June 2022

CST 302- ALGORITHMS ANALYSIS AND DESIGN

MODULE 1			
Sl.No.	**Questions**	**Marks**	**KTU, Year**
1	Define the terms Best case, Worst case and Average case time complexities	3	KTU-May,2019
2	What is the smallest value of n such that an algorithm whose running times is $100n^2$ runs faster than an algorithm whose running time is 2n on the same machine?	3	KTU-May,2019

3	Determine the time complexities of the following two functions fun1() and fun2():
	int fun1(int n)
	{ if (n <= 1)
	return n;
	return 2*fun1(n-1);
	}
	int fun2(int n)
	{
	if (n <= 1)
	return n;
	return fun2(n-1) + fun2(n-1);
		2	KTU-May,2019

4	Find the solution to the recurrence equation using iteration method: T(2k) = 3 T(2k-1) + 1, T (1) = 1	3	KTU-May,2019
5	Solve the recurrence using recursion tree method: T(1) = 1 T(n) = 3T(n/4) + cn2	4	KTU-May,2019

6	Determine the best case and worst-case time complexity of the following function:
	void fun(int n, int arr[])
	{
	int i = 0, j = 0;
	for(; i < n; ++i)
	while(j < n && arr[i] < arr[j])
	j++;
	}
			KTU-May,2019

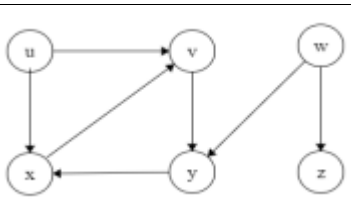
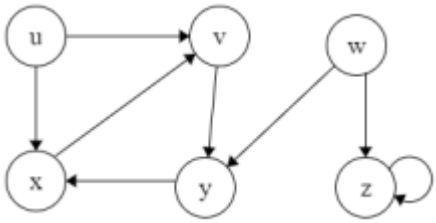
7	Is $2^{n+1} = O(2^n)$? Is $2^{2n} = O(2^n)$? Justify your answer	3	KTU-April,2018

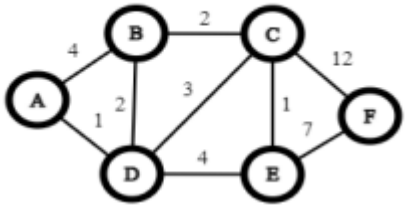
8	Analyse the complexity of the following program
	main ( ) {
	for (inti=1; i<=n;i=i*2)
	sum =sum+i+func(i)
	}
	void func(m)
	{ for (int j=1; j<=m; j++)
	Statement with O(1) complexity
	}
		3	KTU-April,2018

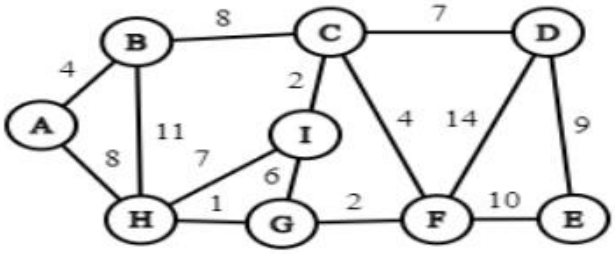
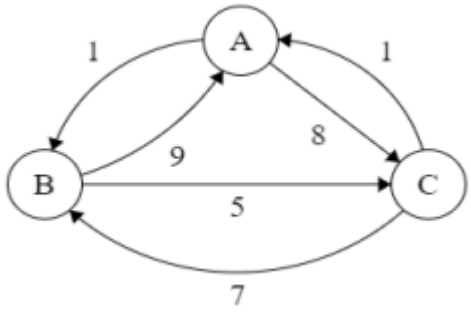
9	Using iteration solve the following recurrence equation T(n)= 2 if n=1 else T(n)= 2T(n/2)+2n+3 Solve the following recurrence using recursion tree method 1) $T(n) = T(n/3) + T(2n/3) + cn$ 2) $T(n) = 2T(n/2) + n$	5 8	KTU-April,2018 KTU-June,2022
7	Using Recursion Tree method, solve. Assume constant time for small values of n. T(n)= 2T(n/10)+ T(9n/10)+n	4	KTU-April,2018
8	What is an algorithm? What are the criteria of an algorithm?	5	KTU-Dec,2018
9	Explain quick sort algorithm and analyze its complexity.	10	KTU-Dec,2018
10	Solve the recurrence equation T(n)=3T(n/4)+n using iteration method	6	KTU-Dec,2018
11	What are recursion trees? Solve T(n)= 2T(n/2) + C using recursion tree.	7	KTU-Dec,2018

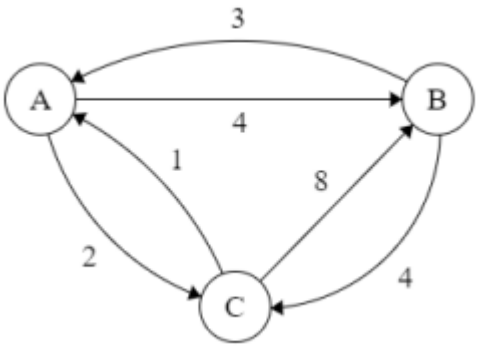
12	Int mystery(int n) {
	int j=0,total=0;
	for (int i=1;j<=n;i++)
	{
	++total;
	j+=2*i;
	}
	return total;
	}
		3	KTU-Sep.,2020

13	the $f(n) = 3n/3 + 2n/2 + 3$ for an algorithm, Let $g(n) = n^3$. Prove that f(n) of this algorithm is in $O(n^3)$	3	KTU-June,2022
14	Solve the recurrence $T(n) = 3T(n/4) + nlogn$. using Master theorem.	3	KTU-June,2022
MODULE 2			
1	State weighted rule (union by rank) and collapsing rule (path compression) applied in the disjoint set union and find operation respectively. How these rules will improve the efficiency of disjoint set operations.	3	KTU-April,2018 KTU-June,2022
2	Consider the directed acyclic graph G=(V,E) given in the following figure.	3	KTU-June,2022

	 Find any topological ordering of G		
3	Give Breadth First Search algorithm for graph traversal. Perform its complexity analysis	7	KTU-June,2022
4	Define B Tree. Explain the important properties of B trees.	2	April,2018 Sep.2020
5	State weighted rule (union by rank) and collapsing rule (path compression) applied in the disjoint set union and find operation respectively. How these rules will improve the efficiency of disjoint set operations.	3	KTU-April,2018
6	Explain the advantages of using height Balanced Trees? Explain AVL Rotations.	4	KTU-May,2019
7	Find the minimum and maximum height of any AVL-tree with 7 nodes? Assume that the height of a tree with a single node is 0.	2	KTU-May,2019
8	Define AVL tree. Construct an AVL tree by inserting the keys: 44, 17, 32, 78, 50, 88, 48, 62, 54 into an initially empty tree. Write clearly the type of rotation performed at the time of each insertion.	7	KTU-June,2022
9	State Master Theorem.	3	KTU-May,2019
10	Explain the UNION and FIND-SET operations in the linked-list representation of disjoint sets. Discuss the complexity.	3	KTU-May,2019 Sep.2020
11	Find the minimum and maximum height of any AVL-tree with 11nodes. Assume that height of the root is 0.	5	KTU-Sep.2020
12	Give Depth First Search algorithm for graph traversal. Perform its time complexity analysis	7	KTU-June,2022
13	Perform DFS traversal on the following graph starting from node A. When multiple nodes are available for next traversal choose nodes in alphabetical order. Classify the edges of the graph into different category. 	7	KTU-June,2022
MODULE 3			
1	Let (u,v) is a minimum weight edge in a graph G. Show that (u,v) belongs to some minimum spanning tree of G.	3	KTU-April,2018
2	Let G be a weighted undirected graph with distinct positive edge weights. If every edge weight is increased by same value will the	3	KTU-April,2018

	minimum cost spanning tree and the shortest path between any pair of vertices change. Justify your answer.		
3	Consider a complete undirected graph with vertex set {0, 1, 2, 3, 4}. Entry Wij in the matrix W below is the weight of the edge {i, j}. What is the minimum possible weight of a spanning tree T in this graph such that vertex 0 is a leaf node in the tree T?	3	KTU-April,2018
4	Write down DFS algorithm and analyse the time complexity. What are classification of edges that can be encountered during DFS operation and how it is classified?	4	KTU-April,2018 Sep 2020
5	Perform DFS traversal on a graph starting from node A. Where multiple node choices may be available for next travel, choose the next node in alphabetical order. Classify the edges of the graph into different category.	5	KTU-April,2018
6	In a weighted graph, assume that the shortest path from a source 's' to a destination 't' is correctly calculated using a shortest path algorithm. Is the following statement true? If we increase weight of every edge by 1, the shortest path always remains same. Justify your answer with proper example.	3	KTU-May,2019
7	Define Strongly Connected Components of a graph. Write the algorithm to find Strongly Connected Components in a graph.	3	May,2019 Sep 2020
8	State Shortest Path Problem and Optimal substructure of Shortest Path.	2	KTU-May,2019
9	Write Dijkstra's Single Source Shortest path algorithm. Analyse the complexity.	4	May,2019 Sep 2020
10	Write the algorithm for DFS and analyse its complexity	4	May,2019
11	Illustrate the divide and conquer approach by applying 2 way merge sort for the input array: [15,12,14,17,11,13,12,16]. Write the recurrence for merge sort and give the complexity.	7	KTU- june 2022
12	Apply Dijkstra's algorithm for single source shortest path to solve the following graph. Assume the source as node A 	7	KTU- june 2022
13	Consider the following instance of Fractional Knapsack problem with 3 objects. The capacity of the knapsack is 20 units. The weights and profits of the 3 items resprctively are represented by the vectors (w1,w2,w3) = (18,15,10) and (p1,p2,p3)=(25,24,15). Using a greedy strategy compute the optimal solution to this instance.	7	KTU- june 2022
14	Apply Kruskal algorithm to find minimum cost spanning tree for the following graph	7	KTU- june 2022

			
MODULE 4			
1	Write and explain an algorithm to find the optimal parenthesization of matrix chain product whose sequence of dimension is given.	5	KTU-April,2018
2	Write and explain merge sort algorithm using divide and conquer strategy. Also analyse the complexity.	4	April,2018
3	Write down and explain Bellman Ford algorithm. Will your algorithm detect all negative cycles in the graph. Justify your answer	5	KTU-April,2018
4	List and explain the characteristic properties associated with a problem that can be solved using dynamic programming.	3	April,2018 Sep 2020
5	Multiply the following two matrices using Strassen's Matrix Multiplication Algorithm. A=6 8 B=2 5 9 7 3 6	5	KTU-May,2019
6	State Matrix Chain Multiplication Problem. Write Dynamic Programming Algorithm for Matrix Chain Multiplication Problem.	4	KTU-May,2019
7	Illustrate the divide and conquer approach of binary search.	9	KU,July2017
8	State optimality principle.	3	Sep 2020
9	Give a control abstraction for Divide and Conquer method. Explain with an example.	5	KTU- Sep 2020
10	Explain the effect of negative weight edges and negative weight cycles on shortest paths.	4	KTU- Sep 2020
11	Discuss Floyd-Warshall algorithm for all pair shortest path problem. Solve the following instance using the algorithm. 	8	KTU- June 2022
12	Discuss the control abstraction used in backtracking design technique. Draw the state space tree for 4-queens problem.	6	KTU- June 2022
14	Discuss the elements of dynamic programming by considering the matrix chain multiplication problem.	5	KTU- June 2022
15	Define Travelling Salesman Problem (TSP). Apply branch and bound technique to solve the following instance of TSP. Assume that the starting vertex as A. Draw the state space tree for each step.	9	KTU- June 2022

			
	MODULE 5		
1	Consider the following algorithm to determine whether or not an undirected graph has a clique of size k. First, generate all subsets of the vertices containing exactly k vertices. Next, check whether any of the sub-graphs induced by these subsets is complete (i.e. forms a clique). Why is this not a polynomial-time algorithm for the clique problem, thereby implying that P = NP?	4	KTU-April,2018
2	Prove that CLIQUE problem is NP-complete.	4	April,2018
3	Define NP- Hard and NP – Complete Problems.	2	May,2019 Sep 2020
4	What are the steps used to show a given problem is NP-Complete? Write notes on polynomial time reducibility. Give Examples.	8	KTU-May,2019
5	Differentiate between P and NP problems.	3	June 2022
6	Define approximation algorithm. Give an approximation algorithm for bin packing using first fit heuristic and give its approximation ratio.	7	KTU- June 2022
7	Discuss the advantages of randomized algorithms over deterministic algorithms. Discuss Las Vegas and Monte Carlo algorithms with a suitable example.	7	KTU- June 2022
8	Write randomized quicksort algorithm and perform its expected running time analysis.	7	KTU- June 2022
9	Prove that CLIQUE problem is NP Complete.	7	June 2022
10	Compare Las Vegas and Monte Carlo algorithms.	3	KTU- June 2022