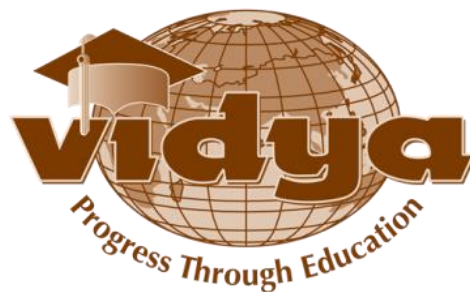# VIDYA ACADEMT OF SCIENCE AND TECHNOLOGY TECHNICAL CAMPUS KILIMANOOR

(A Unit of Vidya International Charitable Trust)

Accredited by NAAC with B++ Grade

QUESTION BANK- 2019 SCHEME

S4 ECE (2022-26 Batch)

Question Bank

Fourth Semester

MAT 204: PROBABILITY DISTRIBUTIONS, RANDOM PROCESS AND NUMERICAL METHODS

CLASS: S4 ECE

Sl. No	QUESTIONS	Marks	KU/KTU (Month/Year)
	MODULE 1		
1	(1) A random variable X takes values 0,1, 2 and 3 with probabilities $P(X=0)=\frac{8}{15}$, $P(X=1)=\frac{1}{3}$, $P(X=2)=P(X=3)=\frac{1}{15}$ (a) Find the mean and variance of X. If $Y=1000+300X$ (b) Find $P(Y \geq 1500)$ and $E[Y]$ (2) The joint probability distribution of X and Y is given by $f(x,y)=\frac{(2x+3y)}{54}$ for $x=1,2$; $y=1,2,3$. Find the (i) marginal distribution of x and y (ii) the conditional distribution of X for $Y=y$ (3) A random variable X takes the values -3, -2, -1, 0, 1, 2, 3 such that $P(X=0)=P(X>0)=P(X<0)$ and $P(X=-3)=P(X=-2)=P(X=-1)=P(X=1)=P(X=2)=P(X=3)$. Obtain the probability mass function and distribution function of X.	7+7+7	KTU- July 2017 May 2019 July 2021 June 2022
2	In an examination, a candidate has to answer 15 multiple choice questions each of which has 4 choices for the answer. He knows the correct answer to 10 questions and for the remaining 5 questions he chooses the answer randomly. (a) What is the probability that he answers 13 or more questions correctly? (b) What is the mean and variance of the number of correct answers he gives?	7	KTU- July 2017
3	The joint distribution of a two-dimensional random variable (X,Y) is given by $P(X, Y)=c(2x+3y)$, $x=0,1,2 : y=1,2,3$. Find i) the value of c ii) the marginal distributions iii) Are X and Y independent?	7	KTU-May 2017
4	1) A box contains 100 cell phones, 20 of which are defective. 10 cell phones are selected for inspection. Find the probability that i. at least one is defective	7+7+7	KTU JULY 2017 May 2019

	ii. at most three are defective
	iii. none of them are defective
	iv. all of them are defective.
	
	2) The monthly breakdown of a computer follows Poisson distribution with mean 1.2. Find the probability that this computer will function for a month
	  i. without a break down
	  ii. with only one breaks down
	  iii. with at most two break down
	
	3) The probability of an item produced by a certain machine will be defective is 0.05.If the produced items are sent to the market in packets of 20, find the number of packets containing
	  (a) at least 2
	  (b) exactly 2
	  (c) at most 2 defective items in a consignment of 1000 packets using Poisson distribution
			July 2021

5	The probability that an electric component manufactured by a firm is defective is 0.01. If the produced items are sent to the market in packets of 10, find the number of packets containing exactly two defectives and at most two defectives in a consignment of 1000 packets using
	  (i) binomial distribution and
	  (ii) Poisson approximation to binomial distribution
		7	KTU-April 2018

6	1) The probability distribution of a discrete random variable X is given by $p(X = x) = \frac{k}{2^x}$, $x = 0, 1, 2, 3, 4$. Find
	  (a) the value of k
	  (b) the probability that X is even
	  (c) $P(X \le 2)$
	  (d) E(X).
	
	2) The probability mass function of a discrete random variable is $p(x) = kx, x = 1, 2, 3$ where k is a positive constant. Find
	    (a) The value of k
	    (b) $P(X \le 2)$
	    (c) $VAR(1 - X)$
		7+3	KTU MAY 2017 JULY-2021

7	(a) Show that Poisson distribution is the limiting case of binomial distribution. (b) Derive the mean and variance of Binomial distribution (c) Derive the mean and variance of Poisson distribution	7+7+7	KTU JULY-2021 JUNE-2022
8	The probabilities that there will be 0, 1, 2, 3 power failures for a certain machine in the month of June are 0.4, 0.3, 0.2, 0.1 respectively. Find the mean and variance for the number of failures.	3	KTU-JUNE 2022

9	If X is a Poisson variable such that $[X = 1] = P[X = 2]$, then find $P[X = 3]$.	3	KTU-JUNE 2022
10	The number of gamma rays emitted per second by a certain radioactive substance follows a Poisson distribution with mean 8. Determine the probability that (i) three particles are emitted in one second (ii) at most one particle is emitted in one second (iii) more than one particle is emitted in one second.	7	KTU-JUNE 2022
11	The joint probability mass function of two random variables X and Y is given by $p(x,y) = \begin{cases} k(x + 2y), & \text{for x} = 1, 2, 3 \ \text{y} = 1, 2 \\ 0, & \text{otherwise} \end{cases}$ where k is a constant. (i) Find the value of k (ii) Find $P[X + Y \le 3]$ (iii) Find the marginal density functions of X and Y and (iv) Are X and Y independent?	7	KTU-JUNE 2022

MODULE 2

1	i. The time for super glue to set can be treated as a random variable having a normal distribution with mean 30 seconds. Find the standard deviation if the probability is 0.20 that it will take on a value greater than 39.2 seconds. ii. 1000 light bulbs with mean length of life 120 days are installed in a factory. Their length of life is assumed to follow normal distribution with S.D 20 days. How many bulbs will expire in less than 90 days? If it is decided to replace all the bulbs together, what interval should be allowed between replacements if not more than 10% should expire before replacement? iii. The mileage which a car owner gets with a certain kind of tyre is a random variable having an exponential distribution with mean 60,000 km .Find the probability that one of the tyres will last(i) at least 50,000km (ii)at most 60,000 km	7+7+7	KTU-May 2017 May 2019 July 2021
2	Buses arrived at a specific stop at 15 minutes interval starting at 7 am. A passenger arrives at the stop at random time between 7 and 7.30 am. Find the probability that he waits 1) less than 5 minutes 2) at most 12 minutes?	7	KTU-MAY 2017
3	Suppose a new machine is put into operation at time zero. Its life time is an exponential random variable with mean life 12 hours. (i) What is the probability that the machine will work continuously for one day? ii) Suppose the machine has not failed by the end of the first day, what is the probability that	7	KTU-March 2017

	it will work for the whole of the next day?		
4	The lifetime of a battery is exponentially distributed. 40% of such batteries do not last longer than 1000 hours. Mr. Kumar purchased such a battery which is already used for 500 hours. What is the probability that it will last another 1000 hours?	7	KTU-March 2017
5	b) Find the mean and variance of uniform distribution c) Find the mean and variance of exponential distribution	7+7	KTU- May 2019 May 2017
6	The probability density function of a random variable is given by $f(x) = \begin{cases} kx^2, & 0 < x < 1 \\ 0, & \text{otherwise} \end{cases}$ Find (a) k (b) Mean (c) $p\left(\frac{1}{4} < X < \frac{3}{4}\right)$ (d) $p\left(X > \frac{2}{3}\right)$	7	KTU- July 2017

7	1) The joint pdf of two continuous random variables X and Y is
	 F(x,y) = $\begin{cases} 8xy, & 0 < y < x < 1 \\ 0, & \text{otherwise} \end{cases}$
	    i. Check whether X and Y are independent
	    ii. Find $p(X + Y < 1)$
	
	 2) The joint pdf of two continuous random variables X and Y is given by f(x,y) = $\begin{cases} kxy, & 0 < x < 4, \ 1 < y < 5 \\ 0, & \text{otherwise} \end{cases}$ Find
	        (i) k
	        (ii) The marginal distributions of X and Y
	        (iii) Check whether X and Y are independent
		7+7	KTU April 2019 June 2022

8	A factory has two outlets to sell its products. The daily sale from the first outlet is uniformly distributed between Rs. 50,000 and 60,000 and from the second outlet is uniformly distributed between 40,000 and 60,000. The sales of the outlets are independent. (i) What is the probability that the total sales from both the outlets combined is more than RS.100000. If 20% of the amount from the sales is profit, find the expected daily profit from both the outlets combined, and the variance of the profit.	7	KTU- July 2017
9	A continuous random variable X is uniformly distributed in $(-k, k)$. Find k if $P[X \geq 2] = 0.25$.	3	KTU- June 2022
10	If $X_1, X_2, \ldots, X_n$ are random variables with mean $\mu = 2$ and variance $\sigma^2 = 2$, then use central limit theorem to estimate $P[110 \leq S_n \leq 150]$, where $S_n = X_1 + X_2 + \cdots + X_n$ and $n = 75$.	3	KTU- JUNE 2022
11	Suppose the diameter at breast height (in.) of trees of a certain type is normally distributed with mean 8.8 and standard deviation 2.8 (i) What is the probability that the diameter of a randomly selected tree will be at least 10 in.? (ii) What is the probability that the diameter of a randomly selected tree will exceed 20 in.? (iii) What is the probability that the diameter of a randomly selected tree will be between 5 in and 10 in.?	7	KTU- JUNE 2022

12	The time (in hours) required to repair a machine is exponentially distributed with mean 2. (i) What is the probability that the repairing time exceeds 2 hours? (ii) What is the conditional probability that a repair takes at least 10 hours given that its duration exceeds 9 hours?	7	KTU-JUNE 2022

13	1) The joint probability density function of two continuous random variables X and Y is given by $f(x,y) = \begin{cases} kx^2y, & \text{if } 1 \le x \le 4, \ 0 \le y \le 4 \\ 0, & \text{otherwise} \end{cases}$. Find
	     a. value of k
	     b. $P[X \ge 2, Y \le 2]$ and
	     c. $P[X + Y < 3]$.
	
	2) A continuous random variable has the distribution function $F(x) = \begin{cases} 0, & \text{if } x < 0 \\ k(x-1)^3, & \text{if } 0 \le x \le 4 \\ 1, & \text{if } x > 4. \end{cases}$ Find
	    (i) value of k
	    (ii) probability density function $f(x)$ of $F(x)$
	    (iii) $P[X \ge 1]$.
		7	KTU-JUNE 2022

MODULE 3

1	(a) A computer generates 100 random numbers which are uniformly distributed between 0 and 1. Find approximately the probability that their sum is at least 50. (b) Assume that X(t) is a random process defined as follows: $X(t) = A\cos(2\pi t + \emptyset)$ where A is a zero-mean normal random variable with variance $\sigma A^2 = 2$ and $\emptyset$ is uniformly distributed random variable over the interval $-\pi \le \varphi \le \pi$. A and φ are statistically independent. Let the random variable Y be defined as $Y = \int_0^1 X(t)dt$. Determine (i) the mean of z (ii) the variance of Y.	7+7	KTU-MAY 2017 June 2022
2	Prove that the random process X(t) is defined by $X(t) = a\sin(\omega t + \theta)$, where a and ω are constants and θ is a random variable Uniformly distributed in $[0, 2\pi]$ is WSS process.	7	KTU-MAY 2018
3	(a) Consider the random process $X(t) = A\cos(\omega t + \theta)$ where A and θ. Is uniformly distributed random variable in $(0, 2\pi)$. Check whether or not the process is WSS. (b) A random process X(t) is defined by $X(t) = Y(t)\cos(\omega t + \theta)$, where ω is a constant and θ is a random variable which is uniformly distributed in $[0, 2\pi]$ and is independent of Y(t). Show that X(t) is a WSS process	7+7	KTU-April 2018
4	If X(t) = f(t) is a stochastic process ,find E(X(t)) ,R(t1 ,t2) and C(t1,t2)	7	KTU-April 2018
5	Let X(t) =Asin t + B cos t be a process where A and B are	7	KTU-

	independent random variables with zero mean and equal variance show that the process is WSS .		APRIL 2018
6	Find the spectral density function of the WSS process whose auto correlation function is e^{-xy^2}	7	KTU-May 2019
7	Find the power spectral density of a wide sense stationary process (t) with autocorrelation function $RX(\tau) = e{-}3|\tau|$.	7	KTU-JULY 2017
8	(a) Find the autocorrelation function and average power of a wide sense stationary process $X(t)$ with power spectral density given by $S_X(\omega) = \begin{cases} 1 - \omega, & |\omega| \leq 1 \\ 0, & \text{otherwise} \end{cases}$ (b) Car arrives at a gas station according to a Poisson process at an average rate of 12 cars per hour. The station has only one attendant. If the attendant decides to take a 2-minute coffee break when there are no cars at the station. What is the probability that one or more cars will be waiting when he comes back from the break given that any car that arrives when he is on coffee break waits for him to get back?	7	KTU-April 2018 June 2022
9	(a) Show that the random telegraph signal process is WSS. (b) Given any two example of a continuous time discrete random processes. (c) How will you calculate the mean, variance and total power of a WSS process from its auto correlation function?	7+3+7	KTU- April 2017

10	The number of enquiries arriving at a call centre is a Poisson process with rate 5 per hour.
	   (i) Find the probability that there would be 3 calls between 10 AM and 11 AM and 4 calls between 2 PM and 4 PM.
	   (ii) A call is categorized as 'long' if it lasts more than 10 minutes.
	   (iii) The probability that an arriving call is long is 0.2. Find the probability that the time between two consecutive long calls is less than 1 hour.
		10	KTU-JULY 2017

11	(a) Find the probability distribution of the time between two consecutive arrivals in a Poisson process. (b) Define stationary random process. Define two types of stationary random process. (c) Write down the properties of the power spectral density	5	KTU-JULY 2017
12	Determine the autocorrelation function of the random process with the power spectral density given by $S_{XX}(w) = S_0 \quad |w|<w0$ $\quad\quad\quad = 0 \quad otherwise$	7	KTU-June 2022
13	The radioactive source emits particle at the rate of 6 per minute in accordance with Poisson process. Each particle emitted has the probability of 1/3being recorded. Find the probability that at least 5 particles are recorded in 5 minutes	3	KTU-May 2019
14	(a) A random process is defined by $X(t) = A cos\omega t, t \geq 0$ where ω	3+7	KTU June

	is a constant and A is uniformly distributed in (0, 3). Determine $E[X(t)]$. (b) Show that the random process defined by $(t)=A\sin(\alpha t+\theta)$, where A and α are constants and θ is a random variable uniformly distributed in $[0,2\pi]$ is a wide sense stationary process.		2022
15	A random process $X(t)$ has the auto correlation function $R_X(\tau) = 25 + \frac{8}{4+\tau^2}$. Find the mean-square value and variance of the process	3	KTU June 2022

MODULE 4

1	(a) Using Newton-Raphson method, compute a real root of $e^{2x} - x - 6 = 0$ lying between 0 and 1. (b) Write the Newton-Raphson iteration formula to find the cubic root of a positive number (c) Using Newton Raphson method to solve the equation $x^3 + x - 1 = 0$ correct to 4 decimal places (d) Using Newton-Raphson method to find a non-zero solution of $f(x) = 2x - \cos x = 0$	7+7+7	KTU-April 2018 June 2022 July 2021
2	Using Lagrange's interpolation method find the polynomial f(x) which agree with the data $f(-1) = 3$, $f(0) = -4$, $f(1) = 5$ and $f(2) = -6$	7	KTU- MAY 2017
3	The speed of a moving particle was measured at different points of time. The time t when the first measurement was recorded is taken as t =0. Subsequent speeds at different times are as shown in the following table 	Time(t) in seconds	0	10	20	30	40	50	60
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Velocity (v) in m/sec	35	39	44	50	56	43	40 | Using Simpson's one-third method, evaluate the distance travelled by the particle in 60 seconds.	7	KTU-APRIL 2018
4	Health surveys are conducted in a city every 10 years. The following data gives the number of people (in thousands) having heart diseases as found from the records of the survey 	Year	: 1961	1971	1981	1991	2001	2011
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No. of people :	16	19	23	28	34	41	 Use Newton's interpolation method to estimate the number of people with heart diseases in the year 2005	7	KTU-MAY 2017
5	(a) Evaluate $\oint_0^6 \frac{1}{1+x^2}$ dx using (1) Trapezoidal rule (2) Simpson's rule with 6 equal intervals. (b) Use trapezoidal rule to evaluate $\int_0^1 y\, dx$ for the following data 	x	0	0.2	0.4	0.6	0.8	1
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y	0	0.04	0.16	0.36	0.64	1		7+7	KTU-MAY 2017 June 2022

6	Using Newton's forward interpolation formula estimate sin 52 given <table><tr><td>θ</td><td>45</td><td>50</td><td>55</td><td>60</td><td>65</td></tr><tr><td>$\sin\theta$</td><td>0.7071</td><td>0.7660</td><td>0.8192</td><td>0.8660</td><td>0.9036</td></tr></table>	7	KTU-MAY 2017
7	Using Lagrange's polynomial estimate $f(1.5)$ for the following data <table><tr><td>x</td><td>0</td><td>1</td><td>2</td><td>3</td></tr><tr><td>f(x)</td><td>0</td><td>0.9826</td><td>0.6299</td><td>0.5532</td></tr></table>	7	
8	Find the root of the equation $\cos x - xe^x = 0$ that lies between 0 and 1, using Regula- falsi method, correct to four decimal places.	7	KTU June 2022
9	Find the equation of the curve that passes through the points (0, 2), (1, 3), (2, 12) and (5, 147) by Lagrange's interpolation formula. Also find (3).	7	KTU June 2022
10	Given a function $y = f(x)$ by the following table. Using Newton's interpolation formula, find (0.2). <table><tr><td>x</td><td>0</td><td>1</td><td>2</td><td>3</td><td>4</td><td>5</td><td>6</td></tr><tr><td>y</td><td>176</td><td>185</td><td>194</td><td>203</td><td>212</td><td>220</td><td>229</td></tr></table>	7	KTU June 2022
11	Evaluate $\int_0^1 \frac{dx}{1+x}$ using Simpson's one third rule. Find the error by comparing with actual integration up to four decimal places. (Take h = 1/6)	7	KTU June 2022

MODULE 5

1	Using Runge-Kutta method of order four, compute y(0.2) given that $\frac{dy}{dx} = e^x + y$, y(0) = 0. Take step size h = 0.1.	7	KTU-MAY 2017
2	Use Euler Method with h = 0.1 to find y at x = 0.3 for the equation $\frac{dy}{dx} = \frac{y}{1+x}$,y(0) =2	3	KTU- May 2017
3	Apply Runge-Kutta Method of order 4, find an approximate value of y when x = 0.7 given $\frac{dy}{dx} = y - x^2$ and y(0.6) = 1.7379.	7	KTU-APRIL 2018
4	Use Runge-Kutta method of order 4 to find y(0.2) for the differential equation $y' = 3x + 0.5y, \ y(0) = 1$ (Take $h = 0.2$)	7	KTU-MAY 2019
5	Given the initial value problem $y' = y + x$, y(0)=0, find y(0.1) and y(0.2) using Euler method	3	Model qp
6	Explain the principle of least squares for determining a line of best fit to a given data	3	Model qp
7	a) Using Gauss-Seidel method, solve the following system of equations $$20x + y - 2z = 17$$ $$3x + 20y - z = -18$$ $$2x - 3y + 20z = 25$$ b) Solve the system of equations Using Gauss-Seidel iteration method starting with the initial approximation $(0,0,0)^T$	7+7	June 2022 July 2021

	$$8x_1 + x_2 + x_3 = 8$$ $$2x_1 + 4x_2 + x_3 = 4$$ $$x_1 + 3x_2 + 5x_3 = 5$$		
8	The table below gives the estimated population of a country (in millions) for during 1980 - 1995 <table><tr><td>year</td><td>1980</td><td>1985</td><td>1990</td><td>1995</td></tr><tr><td>population</td><td>227</td><td>237</td><td>249</td><td>262</td></tr></table> Plot a graph of this data and fit an appropriate curve to the data using the method of least squares. Hence predict the population for the year 2010.	7	Model qp
9	Use Runge-Kutta method of fourth order to find y(0.2) given the initial value problem. $\frac{dy}{dx} = \frac{xy}{1+x^2}$, $y(0) = 1$. Take step-size, $h = 0.1$.	7	Model qp
10	Solve the initial value problem $\frac{dy}{dx} = x + y$, y(0) = 0, 0≤ x <1, taking step-size h=0.2. Calculate y(0.2), y(0.4) and y(0.6) using Runge-Kutta second order method, and y(0.8) and y(1.0) using Adam-Moulton predictor-corrector method.	7	Model qp
11	Write the normal equations obtained by the method of least squares for fitting a parabola $y = a + bx + cx^2$	3	KTU June 2022
12	Given the initial value problem, $y = f(x, y)$, with $y(x_0) = y_0$. Write the second order Runge-Kutta algorithm to find the value of y when $x = x_0 + h$.	3	KTU June 2022
13	Given $y' = 1 + xy$, $y(0) = 2$. Find y at $x = 0.1$, using fourth order Runge-Kutta method, by taking $h = 0.1$	7	KTU June 2022
14	a) By the method of least squares, find the straight line that best fits the following data <table><tr><td>x</td><td>1</td><td>2</td><td>3</td><td>4</td><td>5</td></tr><tr><td>y</td><td>14</td><td>27</td><td>40</td><td>55</td><td>68</td></tr></table> b) Fit a straight-line $y = ax + b$ for the following data <table><tr><td>X</td><td>1</td><td>3</td><td>4</td><td>6</td><td>8</td><td>9</td><td>11</td><td>14</td></tr><tr><td>y</td><td>1</td><td>2</td><td>4</td><td>4</td><td>5</td><td>7</td><td>8</td><td>9</td></tr></table>	7+7	KTU June 2022 July 2021
15	Using Newton's divided difference formula, evaluate $y(8)$ and $y(15)$ from the following data <table><tr><td>X</td><td>4</td><td>5</td><td>7</td><td>10</td><td>11</td><td>13</td></tr><tr><td>Y</td><td>48</td><td>100</td><td>294</td><td>900</td><td>1210</td><td>2028</td></tr></table>	7	KTU July 2021

ECT 202: ANALOG CIRCUITS

MODULE 1

Sl. No.	Questions	M	Year
1.	Design a differentiator circuit to differentiate a square wave input of 20V peak to peak amplitude and 1.5KHz frequency.	3	June 2023
2.	Explain thermal run away.	3	June 2023
3.	Draw the d.c. load line and determine the operating point of the given circuit. Assume the transistor to be of silicon. Take, $\beta=100$.	8	June 2023
4.	Draw the circuit and explain the working of an RC integrator circuit for a square wave input with period T. Sketch its output waveform for RC $\gg$ T, RC $\ll$ T and RC = T.	6	June 2023
5.	With necessary diagrams, explain the voltage divider biasing method of BJT. Derive the expression for stability factor also.	8	June 2023
6.	Set up and explain a slicer circuit that clips an input sine wave at +3V and -6V. Draw the transfer characteristics.	6	June 2023
7.	Define Stability factor. Derive the expression for stability factor 'S'.	3	June 2022
8.	With necessary diagrams, explain any two biasing method of BJT.	8	June 2022
9.	Given an input wave, Vin=10sinωt. Setup and explain a clamper that clamps the wave to 22.3V at the positive peak, assuming a voltage drop of 0.7 V across the diode. Draw the output waveform and transfer characteristics also.	8	June 2022
10.	Design a fixed bias circuit for a CE amplifier such that operating point is V_{CE} =8V and I_C = 2 mA. Given, a fixed 15V d.c supply and a silicon transistor with β= 100. Take base emitter voltage V_{BE} = 0.6V and neglect R_E.	6	June 2022

MODULE 2

1	What is the significance of Miller effect on high frequency amplifiers?	3	June 2023
2	Explain how the presence of r0 in hybrid π model of CE configuration justifies Early effect.	3	June 2023
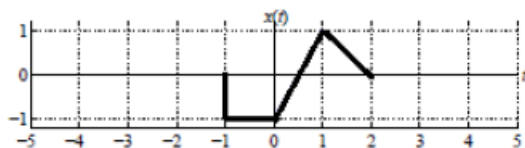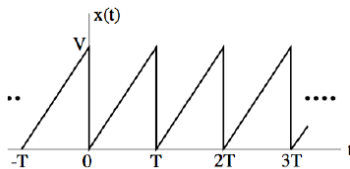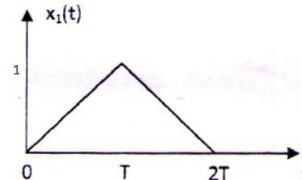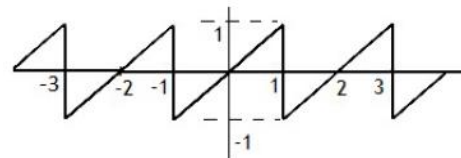
3	Using small signal hybrid π model, obtain the expression for input impedance, output impedance and mid band voltage gain of a common emitter amplifier.	8	June 2023
4	Draw the high frequency hybrid π model of BJT in CE configuration and explain the significance of each parameter.	6	June 2023
5	Using hybrid π model, calculate the small signal voltage gain, current gain, input impedance and output impedance of the given circuit, having R1=47KΩ, R2=10KΩ, RC=2.7KΩ, RE=680Ω, RL=22KΩ VCC=15V, VBE=0.7V, VA=80V, Ic= 2mA and β=100. (Neglecting r0).	14	June 2023
6	Given K=0.4mA/V^2 and $I_D(ON)$ = 3.5mA with $V_{GS}(ON)$ = 4V. Determine the value of VTH.	3	June 2022
7	Draw and explain the frequency response of RC coupled amplifier.	6	June 2022
8	Using hybrid π model, calculate the small signal voltage gain, input impedanceand output impedance of the given circuit. Given,V_{BE}=0.7V, V_A=80V, Ic = 2mA and β=100. (**Neglecting r0**)	14	July 2021
9	Three stages of individual RC coupled amplifier having midband gain of 80 with lower cutoff frequency of 100Hz and upper cutoff frequency of 300MHz are cascaded. Find the resultant	7	July 2021
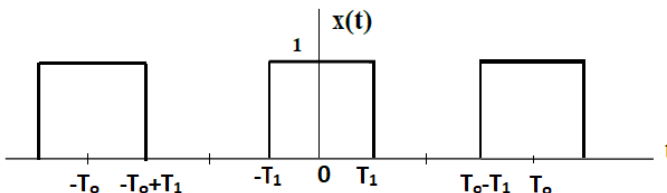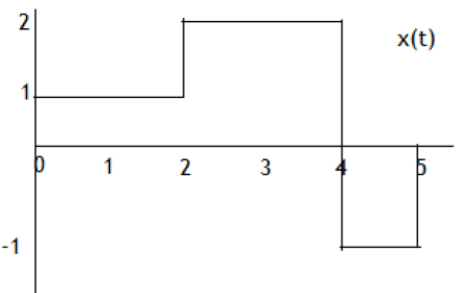
	gain and cutoff frequencies.		
10	Design an RC coupled amplifier for a gain of 200, given that Vcc=15V and Ic =3.2mA and required input impedance is 1.44KΩ. Find the lower cutoff frequency of the amplifier. Assume capacitor values appropriately if necessary. Draw the small signal high frequency CE model of a transistor and give the order of magnitudes of each capacitance and resistance.	14	July 2021

MODULE 3

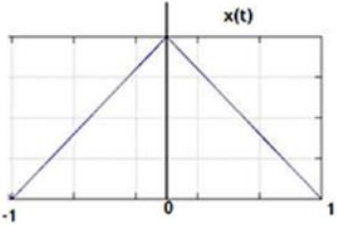|			
1	Given K=0.4mA/V2 and ID(ON) = 3.5mA with VGS(ON) = 4V. Determine VTH.	3	June 2023
2	What are the effects of cascading in gain and bandwidth of an amplifier?	3	June 2023
3	Explain any two biasing techniques for enhancement MOSFET.	8	June 2023
4	Calculate the drain current and drain-to-source voltage of a common source circuit with an n-channel enhancement mode MOSFET. Find the power dissipated in the MOSFET. R1=22KΩ, R2=10KΩ, RD=6.8KΩ, VDD=8V, VT=1V, Kn=0.1mA/V2	6	June 2023
5	Draw the circuit of a common source amplifier using MOSFET. Derive the expressions for voltage gain, input resistance and output resistance from small signal equivalent circuit.	8	June 2023
6	Briefly explain the Common Source stage with current source load.	6	June 2023
7	What are the effects of cascading in gain and bandwidth of an amplifier?	3	June 2022
8	Draw the CS stage with diode connected load and deduce the expression for voltage gain of the amplifier.	8	June 2022
9	Calculate the drain current and drain-to-source voltage of a common source circuit with an n-channel enhancement mode MOSFET. Find the power dissipated in the transistor. R_1=22KΩ, R_2=10KΩ, R_D=6.8KΩ, V_{DD}=8V, V_T=1V, Kn=0.1mA/V^2	6	June 2022
10	Briefly explain a Cascode amplifier.	6	June 2022

MODULE 4

1	Explain Barkhausen criteria for sustained oscillations.	3	June 2023
2	Illustrate the effect of negative feedback on gain of the amplifier.	3	June 2023
3	With neat circuit diagram, explain the working of Wien bridge oscillator. Explain how Barkhausen criterion for oscillation is satisfied by the circuit and derive the expression for the frequency of oscillation.	14	June 2023
4	Explain the working principle of crystal oscillator with neat diagram.	5	June 2023
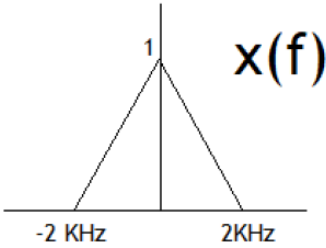
5	Differentiate positive feedback and negative feedback.	3	June 2022
6	Give the block schematic of current-series feedback amplifier configuration and deduce the expression for gain, input impedance and output impedance with feedback.	9	June 2023
7	Draw the block diagrams of current series and current shunt feedback.	3	June 2022
8	With neat circuit diagram, explain the discrete BJT circuit in voltage-series feedback and derive the expression for voltage gain, input impedance and output impedance.	14	June 2022
9	Design wein-bridge oscillator using BJT to generate 1KHz sine wave.	9	June 2022
10	With neat circuit diagram, explain the working of Hartley oscillator	5	June 2022
MODULE 5			
1	What is line regulation and load regulation in a voltage regulator?	3	June 2023
2	What do you mean by crossover distortion? How it can be eliminated?	3	June 2023
3	Explain the working of transformer coupled Class A power amplifier with a neat circuit diagram and collector waveforms. Derive the expression for collector efficiency.	14	June 2023
4	With a neat circuit diagram, explain how output voltage can be regulated by using series feedback voltage regulator. How short circuit protection can be implemented in this?	14	June 2023
5	Illustrate the principle of output current boosting circuit in a voltage regulator?	3	June 2022
6	What do you mean by crossover distortion? How can it be eliminated?	3	June 2022
7	What are the factors affecting the variation in output voltage of voltage regulator? With a circuit diagram, explain how load and line regulations areachieved in a shunt voltage regulator.	14	June 2022
8	Explain the working of Class B push-pull power amplifier with a neat circuit diagram and output waveforms. Derive the expression for collector efficiency	14	June 2022
9	Explain short-circuit protection with the support of figures.	8	KTU Model Question
10	Explain foldback protection with the support of figures.	7	KTU Model Question

ECT 204 SIGNALS AND SYSTEMS

Sl No	Question	Marks	Month and Year of Exam
	MODULE 1		
1	Sketch the signal $x(t) = [e^{-t}u(t)] \sum_{n=-a}^{a} \delta(t - nT)$ where T is any positive integer.	3	June 2022
2	What is the output sequence of an LTI system with impulse response h(n)=[2 , 2] to the input x(n)=[1, 2,3, 1]?	3	June 2022
3	Determine whether the following system is static, time invariant, linear and causal. (x and y denote input and output respectively). Explain each. $y(t) = t^2 x(t) + x(t - 2)$	8	June 2022
4	Check whether the following signals are energy or power signals. i. $x(t) = e^{-a\|t\|}$; $a > 0$ ii. $x(t) = tu(t)$	6	June 2022
5	Find the output of an LTI system with impulse response h(t) to the input x(t). Given x(t) = u(t) − u(t − 2) and h(t) is shown in Figure 1. Figure 1	8	June 2022
6	Sketch the signals (i) y(t) = u(0.5t + 2) (ii) $y(n) = u(n) + u(n - 5)$	6	June 2022
7	Demonstrate the relationship between Unit step, Unit ramp and Unit Impulse functions.	3	June 2023
8	Determine the period if the signal, $\cos\left(\frac{\pi}{3}n\right) + \sin\left(\frac{\pi}{4}n\right)$ is periodic.	3	June 2023
9	Find the convolution of signals given by $x(t) = \begin{cases} 1, 0 \leq t \leq 2 \\ 0, elsewhere \end{cases}$ $\qquad$ $h(t) = \begin{cases} 1, 0 \leq t \leq 3 \\ 0, elsewhere \end{cases}$ Plot the output signal also	8	June 2023
	State and prove the time scaling property of CTFT	3	
10	Check for shift invariance & linearity the systems represented by $y(t) = x^2(t - 1)$	3	
11	Given x(t). Sketch a. x(-t), b. x(t+2) c. x(t-1) d. x(t/2) e. x(2t)	10	

12	What is the output y(n) for a LTI system with impulse response h(n)=(1,2,1) for an input sequence x(n) = (1,3,3,2,1).	6	
MODULE 2			
1	State the Dirichlet's conditions for the convergence of Fourier series.	3	June 2022
2	Prove time-shifting property of Laplace transform	3	June 2022
3	Find the complex exponential Fourier series of the periodic signal shown in Figure 2. Figure 2	8	June 2022
4	If $x(t)$ has a Fourier Transform , find the Fourier Transform of $x_1(t) = x(4t - 3)$ $x_2(t) = \frac{d}{dt}x(t - 3)$	6	June 2022
5	Find the Fourier Transform of the signal x1(t) shown in Figure 3 using convolution property and time shift property of Fourier Transform. Figure 3	8	June 2022
6	Find the Laplace Transform and ROC of the signal $x(t) = (e^{-2t} + 3e^{-3t})u(t)$	6	June 2022
7	Find the Laplace Transform of $x(t) = e^{-2t}[u(t) - u(t - 2)]$	3	June 2023
8	Using convolution property of Laplace transform, determine the Laplace transform of system response when the input signals and impulse responses are: $x(t) = u(t), h(t) = e^{-t}u(t) - e^{-2t}u(t)$	3	June 2023
9	Determine the Trigonometric Fourier Series of the following waveform.	8	June 2023
10	Use the differentiation property to determine the FT of the triangular pulse given.	6	June 2023

11	Find the Fourier Transform of
	  a. $\cos(\omega_0 t)\,u(t)$
	  b. $e^{-t}\sin(5t)u(t)$
		8	June 2023

12	Determine the Laplace Transform of $x(t) = \begin{cases} A, 0 < t < \dfrac{T}{2} \\ -A, \dfrac{-T}{2} < t < T \end{cases}$		June 2023
13	Find the complex exponential Fourier series for the function shown for T_o=4,8. 	8	June 2023
14	Determine FT of the signal given below. 	6	June 2023
MODULE 3			
1	A continuous time signal $(t) = \cos 40t - \cos 60t$ is sampled with a time period T. Can (t) be recovered from the samples (nT) for $=\pi/30$? State the reason for the same.	3	June 2022
2	Find the frequency response $H(\omega)$ and impulse response of an LTI system characterized by the differential equation $$\frac{dy(t)}{dt} + ay(t) = x(t); a > 0$$	3	June 2022
3	Find the impulse response and step response of a system with transfer function $$H(s) = \frac{3s}{2s^2 + 10s + 12}$$	7	June 2022

4	Determine the Nyquist rate of sampling for the signals
	  1. $x(t) = \cos(150\pi t)\sin(50\pi t)$
	  2. $x(t) = \sin(150\pi t)\sin^2(50\pi t)$
		7	June 2022

5	A continuous time LTI system is described by the differential equation $$\frac{dy(t)}{dt} + 5y(t) = x(t)$$	7	June 2022
6	Determine the response of the system to the input $x(t) = e^{-2t}u(t)$ using Fourier Transform.	7	June 2022
7	Consider the continuous time signal	7	June 2022

	$x(t) = \cos(200\pi t) + \sin(320\pi t)$. What will be the Nyquist rate of sampling for the signal? If the signal is sampled at 300samples/sec, write the discrete time signal $[n]$ obtained after sampling. What will be the frequency components at the output if the sampled signal is passed through an ideal low pass filter with cut off frequency 250Hz?		
8	Describe the aliasing effect in sampling with the help of sketches.	3	June 2023
9	Consider the LTI system with input $x(t) = e^{-t}u(t)$ and impulse response $h(t) = e^{-3t}u(t)$ 1. Using Convolution property, determine the Laplace Transform, Y(s), of the output y(t). 2. Find y(t), from the Y(s) obtained in (i).	6	June 2023
10	Explain with the help of figures, the effect of sampling in the frequency domain for the following cases: 1. 11Spectrum of sampled signal with $\omega_s > 2\omega_M$ 2. Spectrum of sampled signal with $\omega_s < 2\omega_M$ Assume an arbitrary message signal spectrum. Here ω_s is the sampling frequency and ω_M is the maximum frequency present in the signal.	8	June 2023
11	Consider the signal x(t) = cos 2000πt + 10 sin 10000πt+ 20 cos 5000πt. Determine 1. Nyquist rate for this signal 2. If the sampling rate is 5000 samples per second, then what is the discrete time signal x(nTs) obtained after sampling, where Ts is the sampling period and n is an integer.	6	June 2023
12	Consider the continuous time band-limited signal x(t) with a spectrum x(f) as shown in figure above. Sketch the spectrum of the discrete time signals $x_1[n]$ and $x_2[n]$ obtained from x(t) by sampling at 5 KHz and 3 KHz respectively. 	8	June 2023
MODULE 4			
1	Define Energy Spectral Density of a discrete time signal? How can you relate it to the DTFT of the signal?	3	June 2022
2	Determine the Fourier series coefficients of the signal $x(n) = 2 + \cos\left(\frac{\pi}{3}n + \frac{\pi}{4}\right)$	3	June 2022
3	Find the DTFT of the following sequences using properties given $x(n)$ has a DTFT $X(e^{i\omega})$ 1. $x_1(n) = x(1-n)$ 2. $x_1(n) = e^{j\frac{\pi}{4}n}x(n-2)$	7	June 2022
4	Consider an LTI system that is characterized by the difference equation	7	June 2022

	$y(n) - \frac{3}{4}y(n-1) + \frac{1}{2}y(n-2) = x(n)$ Find the frequency response $H(e^{j\omega})$ and the impulse response h(n) of the system.		
5	Find the DTFT of the given signal $x(n)$ $$x[n] = \begin{cases} 1, |n| \le N_1 \\ 0, |n| > N_1 \end{cases}$$	7	June 2022
6	State and prove the convolution property of DTFT.	7	June 2022
7	Define Discrete-Time Fourier Transform (DTFT) of a signal $[n]$. Prove that the DTFT is periodic with period 2π.	3	June 2023
8	Determine Discrete Time Fourier Series of function $x[n] = 3\cos(\frac{\pi}{8}n)$	3	June 2023
9	Fourier series coefficients of a discrete time periodic signal x[n] is given by $C_k = \cos\frac{k\pi}{4} + \sin\frac{3k\pi}{4}$. Period of x[n] is N=8. Determine the sequence x[n].	6	June 2023
10	Determine and sketch the magnitude and phase spectra of the following periodic signal $x[n] = \cos\frac{2\pi}{3}n + \sin\frac{2\pi}{5}n$	8	June 2023
11	Determine the DTFT of the signal $[n]$ as give below. $$x = [n] = \begin{cases} 3, -10 \le n < 0 \\ -3, 0 \le n \le 10 \\ 0, elsewhere \end{cases}$$ Obtain the final expression of DTFT in terms of trigonometric functions. Find the magnitude and phase spectra of $[n]$.	9	June 2023
12	Using DTFT, determine the impulse response of the discrete time system described by the difference equation y[n-2]=x[n-1]+3y[n-1]-2y[n]	5	June 2023
MODULE 5			
1	If the ROC of system function of an LTI system is |z| >0.8, comment on the stability and causality of the system with proper justification.	3	June 2022
2	Give the relation between DTFT and z-transform of a discrete time signal	3	June 2022
3	Determine the z-transform for the following signal. Sketch the pole-zero plot and indicate the ROC. $x(n) = \left(\frac{1}{2}\right)^{n-1} u(n+3)$ 77	7	June 2022
4	For the LTI system with system function H(z) find the impulse response so that the system is stable $$H(z) = \frac{5 - 10z^{-1}}{1 - 3.5z^{-1} + 1.5z^{-2}}$$ Can this system be both stable and causal?	7	June 2022
5	Find the inverse z-transform of $$X(z) = \frac{2z^2 + 16}{(z+1)(z-2)}$$ for all possible ROCs.	10	June 2022
6	Write down any four properties of ROC for Z transform.	4	June 2022

7	Find the Z transform of $x(n) = r^n \sin \omega_n u(n)$	3	June 2023
8	What is the final value of x(n), if $X(z) = \dfrac{z^2}{(z-1)(z-0.2)}$		June 2023
9	Obtain the transfer function and impulse response for a stable and causal system with difference equation $y[n] + \frac{1}{6}y[n-1] - \frac{1}{6}y[n-2] = 3x[n] - \frac{1}{6}x[n-1]$	8	June 2023
10	Determine the impulse response of the system described by the difference equation $y(n) = ay(n-1) + x(n)$	3	June 2023
11	Determine the Z transform and plot the ROC of the function given by $x(n) = \left(\frac{1}{2}\right)^n u(n) + \left(\frac{1}{3}\right)^n u(n)$	6	June 2023
12	A certain LTI system is described by the following system function $(z) = \dfrac{(z+{}^1/_2)}{(z-1)(z-{}^1/_2)}$. Find the system response to the input $x(n) = 4^{-(n+2)}u(n)$	4	June 2023
13	Determine the transfer function of the system given by the difference equation $y(n) + \frac{1}{4}y(n-1) = x(n) - x(n-1)$. Calculate the frequency response from its transfer function. Express the same in terms of trigonometric functions. Also obtain the magnitude and phase responses of the given system	10	June 2023

ECT 206 COMPUTER ARCHITECTURE AND MICROCONTROLLERS

MODULE 1

Sl.No.	Questions	Marks	KTU, Year
1	Show the binary representation of (-54.035)10 in Single precision floating point format Write down the range of numbers that can be represented using IEEE 754 single precision floating point representation. How do we represent zero, infinity and 49 in IEEE 754 format.	3 8	KTU JUNE 2023 KTU JULY 2021
2	What are the functional units of a Computer?	3	KTU JUNE 2023
3	a)Explain "shift and add" algorithm for multiplying two numbers with an example b) Differentiate RISC and CISC Computer Architecture	8 6	KTU JUNE 2023
4	a)Draw and explain the general internal architecture of a processor b) Explain processor operations Instruction fetch, decode and execute.	8 6	KTU JUNE 2023
5	Differentiate between Von-Neumann and Harvard Architecture.	3	KTU JUNE 2022
6	Define Address bus, Data bus and Control bus.	3	KTU JUNE 2022
7	Explain Non-restoring division algorithm with an example.	8	KTU JUNE 2022
8	Explain Instruction Cycle with a sample timing diagram.	6 10	KTU JUNE 2022 MODEL
9	Illustrate the algorithm for division of two 4 bit signed binary numbers, -6/4. Write the algorithm or draw the flowchart also.	8	KTU JULY 2021
10	How does a computer go from a set of stored instructions to running them?	7	KTU JUNE 2022

MODULE-2

Sl.No.	Questions	Marks	KTU, Year
1	Explain the memory organization of 8051 microcontroller.	3	KTU JUNE 2023

2	Write down the function of following instructions (a) XRL A,@R1 (b) CLR A (c) XCH A,@R0 (b) ANL A,@R1 (b) RLC A (c) MOVX A,@R0	3 3	KTU JUNE 2023 KTU JUNE 2022
3	a) Explain different Addressing Modes of 8051 Microcontroller with examples. b) Explain Read/Write operation of any one port of 8051 microcontroller using port diagram.	8 6	KTU JUNE 2023
4	a) Explain the interrupts of 8051 microcontroller b) Draw and explain the architecture of 8051 microcontroller.	5 9	KTU JUNE 2023
5	Draw and explain the PSW of 8051 microcontroller.	3	KTU JUNE 2022 KTU JULY 2021
6	Explain TCON and TMOD special function register in 8051 Microcontroller	6	KTU JUNE 2022
7	List the components of 8051 microcontroller	3	KTU JULY 2021 MODEL
8	Write the operations happening in the following instructions: ADD A, 56 XCHD A, @R1 DJNZ R6, LABEL DIV AB XRL A, #0FFh JB P1.2 LABEL	3	KTU JULY 2021 MODEL
9	Explain the RAM memory organization of 8051 microcontroller using a schematic diagram. Also list the 8051 Special function registers and its functions.	9	KTU JULY 2021
10	What is stack? Explain the role of stack in program execution during a CALL instruction	5	KTU JULY 2021
MODULE -3			
1	Write an assembly language program to copy a block of 8 bytes of data to RAM locations starting at 80H from RAM locations 20H.	3	KTU JUNE 2023
2	What are the types of constants in embedded C?	3	KTU JUNE 2023

3	a)Explain the interfacing of stepper motor with the microcontroller. Write an assembly language program to rotate stepper motor in a clockwise direction continuously in full-step mode.	9	KTU JUNE 2023
	b) Write an 8051 assembly language program to find the sum of 25 data bytes stored in array of external RAM starting with address 3200H. Store the 16 bit sum at the end of array.	5	
4	a) Explain interfacing of DAC with 8051 using a diagram and also write an embedded C program to generate staircase waveform.	7	KTU JUNE 2023
	b) Write an assembly language program to interface a 7 Segment LED display with 8051 microcontroller.	7	
5	What is constant in embedded C?	3	KTU JUNE 2022
6	Write an ALP to find the largest number in an array of 10 bytes, stored in the internal memory block starting with 21H. Store the result at 50H.	6	KTU JUNE 2022
7	Draw the block diagram to show how 8051 is connected to DAC 0808 at port P1.Write a program to generate Ramp signal.	8	KTU JUNE 2022
8	Write an 8051 C program to get a byte of data from Port P1. If it is less than 100, send it to P0; otherwise, send it to P2	6	KTU JUNE 2022
9	Write an 8051 C program to send values 00-FF to port P1.	3	KTU JULY 2021
10	Write an 8051 C program to send letters 'M', 'D' to LCD using delays.	7	KTU JULY 2021
MODULE -4			
1	Explain how the baud rate is configured in 8051 serial port	3	KTU JUNE 2023
2	Explain assembler, interpreter and compiler.	3	KTU JUNE 2023
3	a) Explain 8051 timer mode 1 and mode 2 characteristics and operations using diagrams.	8	KTU JUNE 2023
	b) Write an 8051 C program to transfer the message "FOLLOW THIS" serially at baud rate of 9600, 8bit data with 1 stop bit continuously.	6	
4	a)Write an 8051 assembly language program to generate a square wave of 1KHz frequency at pin P0.1 using Timer 0. Explain how timer modes are selected using TMOD register.	8	KTU JUNE 2023
	OR		KTU JUNE 2022
	Write an ALP to generate a square wave of frequency 100KHz on	7	

	pin P1.0, using Timer 1 operating in mode 0. Assume Crystal frequency 11.0592 MHz b) Draw and explain ARM7 register architecture.	6	KTU JUNE 2023 KTU JUNE 2022
5	What is the difference between a Timer and Counter?	3	KTU JUNE 2022
6	Explain the format of SCON Special Function Register.	3	KTU JUNE 2022
7	Explain various System software.	8	KTU JUNE 2022
8	Write an embedded C program for the 8051 to transfer letter "A" serially at 9600 baud, continuously. OR Explain the steps to transfer data serially in 8051. Write an 8051 assembly language program to transfer 'Y' serially at baud rate 9600 continuously through Port 0 OR Assume a switch is connected to pin PL7. Write a embedded C program for 8051 microcontroller to monitor its status and send two messages to serial port continuously as follows: SW=0 send "NO" SW=1 send "YES" Assume XTAL = 11.0592 MHz, 9600 baud, 8-bit data, and 1 stop bit OR Write a embedded C program for 8051 microcontroller to send the message "Hello World !" to serial port. Assume a SW is connected to pin P1.2. Monitor its status and set the baud rate as follows: SW = 0 , 4800 baud rate SW = 1 , 9600 baud rate Assume XTAL = 11.0592 Mhz, 8 – bit data, and 1 stop bit	6 8 10 10	KTU JUNE 2022 KTU JULY 2021 MODEL MODEL
9	Assume XTAL=11.0592. Compute the value to be loaded into TH0 andTL0 (mode 1) to incorporate a time delay of 5ms	3	KTU JULY 2021
10	Explain the procedure of doubling the baud rate of data transfer in 8051serial communication.	3	KTU JULY 2021
	MODULE -5		
1	Write a short note on memory hierarchy	3	KTU JUNE 2023 KTU JUNE 2022
2	Explain the replacement algorithm used in cache memory.	3	KTU JUNE 2023

3	a) Explain programmed I/O and interrupt driven I/O.	8	KTU JUNE 2023
			KTU JULY 2021
	b) What is the role of TLB (Translation Look aside Buffer) in virtual address to physical address translation?	6	
4	a) Explain about DMA data transfer methods.	4	KTU JUNE 2023
	b) Explain set associative mapping technique used in cache memory. How it is different from direct mapping.	10	
5	Define Virtual memory.	3	KTU JUNE 2022
6	Why does dynamic RAM need constant refreshing? How is this done?	3	KTU JUNE 2022
7	Explain different mapping techniques in cache memory.	8	KTU JUNE 2022
8	Explain the Asynchronous input/output transfer with proper timing diagram.	6	KTU JUNE 2022
9	Explain the address translation mechanism in Virtual Memory.	8	KTU JUNE 2022
10	Explain the working of DRAM and SRAM with neat diagram.	6	KTU JUNE 2022

MCN 202 CONSTITUTION OF INDIA

	Module 1		
Sl No	**Questions**	**Marks**	**KTU,Year**
1	Explain the salient features of Indian Constitution	3	July 2021 (FN)
2	What do you mean by federal system of government? Give an example	3	July 2021 (FN)
3 a	What is preamble? Explain the importance of preamble in the implementation of Constitution	6	July 2021 (FN)
b	Explain different ways for acquiring Indian citizenship.	8	July 2021 (FN)
4a	Explain the salient features of Indian constitution.	8	July 2021 (FN)
b	Write notes on methods of termination of Indian citizenship.	6	July 2021 (FN)
5	Define Constitution. Why is it necessary for a Country	3	July 2021 (AN)
6	Explain the need and importance of Preamble	3	July 2021 (AN)
7 a	What is Preamble? Can it be used for the interpretation of the constitution? Also explain its significance	8	July 2021 (AN)
b	Describe the salient features of Indian Constitution	6	July 2021 (AN)
8 a	Give detail account on the historical background of Indian Constitution	6	July 2021 (AN)
b	What is citizenship? Discuss the various methods of acquiring Indian citizenship	8	July 2021 (AN)
9 a	List out the salient features of Indian Constitution	7	June 2023
b	Discuss the various aspects in the preamble of Indian Constitution	7	June 2023
10 a	Discuss the various methods to acquire Indian citizenship	8	June 2023
b	Explain any three citizenship amendment act	6	June 2023

	Module 2		
Sl No	Questions	Marks	KTU,Year
1	Explain the concept of " Equality before Law"	3	July 2021 (FN)
2	"No person shall be prosecuted and punished for the same offence more than once". Discuss this clause	3	July 2021 (FN)
3 a	Explain the concept of appeal by special leave	6	July 2021 (FN)
b	Discuss the classification of Directive Principles of State Policy in detail	8	July 2021 (FN)
4 a	What do you mean by right against exploitation? Explain	7	July 2021 (FN)
b	Distinguish between fundamental rights and directive principles of state policy	7	July 2021 (FN)
5	How is State defined under Article 12 of Indian Constitution	3	July 2021 (AN)
6	What is the basic difference between Fundamental Rights and Directive Principles of State Policy?	3	July 2021 (AN)
7 a	Describe the Rights to Constitutional Remedies and explain its significance	6	July 2021 (AN)
b	Explain the needs and importance of fundamental duties of Indian Citizen	8	July 2021 (AN)
8 a	What are Fundamental Rights? Examine each of them	8	July 2021 (AN)
b	State the Directive Principles of State Policy and explain its significance	6	July 2021 (AN)
9 a	What are the features of fundamental rights? Explain any two types of fundamental right.	9	June 2023
9 b	List out the Gandhian ideology included in directive principle	5	June 2023
10 a	What are the duties of Indian Citizens according to Constitution?	8	June 2023
10 b	List out the features of directive principles of state	6	June 2023

Module 3			
Sl No	Questions	Marks	KTU,Year
1	Explain the procedure for impeachment of the President of India.	3	July 2021 (FN)
2	Explain the role of the Attorney General for India	3	July 2021 (FN)
3 a	Explain the powers of President of India.	8	July 2021 (FN)
b	Explain the constitutional position and essential qualifications of Vice-president of India.	6	July 2021 (FN)
4 a	Explain the qualification and disqualification for membership in the house of the people.	8	July 2021 (FN)
b	Explain various kinds of jurisdiction of Supreme Court	6	July 2021 (FN)
5	Explain the procedure for impeachment of the President of India.	3	July 2021 (AN)
6	Mention the Powers and Functions of the Attorney General for India	3	July 2021 (AN)
7 a	Explain various kinds of jurisdiction of Supreme Court of India	7	July 2021 (AN)
b	Explain the constitutional duties and powers of the Prime Minister	7	July 2021 (AN)
8 a	Explain the functions and powers of the President of India.	8	July 2021 (AN)
b	Explain in detail about the Union Government structure and functions	6	July 2021 (AN)
9.a	Describe the procedure for election and removal of the president of India	8	June 2023
9.b	Explain any three functions of Parliament	6	June 2023
10.a	Explain the powers and functions of the Prime Minister	9	June 2023
10.b	Supreme Court may in its discretion to grant to special leave to appeal. Examine the situation	5	June 2023

Module 4			
Sl No	Questions	Marks	KTU,Year
1	Explain the procedure for the appointment of chief minister	3	July 2021 (FN)
2	Explain the duties of advocate general of the state.	3	July 2021 (FN)
3 a	Explain the powers and functions of the Governor of Kerala state.	6	July 2021 (FN)
b	Explain the composition and duration of state legislative council	8	July 2021 (FN)
4 a	Explain the qualification and disqualification for membership of the state legislature	7	July 2021 (FN)
b	Explain the constitution of High court. What are the essential qualifications required for the appointment of High court Judge?	7	July 2021 (FN)
5	What are the constitutional provisions relating to freedom of trade ,commerce and intercourse	3	July 2021 (AN)
6	List out the three types of emergencies under Indian constitution	3	July 2021 (AN)
7 a	Describe the duties and role of Comptroller and Auditor General of Indian (CAG)	8	July 2021 (AN)
b	Examine the administrative and financial relation between the Union and the State	6	July 2021 (AN)
8 a	Enumerate the powers and functions of Public Service Commission	8	July 2021 (AN)
b	Explain the characteristics of Administrative Tribunals. What are the reasons for the growth of Administrative Tribunals in India	6	July 2021 (AN)
9.a	Discuss the qualification and disqualification of the membership of state legislature	10	June 2023
9.b	What are the duties and functions of Advocate general of the state	4	June 2023
10.a	List out the different jurisdiction and powers enjoyed by the High Court and explain original and writ jurisdiction in detail	10	June 2023
10.b	What are the powers enjoyed by the Governor	4	June 2023

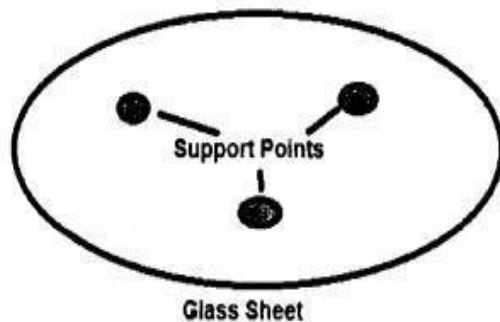| Module 5			
Sl No	**Questions**	**Marks**	**KTU,Year**
1	Discuss the functions of comptroller and auditor general of India	3	July 2021 (FN)
2	Explain the distribution of tax revenue with respect to centre-state financial relation.	3	July 2021 (FN)
3 a	Explain parliamentary legislation in the state field	6	July 2021 (FN)
b	Discuss the effects of national and financial emergencies	8	July 2021 (FN)
4 a	Explain the procedure for amendment of the constitution	6	July 2021 (FN)
b	What is the need for administrative tribunals? Explain the functions of state administrative tribunals	8	July 2021 (FN)
5	Why do we need to form separate Union Territories	3	July 2021 (AN)
6	Distinguish between an ' Ordinary Bill' and 'Money Bill'	3	July 2021 (AN)
7 a	Explain the various writs issued by High court of Kerala	6	July 2021 (AN)
b	Discuss the constitutional position and powers of Governor	8	July 2021 (AN)
8 a	Explain the functions of the State Legislature	8	July 2021 (AN)
b	Explain the responsibilities and functions of Council of Ministers to State Legislative Assembly	6	July 2021 (AN)
9.a	What are the five extraordinary circumstances on which the Constitution empowers the Parliament to make laws on any matter enumerated in the State list?	10	June 2023
9.b	Briefly explain the grants – in – aid the state	4	June 2023
10.a	Explain three types of emergencies under Indian Constitution	10	June 2023
10.b	What are the functions of interstate council	4	June 2023

EST 200 DESIGN AND ENGINEERING

	MODULE I		
Sl.No.	**Questions**	**Marks**	**KTU, Year**
1	Outline the significance of understanding customer requirements in the design process	3	KTU JUL 2021
2	Explain the design process of designing a handbag for women in the age group of 15 to 25 years. Use hand sketches to support your idea	14	KTU JUL 2021
3	Describe the concept of generating design alternatives and choosing a design through designing a coffee mug with the help of sketches	14	KTU JUL 2021
4	Discuss the importance of design constraints?	3	KTU DEC 2020
5	Describe how to select the "best possible design" from the generated design alternatives.	3	KTU DEC 2020
6	Design two alternatives of a chair suitable for a five-year-old child, and then narrow down to the best design based on objectives and constraints. Sketch both the designs.	14	KTU DEC 2020
7	Identify the objectives, functions, and constraints for designing a water level indicator. Illustrate the various stages of the design process. Provide suitable sketches.	14	KTU DEC 2020
8	Give the main objectives and constraints for the design a)Main entrance door of a house b)The door of a room within the house c)The door to a bathroom within the house d)Lunch box	5	KTU MAY 2019
9	What is engineering design? Draw a diagram to represent the engineering design process?	3	KTU JUNE 2022
10	How will a prototype help to identify the best possible solution for the problem?	3	KTU JUNE 2022
11	Design (a)simple calculator (b) length-adjustable mop to clean the ceiling fan (c) study table for a child upto 5 years old specifying objectives, functions and constraints through various stages of design processes. Use hand sketches to illustrate the process.	14	KTU MAY 2019 KTU JUNE 2022 KTU JUNE 2023

12	An electric car recharging station has to be designed. Find the customer requirements and explain how it can be materialized. Includethe detailed layout of the station?	14	KTU JUNE 2022
13	How is engineering design different from other kinds of design?	3	KTU JUNE 2023
14	Choose the best design for a laptop stand for avoiding overheating, also incorporate the customer requirements. Show how design objectives were finalized considering the constraints also.	14	KTU JUNE 2023
	MODULE II		
1	Explain convergent questioning in design thinking	3	KTU JUL 2021
2	Explain how the conflict in a team environment helps in better design of products	3	KTU JUL 2021
3	Illustrate the design thinking process through designing a (a) walking stick for elderly people (b) a parachute mechanism for the safe landing of an egg that is dropped from a height of 3 meters (c) a water bottle that can be opened with one hand with help of sketches.	14	KTU JUL 2021 KTU JUL 2021 KTU DEC 2020
4	Discuss how to manage the conflicts in a team executing the design thinking process.	3	KTU DEC 2020
5	How does the design thinking approach help engineers in creating innovative and efficient designs?	3	KTU DEC 2020
6	During the Covid-19 pandemic, people have to wear a mask, but wearing a mask is not comfortable. Empathize about this design problem and arrive at a solution using the design thinking process, so that people can select the level of protection provided by masks according to different situations. Illustrate the solution using sketches.	14	KTU DEC 2020
7	Design a manual mango plucker (with a height adjusting mechanism that can be used by a common man to pluck and collect safely the mangoes from the mango tree in his yard. - Prepare a detailed design highlighting the benefits of our design - Draw a neatly labeled sketch showing your design	10	KTU JULY 2018
8	Explain and differentiate conceptual design and detailed design?	3	KTU JUNE 2022
9	Explain the five different stages of design thinking? Illustrate it with the help of a face mask design	14	KTU JUNE 2022

10	Explain the term design functions as applicable to engineering design.	3	KTU JUNE 2023
11	How does design thinking approach help engineers in creating innovative and efficient designs?	3	KTU JUNE 2023
12	Construct a number of possible designs and then refine them to narrow down to the best design for a baby seater in a car. Show how convergent-divergent thinking helps in the process. Illustrate with hand sketches.	14	KTU JUNE 2023
13	Design a carry bag for shopping purposes. Illustrate the various stages involved in design thinking. Sketch the final design.	14	KTU JUNE 2023

MODULE III

1	Describe how prototyping helps in the design process	3	KTU JUL 2021
2	Explain any three advantages of communicating designs in writing.	3	KTU JUL 2021
3	Design an office chair and communicate your design using sketches with design detailing, material selection, scale drawings, and dimensions	14	KTU JUL 2021
4	Describe the role of mathematical modeling in design engineering citing an example	14	KTU JUL 2021 KTU JUL 2023
5	Clarify the part of mathematics and physics in the design engineering process.	3	KTU DEC 2020

6	What are factors to be considered in
	    (a) Preparing technicalreports to communicate a design efficiently?
	
	    (b) Communicating designs through oral presentation?
		3
		
		3
			KTU DEC 2020
			
			KTU JUL 2023

7	Design a (a) foldable steel table (b) a foldable bed Draw the detailed 2D drawings of the same with design detailing, scale drawings, and dimensions. Use only hand sketches.	14	KTU DEC 2020 KTU JUL 2023
8	Prepare a technical report for a newly designed website for online training of students with neat diagrams for presenting to a client.	14	KTU DEC 2020
9	Show how engineering sketches and drawings convey designs.	4	MODEL

10	Explain the role of mathematics and physics in design engineering process.	3	MODEL
11	Graphically communicate the design of a thermos flask used to keep hot coffee. Draw the detailed 2D drawings of the same with design detailing, material selection, scale drawings, dimensions, tolerances, etc. Use only hand sketches.	14	MODEL
12	Describe the role of mathematical modeling in design engineering. Show how mathematics and physics play a role in designing a lifting mechanism to raise 100 kg of weight to a floor at a height of 10 meters on a construction site	14	MODEL
13	Explain the steps for oral presentation for marketing your own product within limited budget? Illustrate with an example and suitable figures.	14	KTU JUL 2023
14	A web page has to be maintained to store the details of covid patients in Kerala district wise. Design a web page and its popups with neat sketches and necessary documentation. The design must include the specification of softwares required for the page development.	14	KTU JUNE 2022
15	A round glass of 600 mm diameter and 6mm thick is available. This is to be designed as a table supported at three points by a steel tube bent conveniently. The height of the table is to be 300 mm and the total length of the tube used should not exceed 1.8 m, The tube should not be out or joined. Design the bent tube for supporting the table	10	KTU SEP 2020

Support Points

Glass Sheet

	MODULE IV		
1	Illustrate advantages of reverse engineering in design	3	KTU JUL 2021
2	Explain biomimicry in design with an example	3	KTU DEC 2020
	How does intelligence in nature inspire engineering designs?	3	KTU JUL 2023
3	a) What is meant by modular design?	5	KTU MAY 2019
	b) How modular design is realized in i) Umbrella and ii) Ink Pen iii) bicycle iv) desktop Computers? Draw the different modules involved in each of theseproducts.	14	KTU MAY 2019
4	Demonstrate the concept of ergonomics through the design of a table lamp	14	KTU JUL 2021
5	a) Describe the use of value engineering in the design process.	3	KTU DEC 2020
	b) Apply value engineering and design. Illustrate the solution using sketches (a) Pen (b)bag for the students residing in poor homes (c)lightweightpen (d) product for easy cleaning of dust from windows, fans, and lampshades. .	14	KTU DEC 2020 KTU JUL 2018 KTU JUN 2017
6	Design waste bins to be kept at bus stops for waste collection enabling source separation. The bin should be theft-resistant and protect the contents of the bin from external weather conditions. Design the bins with ergonomic consideration for waste collection workers. Sketch the design using hand drawings.	14	KTU DEC 2020
7	Show the development of a nature-inspired design for a solar-powered bus waiting shed beside a highway. Relate between natural and man-made designs. Use hand sketches	14	MODEL
8	Show the design and then depict how the design changes when considering 1) aesthetics and 2) ergonomics into consideration. Give hand sketches and explanations to justify the changes in designs. (a) A sofa (b) Kid friendly craft	14	MODEL KTU JUL 2023

9	Distinguish between project-based learning and problem-based on learning in design engineering.	3	MODEL
10	Describe how concepts like value engineering, concurrent Engineering, and reverse engineering influence engineering designs?	3	MODEL
11	Draw the figure of a smartphone which is both aesthetic and ergonomic	5	KTU JUN 2017
12	A class room has to be designed in such a way that it should support the faculty for taking both online and offline mode class in the same room. Prepare a bill of material and draw a neat sketch showing the seating arrangement, cable layout, projector and smart board position, podium, camera and the teacher position. Aesthetic, ergonomics and convenience mustbe considered.	14	KTU JUNE 2022
13	(a) Write the significance of life cycle design? (b) Apply the ergonomic design concepts to design a knife for various purposes. Illustrate each design with a neat sketch?	4 10	KTU JUNE 2022
14	Design a smart umbrella which has automatically folding and unfolding mechanism during heavy rain and sunlight with the concept of bio mimicry and sustainability. Use hand sketches to support your arguments.	14	KTU JUL 2023
15	Examine how engineering students can learn design engineering through projects.	3	KTU JUL 2023

	MODULE V		
1	Describe ethics to be followed in engineering design	3	KTU JUL 2021
	Or		
	How do ethics play a decisive role in engineering design?	3	KTU DEC 2020
2	(a) Explain the significance of sustainability in engineeringdesign	3	KTU JUL 2021
	(b)Illustrate the changes in the design of disposable tea cups in terms of production, use, and sustainability	1 4	KTU JUL 2021
3	Describe how to estimate the cost of a table in the design stage? Show how economics will influence engineering designs.	1 4	KTU JUL 2021
	Or		
	Describe how to estimate the cost of a pen and list the various parts. Show how economics will influence engineering designs. Use hand sketches to support your arguments.		KTU DEC 2020
	Or		
	Describe the how to estimate the cost of a particular design using ANY of the following: i) a website, ii) the layout of a plant, iii) the elevation of a building, iv) an electrical or electronic system or device and v) a car. Show how economics will influence engineering designs. Use hand sketches to support your arguments.		MODEL
	OR		
	A table has to be designed as a study table, but it must include a provision to place your computer. Calculate the cost difference if you want to convert it as a dining table. The cost calculation must include labor, material and overhead costs	14	KTU JUNE 2022
4	Design a fan that automatically reduces speed or stops when the temperature reduces during the night for energy conservation. Use hand sketches to support your design.	1 4	KTU DEC 2020
5	Examine the changes in the design of footwear with constraints of 1) production methods, 2) life span requirement, 3) reliability issues and 4) environmental factors. Use hand sketches and give proper rationalization for the changes in design.	1 4	MODEL
6	Show how designs are varied based on the aspects of production methods, life span, reliability, andenvironment?	3	MODEL
7	Show how designs are finalized based on the aspects of production methods.	3	

8	Examine the changes in the design of a hand purse with constraints of 1) production methods 2) life span requirement 3) reliability issues and 4) environmental factors. Use hand sketches and give proper rationalization for the change in design	14	KTU JUL 2023
9	Describe how to estimate the cost of a particular design of a smart bus for public use with wifi and proper cleaning facility. List the various components used. Show how economics will influence the engineering designs, use hand sketches to support the arguments.	14	KTU JUL2023