Question Bank

SUBJECT: PROBABILITY DISTRIBUTIONS, RANDOM PROCESS AND NUMERICAL METHODS-2021

CLASS : S4 ECE

Module 1

Sl. No	QUESTIONS	Marks	KU/KTU (Month/ Year)	Instructional Objectives
1	A random variable X takes values 0,1, 2 and 3 with probabilities $P(X = 0) = 8/15$, $P(X = 1) = 1/3$, $P(X = 2) = P(X = 3) = 1/15$ (i) Find the mean and variance of X. If $Y = 1000 + 300X$ (ii) find $P(Y \geq 1500)$ and $E[Y]$	7	KTU- July 2017	Evaluate
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. (i) What is the probability that he answers 13 or more questions correctly? (ii) What is the mean and variance of the number of correct answers he gives?	8	KTU- July 2017	Remember
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?	8	KTU- May 2017	Understand
4	a) A box contains 100 cell phones, 20 of which are defective. 10 cell phones are selected for inspection. Find the probability that 1) at least one is defective 2) at most three are defective 3) none of them are defective 4) all of them are defective.	8	KTU- JULY 2017	Evaluate
5	The monthly breakdown of a computer follows Poisson Distribution with mean 1.2. Find the probability that this computer will function for a month a) without a break down b) with only one breaks down c) with at most two break down	8	KTU- JULY 2017	Evaluate

6	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	8	KTU-April 2018	Apply
7	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 (i) the value of k (ii) the probability that X is even and (iii) E(X).	7	KTU-MAY 2017	Evaluate
8	The joint probability distribution of X and Y is given by f(x,y)=(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	7	KTU-May 2019	Evaluate
9	Show that Poisson distribution is the limiting case of binomial Distribution .	7	KU-MAY 2015	Understand
10	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 (i) at least 2 (ii)exactly 2 (iii) at most 2defective items in a consignment of 1000 packets using Poisson distribution	8	KU-MAY 2019	understand
11	Suppose X is binomial random variable with parameters n = 100 and p = 0.02. Find $P(X < 3)$ using Poisson approximation to X.	3	Model qp	understand
12	The diameter of circular metallic discs produced by a machine is a random variable with mean 6cmand variance 2cm. Find the mean area of the discs.	3	Model qp	Evaluate
13	The probability mass function of a discrete random variable is $p(x) = kx$, x = 1, 2, 3 where k isa positive constant. Find (i)find the value of k (ii) $P(X \leq 2)$ (iii) $E(X)$ (iv) $VAR(1 - X)$	7	Model qp	Apply

14	Accidents occur at an intersection at a Poisson rate of 2 per day. what is the probability that there would be no accidents on a given day? What is the probability that in January there are atleast 3 days (not necessarily consecutive) without any accidents?	7	Model qp	Apply
15	Find the mean and variance of a binomial random variable	7	Model qp, KTU-JUNE 2022	Understan
16	The joint probability distribution of two discrete random variables X and Y is given by $p(x,y) = \frac{1}{30}$ (x+y) ,x =0,1,2 y = 0,1,2,3 Find the correlation coefficient between X and Y.	7	KTU-JULY 2017	Understand
17	Two fair dice are rolled. Let X denote the number on the first die and $Y = 0$ or 1, according as the first die shows an even number or odd number. Find (i) the joint probability distribution of X and Y, (ii) the marginal distributions. (iii) Are X and Y independent	7	Model qp	Understan
18	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	
19	If X is a Poisson variable such that $P[X = 1] = P[X = 2]$, then find $P[X = 3]$.	3	KTU-JUNE 2022	
20	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	
21	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	KTU-JUNE 2022	
22	The joint probability mass function of two random variables X and Y is given by $p(x,y) = k(x + 2y) \, for \, x = 1,2,3 \; y = 1,2$ $= \; 0, \; otherwise$ where k is a constant. (i) Find the value of k (ii) Find $P[X + Y \leq 3]$	7	KTU-JUNE 2022	

	(iii) Find the marginal density functions of X and Y and			
	(iv) Are X and Y independent?			

MODULE 2

1	The time for super glue to set can be treated as a random variable having a normal distribution with mean30 seconds. Find the standard deviation if the probability is 0.20 that it will take on a value greater than 39.2 seconds	8	KTU-MAY 2017	create

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	Analyze

3	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?	8	KTU-MAY 2017	Understand

4	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 it will work for the whole of the next day?
		8	KTU-March 2017	Analyze

5	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?	5	KTU-March 2017	Remember
6	Find the mean and variance of a random variable X which is uniformly distributed in the interval $[a,b]$	5	KTU-March 2017	Understand
7	A printer ink cartridge has a life of X hours under normal usage. The variable X is modelled by the probability density function $F(x) = \begin{cases} \dfrac{k}{x^2} & ,x \geq 400 \\ 0 & otherwise \end{cases}$	8	KTU-JULY 2017	Evaluate

	(i) Find k (ii) Find the probability that such a cartridge has a life of at least 600 hours of normal usage. (iii) Find the probability that two cartridges will have to be replaced before each has been used for 600 hours.			
8	Find the mean and variance of uniform distribution	5	KTU- May 2017	Remember
9.	Buses arrived at a specified stop at 15 minute intervals starting at 8AM. A passenger arrives at the stop at random time between 8 AM and 8.30 AM. Find the probability that he waits (i) less than 5 minutes, (ii) at least 12 minutes	7	KTU- MARCH 2017	Understand
10.	Find the mean and variance of exponential distribution	5	KTU – May 2017	Remember
11	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	KTU – May 2019	Apply
12	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?	5	KTU- May 2017	understand
13	The probability density function of a random variable is given by f(x) = kx^2 ,$0 < x < 1$ =0 ,otherwise Find a) k b) Mean c)p ($\frac{1}{4} < X < \frac{3}{4}$) d) p(X > $\frac{2}{3}$)	7	KTU- July 2017	Evaluate
14	Find the mean and variance of the continuous random variable X with probability density function $f(x) = 2x - 4,\ 2 \le x \le 3$ $=\ 0$ otherwise	3	Model qp	Evaluate
15	The random variable X is exponentially distributed with mean 3. Find $P(X > t + 3\ X > t)$ where t is any positive real number.	3	Model qp	Evaluate
16	The joint density function of random variables X and Y is given by . f(x,y) = $e^{-(x+y)}$, $x > 0,\ \ y > 0$	7	Model qp	Evaluate

	= 0　　　　　　otherwise. Find $P(X + Y \leq 1)$. Are X and Y independent? Justify			
17	A continuous random variable X is uniformly distributed with mean 1 and variance 4/3. Find $P(X < 0)$	7	Model qp	Evaluate
18	The IQ of an individual randomly selected from a population is a normal distribution with mean 100 and standard deviation 15. Find the probability that an individual has IQ (i) above 140 (ii)between 120 and 130	7	Model qp	Evaluate
19	The lifetime of a certain type of electric bulb may be considered as an exponential random variable with mean 50 hours. Using central limit theorem, find the approximate probability that 100 of these electric bulbs will provide a total of more than 6000 hours of burning time.	7	Model qp	Evaluate
20	A pair of random variables X and Y have a joint probability density function given by $f(x,y) = \begin{cases} \frac{1}{\pi}, x^2 + y^2 \leq 1 \\ 0, otherwise \end{cases}$ Show that X and Y are not independent , but uncorrelated .	8	KTU-March 2018	Understand
21	The joint pdf of two continuous random variables X and Y is $F(x,y) = \begin{cases} 8xy, 0 < y < x < 1 \\ 0, otherwise \end{cases}$ 1)Check whether X and Y are independent 2) Find p(X +Y) < 1)	8	KTU-APRIL 2018	Analyze
22	A factory has two outlets to sell its products. The daily sales 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	Evaluate
23	The joint pdf of two continuous random variables X and Y is given by $f(x, y) = \begin{cases} kxy, 0 < x < 4, 1 < y < 5 \\ 0, \quad otherwise \end{cases}$ Find i)k 　ii) The marginal distributions of X and Y 　 iii) Check whether X and Y are independent.	8	KTU-April 2018	Evaluate
24	A continuous random variable X is uniformly distributed in $(-k, k)$. Find k if $P[X \geq 2] = 0.25$.	3	KTU-JUNE 2022	

25	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	
26	A continuous random variable has the distribution function $\quad F(x)= 0 \qquad\quad if\ x<0$ $\qquad = k(x-1)3 \quad if\ 0 \leq x \leq 4$ $\qquad =1 \qquad\quad if\ x > 4.$ Find (i) value of k $\qquad$ (ii)probability density function $f(x)$ of $F(x)$ $\qquad$ (iii) $P[X \geq 1]$.	7	KTU-JUNE 2022	
27	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)$\qquad$ What is the probability that the diameter of a randomly selected tree will be at least 10 in.? (ii)$\qquad$ What is the probability that the diameter of a randomly selected tree will exceed 20 in.? (iii)$\qquad$ What is the probability that the diameter of a randomly selected tree will be between 5 in and 10 in.?	7	KTU-JUNE 2022	
28	The time (in hours) required to repair a machine is exponentially distributed with mean 2. (i)$\qquad$ What is the probability that the repairing time exceeds 2 hours? (ii)$\qquad$ What is the conditional probability that a repair takes at least 10 hours given that its duration exceeds 9 hours?	7	KTU-JUNE 2022	
29	The joint probability density function of two continuous random variables X and Y is given by $\quad f(x, y) = kx^2y \ \ if\ 1 \leq x \leq 4, 0 \leq y \leq 4$ $\qquad = \quad 0 \qquad otherwise.$ $\quad$ Find (i) value of k $\qquad$ (ii)$P\ [X \geq 2, Y \leq 2]$ and $\qquad$ (iii) $P[X+Y<3]$.	7	KTU-JUNE 2022	

MODULE 3

1	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.	7	KTU-MAY 2017	Evaluate
2	Prove that the random process X(t) is defined by X(t) =asin$(\omega t + \theta)$,where a and ω $\;are\;constants\;and\;\theta\;is\;a\;random\;variable$ Uniformly distributed in $[0\;,2\pi]$ is WSS process .	7	KTU-MAY 2018	Evaluate
3	Consider the random process X(t) = A cos$(\omega t + \theta)$ where A and θ Is uniformily distributed random variable in (0 , 2π). Check whether or not the process is WSS .	7	KTU-April 2018	Analyze
4	A random process X(t) is defined by X(t) = Y(t) cos$(\omega t + \theta)$where Is a WSS process ,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	8	KTU-April 2018	Create
5	If X(t) = f(t) is a stochastic process , find E(X(t)) ,R(t1 ,t2) and C(t1,t2)	8	KTU-April 2018	Evaluate
6	Let X(t) =Asin$\,t + B\cos t$ be a process where A and B are independent random variables with zero mean and equal variance show that the process is WSS .	8	KTU-APRIL 2018	Create
7	Find the spectral density function of the WSS process whose auto correlation function is e^{-xy^2}	8	KTU-May 2019	Apply
8	A computer generates 100 random numbers uniformly distributed between 0 and 1. Use central limit theorem to find the probability that i) their sum is 60 or more, ii) their average is 0.7 or less	7	KTU-JULY 2017	Evaluate
9	A random process $X(t)$ is defined by $X(t) = \;\sin(t + \;\theta\;)$ where θ is a random variable taking values 0 or π with equal probability. Find the mean, autocorrelation and autocovariance of $X(t)$. Is it a wide sense stationary process?	7	KTU-JULY 2017	Analyze
10	Find the power spectral density of a wide sense stationary process $X(t)$ with autocorrelation function $RX(\tau) = e{-3}|\tau|$.	8	KTU-JULY 2017	Evaluate
11	Find the autocorrelation function and average power of a wide sense stationary process $X(t)$ with power spectral density given by $SX(\omega) = \{\,1 - \omega,\quad |\omega| \leq 1$ = 0 , otherwise	8	KTU-April 2018	Evaluate
12	Show that the random telegraph signal process is WSS	7	KTU-April 2017	Create
13	Show that the process X(t) = Ycos ωt ,where Y is uniformly distributed in	8	KTU-July 2017	Create

14.	Give any two examples of a continuous time discrete state random processes.			
15	How will you calculate the mean, variance and total power of a WSS process from its autocorrelationfunction?			
16	A random process $X(t)$ is defined by $X(t) = Y(t) \cos(\omega t + \Theta)$ where $Y(t)$ is a WSS process, ω isa constant and Θ is uniformly distributed in $[0, 2\pi]$ and is independent of $Y(t)$. Show that $X(t)$is WSS			
17	Find the power spectral density of the random process $X(t) = a \sin(\omega_0 t + \Theta)$, ω_0 constant and Θ is uniformly distributed in $(0, 2\pi)$			
18	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	Evaluate
19	Find the probability distribution of the time between two consecutive arrivals in a Poisson process.	5	KTU-JULY 2017	Understand
20	The number of particles emitted by a radioactive source is Poisson distributed .The source emits particles at a rate of 6 per minute .Each emitted particle has a probability of 0.7 of being counted .Find the probability that 11 particles are conted in 4 minutes .	8	KTU-APRIL 2018	Remember
21	In each of the following examine whether $f(\omega)$ could be the power spectral density(PSD) of a wide sense stationary process. Explain your reasoning. $f(\omega) = \begin{cases} \dfrac{\sin \omega}{\omega}, \omega \neq 0 \\ 0, \omega = o \end{cases} \omega$ If $f(\omega)$ is a valid PSD find the corresponding autocorrelation function.	7	KTU-May 2017	Understand
22	Let X_i are independent random variables taking values -1 and 1 with probability $\dfrac{`1}{2}$ A random process $Z_n$is defined as $Z_{n= X_1+X_2+\cdots\ldots+X_n, n=1,2,\ldots}$ Is the process a WSS process?	5	KTU - MAY 2017	Understand

23	The arrival of patients at a doctor's consulting room is found to follow a Poisson process with an average of one in 5 minutes. The room can accommodate a maximum of 4 persons and if more people come, they wait outside the room. If patients start coming from 8 A.M. onwards, (i) What is the probability that the room is full when the doctor arrives at 9 A. M.? (ii) If the doctor takes a break from 11A.M. to 11.15 A.M., and a lunch break from 1 P.M to 1.30 P.M. what is the probability that no new patients arrive during both the tea break and lunch break?	8	Ktu-MAY 2017	Evaluate
24.	Obtain the probability distribution of the time between two consecutive occurrences of a Poisson process	4	KTU-May 2017	Understand
25	The radio active 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	5	KTU-May 2019	Understand
26	A random process is defined by $X(t)=A\,cos\omega t, t\geq0$ where ω is a constant and A is uniformly distributed in (0,3). Determine $E[X(t)]$.	3	KTU June 2022	
27	A random process X(t) has the auto correlation function $RX(\tau)=25+\dfrac{8}{4+\tau^2}$. Find the mean-square value and variance of the process	3	KTU June 2022	
28	Assume that X(t) is a random process defined as follows: X(t) = A cos (2πt + Ø) where A is a zero-mean normal random variable with variance $\sigma A^2 = 2$ and Ø is uniformly distributed random variable over the interval $-\pi \leq \phi \leq \pi$. A and φ are statistically independent. Let the random variable Y be defined as Y = ∫X(t) dt Determine (i) the mean of Y (ii) the variance of Y.	7	KTU June 2022	
29	Show that the random process defined by $X(t)=A\sin(\alpha t+\theta)$, where A and α are constants and θ is a random variable uniformly distributed in $[0,2\pi]$ is a wide sense stationary process.	7	KTU June 2022	
30	Determine the autocorrelation function of the random process with the power spectral density given by S_{xx} (w) = S_0 $|w|<w0$ = 0 $otherwise$	7	KTU June 2022	
31	Car arrive 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 June 2022	

	MODULE 4			
1	Using Newton-Raphson method, compute a real root of $e^{2x} - x - 6 = 0$ lying between 0 and 1.	7	KTU-APRIL 2018	Evaluate
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	5	KTU-MAY 2017	Evaluate
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		KTU-APRIL 2018	Understand
	Time(t) in seconds 0 10 20 30 40 50 60			
	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.			
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	10	KTU-MAY 2017	Apply
	Year : 1961 1971 1981 1991 2001 2011			
	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			
5	Using Newton Raphson method to solve the equation $x^3 + x - 1 = 0$ correct to 4 decimal places	6	KTU-May 2017	Apply
6	Evaluate $\oint_0^6 \frac{1}{1+x^2}$ dx using 1) Trapezoidal rule 2) Simpson's rule with 6 equal intervals.	7	KTU-MAY 2017	Apply
7	Using Newton's forward interpolation formula estimate sin52 given	7	KTU-MAY 2017	Apply
	θ : 45 50 55 60 65			
	$\sin\theta$:0.7071 0.7660 0.8192 0.8660 0.9036			
8	Use Newton-Raphson method to find a non-zero solution of x = 2 sin x. Start with x_0 = 1	7	Model qp	Evaluate
9	Evaluate $\int_0^{} e^{-x^2/2}dx$ using Simpson's one-third rule, dividing the interval [0, 1] into 8 subintervals	7	Model qp	Evaluate
10	Using Lagrange's interpolating polynomial estimate $f(1.5)$ for the following data	7	Model qp	Evaluate

		x	0	1	2	33	
		$y = f(x)$	0	0.9826	0.6299	0.5532	

11	Consider the data given in the following table	7	Model qp	Evaluate

x	0	0.5	1	1.5	22
$f(x)$	1.0000	1.0513	1.1052	1.1618	1.2214

Estimate the value of $f(1.80)$ using newton's backward interpolation formula.

12	Find all the first and second order forward and backward differences of y for the following set of (x,y) values: $(0.5, 1.13)$, $(0.6, 1.19)$, $(0.7, 1.26)$, $(0.8, 1.34)$	3	Model qp	Evaluate

13	The following table gives the values of a function $f(x)$ for certain values of x.	3	Model qp	Evaluate

x	0	0.25	0.50	0.75	1
$f(x)$	1	0.9412	0.8	0.64	0.5

Evaluate $\int_0^1 f(x)dx$ using trapezoidal rule.

14	Write the Newton-Raphson iteration formula to find the cubic root of a positive number N.	3	KTU June 2022	

15	Use trapezoidal rule to evaluate $\int_0^1 y\,dx$ for the following data	7	KTU June 2022	

x	0	0.2	0.4	0.6	0.8	1
y	0	0.04	0.16	0.36	0.64	1

16	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	

17	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 $y(3)$.	7	KTU June 2022	

18	Given a function $y=f(x)$ by the following table. Using Newton's interpolation formula, find $f(0.2)$.	7	KTU June 2022	

x	0	1	2	3	4	5	6
y	176	185	194	203	212	220	229

19	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 .		8	KTU-MAY 2017	APPLY
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		6	KTU-May 2017	Apply
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	Apply
4	Use Runge Kutta method of order 4 to find y(0.2)for the differential equation y^1=3x+0.5 y,y(0)=1(Take h=0.2)		7	KTU-MAY 2019	Apply
5	Given the initial value problem $y^\jmath = y + x$, $y(0) = 0$, find $y(0.1)$ and $y(0.2)$ using Euler method		3	Model qp	Evaluate
6	Explain the principle of least squares for determining a line of best fit to a given data		3	Model qp	Evaluate
7	Using Gauss-Seidel method, solve the following system of equations $$20x + y - 2z = 17$$ $$3x + 20y - z = -18$$ $$2x - 3y + 20z = 25$$		7	Model qp	Evaluate
8	The table below gives the estimated population of a country (in millions) for during 1980-1995 	year	1980	1985	1990	1995	 |---|---|---|---|---| | population | 227 | 237 | 249 | 262 | Plot a graph of this data and fit an appropriate curve to the data using the method of leastsquares. Hence predict the population for the year 2010.		7	Model qp	Evaluate
9	Use Runge-Kutta method of fourth order to find $y(0.2)$ given the initial value problem.dy/dx=$\frac{xy}{1+x^2}$ $y(0) = 1$ Take step-size, h = 0.1.		7	Model qp	Evaluate

10	Solve the initial value problem dy/dx=x+y, y(0) =0 , $0 \le x < 1$, taking step-size $h = 0.2$. Calculate $y(0.2), y(0.4)$ and $y(0.6)$ us- ing Runge-Kutta second order method, and $y(0.8)$ and $y(1.0)$ using Adam-Moulton predictor-corrector method.	7	Model qp	Evaluate
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	Apply Gauss-Seidel method to solve the equations $20x+y-2z=17$, $3x+20y-z= -18$, $2x-3y+20z=25$.	7	KTU June 2022	
14	Given $dy/dx=x+y$, $y(0)=1$. Using Euler's method, find $y(0.1), y(0.2)$ and $y(0.3)$ by taking $h=0.1$. Hence obtain $y(0.4)$ using Adams-Moulton predictor- corrector method.	7	KTU June 2022	
15	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	
16	By the method of least squares, find the straight line that best fits the following data 	x	1	2	3	4	5
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y	14	27	40	55	68		7	KTU June 2022	

Type equation here.

EET 204 ELECTROMAGNETICS

Sl No.	QUESTION	Marks	Year
	MODULE 1		
1	Obtain gradient of the functions: a) $F = 5\rho^4 z^3 \sin\varphi$ b) $V = 10r^4 \sin\theta \cos\varphi$	5	KTU April 2018
2	Given two points, C(-3,2,1) and D(r=5,θ=20^0,ϕ=-70^0). Find a) the spherical coordinates of C b) rectangular coordinates of D c) distance from C to D	10	KTU April 2018
3	Explain about the physical significance of divergence of vector quantity.	5	KTU April 2018
4	Explain about the cylindrical coordinate system.	3	KTU April 2018
	Find the gradient of scalar function $V=\rho^2 \sin 2\emptyset$ in cylindrical coordinates and the directional derivative of the function in the direction of the vector $\vec{A}=\vec{a_\rho}+\vec{a_\phi}$ at the point (2, π/4,0).	7	KTU April 2018
5	Explain about the conservative field.	2	KTU April 2018
	Determine the divergence of vector field 1)$P = x^2 yz\vec{a_x} + xy\vec{a_z}$ 2)$Q = 1/r^2 \cos\theta \, \vec{a_r} + r\cos\theta \sin\theta \, \vec{a_\theta}$	8	KTU April 2018
6	Find the divergence of A where, $A = \rho z \sin\varphi \, a\rho + 3\rho z^2\cos\varphi\rho^a{}_\varphi$	5	KTU MAY 2019
7	a) State and Prove Stoke's Theorem b) What is Curl of a vector field? Explain its physical significance.	5+5	KTU MAY 2019
8	a) Explain the concept of electric potential and potential gradient. b) Explain spherical co-ordinate system.	5+5	KTU MAY 2019
9	Convert the point P (1.41,45°,3) given in cylindrical system to spherical coordinate system	5	KTU May 2022

10	Define curl and also find the curl of vector field $A = \varrho sin\Phi a\varrho + \varrho^2 za\Phi + zcos\Phi az$	5	KTU May 2022
11	State divergence theorem and explain the physical significance of divergence.	5	KTU May 2022
5	Using divergence theorem evaluate the surface integral $\iint F \cdot ds$ over S. Where $F = 2xyax + y^2ay + 4yzaz$ and S is the surface of the cube defined by x=0 & x=1, y=0 & y=1, z=0 &z=1	10	KTU May 2022

MODULE 2			
1	Derive the expression of electric field intensity due to sheet charge having surface charge density σ_s C/m2	5	KTU April 2018
2	Three concentrated charges of 0.25 µ C are located at the vertices of an equilateral triangle of 10 cm side. Find the magnitude and	10	
3	Explain about energy densities in electric and magnetic fields.	5	KTU April 2018
4	Obtain the expression of the electric field due to different charge bodies.	5	KTU April 2018
5	Derive the expression for electric field intensity of an electric dipole.	10	KTU May 2022
6	Write a note on poisson's equation and laplace's equation	5	KTU May 2022
7	A circular of radius 'a' meter is charged uniformly with a charge density ρs c/m2.Find the electric field at a point 'h' meter from the disc along its axis.	10	KTU May 2022
8	a) State and Prove Gauss's law. b) Apply Gauss's law to find the expression for Electric field Intensity and Electric flux density due an infinite line charge distribution.	5+5	KTU MAY 2019
9	Define equipotential surface?	5	KTU MAY 2019
10	State and explain coulomb's Law	5	KTU

			MAY 2019
11	Explain magnetic vector potential	5	KTU MAY 2019
12	Derive the boundary conditions to explain the behavior of magnetic field at the interface of two magnetic media.		KTU MAY 2019

MODULE 3			
1	State and explain Ampere's circuit law.	3	KTU April 2018
	A current filament carries a current of 10 A in the a_z direction on the z axis. Find in rectangular system at point P(1,2,3) due to this filament if it extends from a)z = -∞ to +∞ b) 5 to ∞.	7	KTU April 2018
2	Explain Biot-Savart Law.	5	KTU MAY 2019
3	a) Apply Biot-Savart law and determine an expression for magnetic field intensity at a point due to an infinitely long straight conductor carrying current I. b) Explain continuity equation for current.	7+3	KTU MAY 2019
4	A circular loop consists of 25 turns of very fine wire. The average radius of the loop is 20 cm and it carries a current of 1.6 A. Find the magnetic flux density at the center of the loop along axial direction.	10	KTU MAY 2019
5	Define magnetic vector potential	5	KTU MAY 2019
6	a) State Ampere's circuital law and explain any one application of Ampere's circuital law b) Derive the boundary conditions with respect to the electric field at the interface of a dielectric – dielectric boundary	5+5	KTU MAY 2019
7	Formulate the magnetic field intensity on the axis of a circular	10	KTU

	loop carrying current.		MAY 2019
8	Derive the expression for magnetic field intensity due an infinite wire carrying current.	10	KTU MAY 2019
9	Derive wave equations from Maxwell's equations	10	KTU May 2022
10	State Biot-Savart law	3	KTU May 2022
11	Derive the boundary conditions to explain the behavior of magnetic field at the interface of two magnetic media.	7	KTU May 2022
12	Derive the expression for magnetic field intensity at any point due to an infinitely long straight current carrying conductor.	10	KTU May 2022

MODULE 4			
1	Discuss about inconsistency of Ampere's law and Displacement current density	5	KTU May 2022
2	Find the magnetic flux crossing the portion of the conductor in the plane $\emptyset = \pi/4$ defined by for a current of 2 A.	5	KTU April 2018
3	Derive the expression of inductance of solenoid having N turns. Explain the electric boundary conditions of two dielectric media.	6+ 4	KTU April 2018
4	A) Formulate the Maxwell's equation in differential form and point form in phasor form	7+ 3	KTU April

	B) Explain the continuity equation			2018
5	Explain the self-inductance associated with magnetic fields & prove that maximum energy stored in magnetic field is proportional to the self-inductance.	5	KTU May 2022
6	a) Derive an expression for energy stored in an electrostatic field in terms of electric flux density. b) What is electric polarization? Explain.	7+3	KTU MAY 2019
7	Derive Maxwell's equations in differential and integral form from Faraday's Law	5	KTU MAY 2019
1	Derive and Explain Uniform plane wave equation	5	KTU April 2018
2	Define a) intrinsic impedance b) characteristic impedance	5	KTU April 2018
3	Write down the expression of transmission line parameters	5	KTU April 2018
4	What is skin depth?	3	KTU April 2018
	Show that the power flow along a concentric cable is the product of voltage and current using Poynting Theorem	7	KTU April 2018
5	Explain group velocity and phase velocity.	5	KTU April 2018
6	Derive the attenuation constant and phase shift constant for a perfect conductor	5	KTU April 2018
7	Explain about electromagnetic interference.	5	KTU April 2018
8	A circular loop located at $x^2 + y^2 = 16, z = 0$ carries a current of 10 A along $a\Phi$. Determine magnetic field intensity at (0,0,5)	5	KTU May 2022

		MODULE - 5		

1	Differentiate conduction current and displacement current densities	10	
12	Explain about the Poynting theorem.	5	KTU April 2018
3	A 9375 MHz uniform plane wave is propagating in polystyrene. If the amplitude of the electric field intensity is 20 V/m and the material is assumed to be loss less find α, β, λ, intrinsic impedance, propagation constant and amplitude of H.	5	KTU April 2018
4	Explain the power flow in a co-axial cable.	10	KTU April 2018
5	Derive wave equation from Maxwell's equation.	5	KTU April 2018
6	Formulate wave equation in phasor form.	10	KTU April 2019
7	Explain complex averaging pointing vector	5	KTU April 2019
8	What are uniform plane waves?	10	KTU April 2019
9	Derive the transmission line equations for a two wire transmission line supporting transverse electromagnetic waves.	10	KTU May 2022
10	What is electromagnetic compatibility?	5	KTU May 2022
11	A uniform plane wave in free space is given by E=10.4× 10−6e $j(2\pi \times 109$ $t-\beta x)ay$V/m. Find (i) Direction of propagation (ii) wave velocity (iii) Phase constant β	5	KTU May 2022

QUESTION BANK(S4EEE)

Subject : EET206 DIGITAL ELECTRONICS

Module 1

Sl. No	Questions	Marks	KU/KTU
			(Month/Year)
1	a)Create a table showing 4 – bit Gray Code and the corresponding Binary Code. Explain how the table is derived. b)What is gray code? Find the binary equivalent of the gray code (1110).	5	KTU JUN 2019,2021
2	a)Differentiate between the methods of binary subtraction using 1's complement and 2'scomplement. Show an example in each case with 4 bit numbers. b)Perform following arithmetic operation using 2's compliment method. (a) $-70-85$ (b) $130-65$ c)Determine the range of numbers in 1's complement and 2's compliment for word length of 8 bit and 16 bit. d)Add 10111 and 11000 using 1's and 2's complement method.	6	KTU JUN 2021, KTU JUN 2019,2021
3	Perform each of the following conversions:(a) $(473)10$ to BSD code. (b) BAD in to ASCII code. (c) $(289)10$ to Hexadecimal. (d) $(1100011.11)2$ to decimal. (d) $(53)8$ to Hexadecimal. (e) Convert $(2486)10$ to HEX and Octal numbers.	10	KTU DEC 2017
4	Describe the operation of basic parity generating and checking logical unit	10	KTU JUN 2016
5	Convert 145 to BCD, Gray code and Excess 3 code.	4	KTU DEC 2017,2022
6	Write short note on excess 3 code.	4	KTU DEC 2018
7	Write short note on ASCII Code.	5	KTU DEC 2016
8	Distinguish between CMOS and TTL families. Draw the circuit diagram of a typical TTL gate and explain With the help of relevant circuit schematics, briefly describe the operation of CMOS NAND and NOR gates.	10	KTU DEC 2019,2022

Module 2			
Sl. No	Question	Marks	KU/KTU
			(Month/Year)
1	State and prove De Morgan's theorem.	5	KTU DEC 2016,2020
2	A) Prove that AB + AC + BC = AB + AC B) .Reduce the expression (B + BC)(B + BC)(B + D). C) Reduce the expression f = AB + A + AB. D) Simplify the following Boolean expression AB + AC + A B C.	4	KTU DEC 2021
3	A) Using K – Map derive the reduced Boolean expression for the following function. f(A, B, C, D) = Pm(0, 1, 2, 3, 4, 6, 9, 11) + d(2, 5) B) Express the following function as a sum of minterms. F(A, B, C, D) = BD + AD + BD C) F(A, B, C, D) = πM(1, 3, 5, 7, 13, 15) + d(6, 8) D) f(A, B, C, D) = π(6, 7, 8, 9).d(10, 11, 12, 13, 14, 15) E) Using K Map, Simplify, F(A, B, C, D) = Σm(1, 4, 9, 10, 11, 12, 14) + d(0, 8, 13) and realize the function using NAND gates only.	10	KTU DEC 2020,2022
4	Differentiate between combinational and sequential circuits.	5	KTU DEC 2016,2021
5	Draw the truth table for a half adder and express its sum and carry output in terms of inputs.	4	KTU JUNE 2020,2022
6	Draw the truth table for a full subtractor. Reduce it using K – Map. Implement it using logic gates.	10	KTU DEC 2017,2019
7	Describe the working of a Carry Look Ahead Adder using the example of 4 – bit numbers. Clearly show the derivations of the equations. Show the implementation in Hardware.	10	KTU DEC 2017,2020

MODULE 3

Sl. No	Questions	Marks	KU/KTU (Month/Year)
1	Draw the block diagram of 4 bit ALU, and explain it, showing its inputs and outputs. Explain the architecture of ALU with the help of a block diagram	10	KTU 2017 JUNE,2021,2022
2	A) What are Multiplexers? Implement (4 × 1) Mux using (2 × 1) Multiplexers. B) Implement the Boolean function F(A, B, C, D) = AB + BD + BCD using a 8 : 1 MUX considering A as input and B,C,D as select lines. C) Use a Multiplexer having 3 select input to implement the logic function f =Σm(0, 1, 4, 10, 11, 14, 15). D) Compare Multiplexers and Demultiplexers E) Use a 4 x 1 MUX to implement the logic function F(A,B,C) = ∑m(1,2,4,7).	10	KTU DEC 2017,2021
3	Explain encoder and decoder.	4	KTU JUNE 2019,2022
4	Design 1 : 8 De-multiplexer using two 1 : 4 De-multiplexers.	10	KTU DEC 2017,2018
5	Design a BCD to Decimal decoder.	10	KTU DEC 2017,2022
6	Explain the even parity method for error detection.		KTU DEC 2019
7	What is the purpose of decoder? Explain the functioning of a BCD to Decimal Decoder circuit.		KTU DEC 2020
8	Realize a 2-bit comparator		KTU DEC 2021,2022

		Module 4		
Sl. No	Questions		Marks	KU/KTU
				(Month/Year)
1	Draw the logic diagram and truth table of clocked SR Flip flop.		5	KTU DEC 2016,2021
2	A) Realize a J K Master Slave flip flop using NAND gates. Explain its working. B) Realize JK Flip flop using SR flip flop.		10	KTU DEC 2020
3	How will you convert a RS flip flop to JK Flip flop?		4	KTU 2018 JUNE
4	What is the difference between level triggering and edge triggering.		4	KTU 2019 JUNE
5	What is race around problem ?		5	KTU DEC 2016,2020
6	Explain with diagram and waveform JK flip flop to D flip flop.		10	KTU DEC 2017
7	Draw a 4 – bit Serial-In-Parallel-Out shift register and explain its working.		8	KTU JUN 2019
8	A) With circuit diagram explain 4 bit PIPO shift register. B) With diagram and waveform describe 4 bit SIPO Shift register		8	KTU DEC 2020
9	A) Differentiate between Asynchronous counters and Synchronous counters with the help of diagrams. What are the advantages and disadvantages ? B) Draw a 4 – bit Asynchronous up counter and discuss its characteristics. Draw the waveforms. C) What are Asynchronous inputs of a Flip flop and discus its functions.		10	KTU DEC 2018
10	A) Explain the operational basics of binary ripple counters. Implement 3 bit binary ripple counter using JK Flip flop. B) With diagram and waveform explain 4 bit ripple counter.		10	KTU DEC 2017,2019
11	A) Design a Mod 6 Synchronous counter. Enumerate all the steps in the design. B) Design a Mod 5 synchronous up counter using JK flip flop.		10	KTU DEC 2018
12	A) Design a counter to obtain a count sequence of 2,4,3,6,2,4,3,6,... using JK Flip flop B) Design a modulo-9 synchronous counter using T flipflops C) Design a D counter that goes through states 0,1,3,4,0...The unused states must always go to zero(000) on the next clock pulse.			KTU DEC 2018,2020

		Marks	
13	A) Design a 4 bit Ring counter. Draw the Truth Table and the waveform. B) Draw the circuit diagram of 4 bit ring counter. Explain its working with timing diagram.	10	KTU DEC 2019,2022
14	A) Distinguish Johnson counter from Ring Counter. B) Explain 4 bit Johnson counter with waveforms.	5	KTU DEC 2017,2019

MODULE 5

Sl. No	Questions	Marks	
			(Month/Year)
1	A) Analyse the working of a R-2R ladder Digital to Analog converter with the help of a diagram. B) Analyse the working of a Weighted Digital to Analog converter with the help of a diagram. C)	10	KtU DEC 2019,2021
2	A) Describe the structure of a Programmable Logic Array. Take a simple example and explain. B) Compare PAL and PLA. C) Give the advantages of Programmable logic devices over fixed logic devices. Also explain PAL Architecture.	10	KTU DEC 2017,2020,2022
3	A) Compare Static RAM and Dynamic RAM. B) Draw circuit of static bipolar RAM cell and explain its operation C) Explain the working of dynamic RAM cell and give advantages and disadvantages. D) Differentiate between ROM and RAM. E) Draw the basic structure of RAM. F) What are the basic classifications of RAM.	5	KTU DEC 2019
4	Explain EPROM		KTU DEC 2018
5	Compare and contrast between ROM, PROM and EPROM.	10	KTU 2017 JUNE,2019
6	A) Design a Full Adder using VHDL. B) Write VHDL code for implementing Full adder circuit	10	KTU 2022 JUNE

HUT200 PROFESSIONAL ETHICS

	MODULE 1		
Sl.No	**Question**	**Marks**	**KU/KTU Month/Year**
1	Distinguish between Morality and Ethics.	3	KTU JUNE 2022
2	List the factors that enhance the self confidence in a person. List two methods of developing self confidence.	3 3	KTU JUNE 2022, JULY 2021
3	a) Explain the qualities of service learning. b) Describe the qualities required to live a peaceful life.	7 7	KTU JUNE 2022
4	a) Explain the steps for developing a strong work ethic. b) Classify courage based on the type of risk. c) Explain the role of caring and sharing in a workplace. d) How integrity plays a major role in work ethics. Discuss with suitable examples. e) Explain the core elements of a strong work ethic.	8 6 5 9 14	KTU JUNE 2022, DEC 2021, JULY 2021
5	Define empathy. What is the difference between empathy and sympathy?	3	KTU DEC 2021
6	What is a civic virtue and how is it related to respect for others?		KTU DEC 2021
7	a) Explain the need for cooperation and commitment. b) Write a note on "Social Expectations".	8 6	KTU DEC 2021
8	What are the two approaches to Engineering ethics?	3	KTU JULY 2021
9	Explain about academic integrity and write the five pillars of academic integrity.	14	KTU JULY 2021
	MODULE 2		
Sl.No	**Question**	**Marks**	**KU/KTU Month/Year**
1	Differentiate consensus and controversy in Engineering ethics.	3	KTU JUNE 2022
2	List out the models of professional roles.	3	KTU JUNE 2022

3	What are the essential conditions for a valid informed consent?	3	KTU JUNE 2022
4	a) Explain the causes of Moral Dilemmas. b) Describe the different types of inquiries in solving ethical problems	8 6	KTU JUNE 2022
5	a) Explain the types of Ethical theories. b) Compare Gilligan's theory with Kohlberg's theory on moral development.	8 6 14	KTU JUNE 2022, DEC 2021
6	Compare and contrast tradition and custom. Give an example.	3	KTU DEC 2021
7	Explain Normative Senses.	3	KTU DEC 2021
8	a) What is professionalism? b) Discuss the motives of professionalism and the models for professional engineers.	4 10	KTU DEC 2021
10	a) Explain the three main levels of moral developments, deviced by Carol Gilligan. b) Discuss three types of inquiries.	7 7	KTU JULY 2021
11	List and explain the varieties of moral issues.	14	KTU JULY 2021

MODULE 3

Sl.No	Question	Marks	KU/KTU Month/Year
1	List out the limitations of Codes of Ethics.	3	KTU JUNE 2022
2	a) Describe the causes and fatal effects of Bhopal Gas Tragedy b) Illustrate the role of engineers as experimenters.	7 7	KTU JUNE 2022
3	a) Evaluate the importance of accountability in a professional's life. b) Explain the role of Codes of Ethics in the service life of a professional Engineer.	6 8	KTU JUNE 2022
4	Why are codes of ethics important? What are the advantages of codes of ethics? What are the different roles and functions of "Code of ethics"?	3 14	KTU DEC 2021, JULY 2021
5	Explain the term "Balanced outlook on law"	3	KTU DEC 2021

6	Explain the Bhopal gas tragedy. Discuss the violation of moral, ethics and professional codes of standards in it.	14	KTU DEC 2021
7	Give three conditions essential for valid informed consent.	3	KTU JULY 2021
8	Explain about Bhopal Gas Tragedy and write its cause and fatal effect.	14	KTU JULY 2021
9	Explain the Babylon's Building Code and The United States Steamboat Code	14	KTU JULY 2021

MODULE 4

Sl.No	Question	Marks	KU/KTU Month/Year
1	Define collegiality and loyalty.	3 7	KTU JUNE 2022, DEC 2021
2	Differentiate between Patents and Trademarks.	3	KTU JUNE 2022
3	a) Explain the different steps in managing conflicts in an organization. b) Describe the major steps involved in the process of collective bargaining. c) How can conflicts be managed in a workplace?	7, 14 7 6	KTU JUNE 2022, JULY 2021, DEC 2021
4	a) Exemplify conflicts of interest and conflicts in interest. b) Illustrate various rights of an engineer as a professional.	6 8	KTU JUNE 2022
5	Differentiate between copyright and trademark.	3	KTU JULY 2021
6	What is meant by 'Occupational Crime'?	3	KTU JULY 2021

MODULE 5

Sl.No	Question	Marks	KU/KTU Month/Year
1	Describe the various requirements for engineers who act as advisors.	3	KTU JUNE 2022
2	List out the importance of Business Ethics. List any three characteristics of Business Ethics.	3	KTU JUNE 2022, JULY 2021
3	a) Describe the two world views on Environmental Ethics.	8	KTU JUNE

	b) Explain the different types of issues in Computer Ethics.	6	2022
4	Explain the features, advantages and limitations of MNCs.	14	KTU JUNE 2022
5	Discuss in detail about the moral and ethical issues involved in the use of computers and the internet with examples.	14	KTU DEC 2021
6	Discuss the following in detail: a) Engineers as consultants b) Engineers as expert witnesses	14	KTU DEC 2021
7	List any ethical responsibilities of a consulting engineer.	3	KTU JULY 2021
8	Explain the role of computers in technological development.	14	KTU JULY 2021

MCN 202 CONSTITUTION OF INDIA

	Module 1		
Sl No	**Questions**	**Marks**	**KTU,Year**
1	Explain the salient features of Indian Constitution	3 6 8 3	July 21 July 2021 (AN) July 21 June 22
2	What do you mean by federal system of government? Give an example	3	July 2021 (FN)
3	What is preamble? Explain the importance of preamble in the implementation of Constitution	6 3 3	July 2021 July 2021 (AN) June 22
4	Explain different ways for acquiring Indian citizenship.	8	July 2021 (FN)
5	Write notes on methods of termination of Indian citizenship.	6	July 2021 (FN)
6	Define the Constitution. Why is it necessary for a Country	3	July 2021 (AN)
7	Define Constitution of India with comparison with other countries.	7	June 22
8	Discuss the term Union and its Territory.	7	June 22
9	Explain the term citizenship and its types.	7	June 22
10	What is Preamble? Can it be used for the interpretation of the constitution? Also explain its significance	8	July 2021 (AN)
11	Give detail account on the historical background of Indian Constitution	6	July 2021 (AN)
12	What is citizenship? Discuss the various methods of acquiring Indian citizenship	8	July 2021 (AN)
13	How Indian Citizenship can be acquired.	7	June 22

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	Explain the concept of appeal by special leave	6	July 2021 (FN)
4	Discuss the classification of Directive Principles of State Policy in detail	8	July 2021 (FN)
5	What do you mean by right against exploitation? Explain	7	July 2021 (FN)
6	Distinguish between fundamental rights and directive principles of state policy	7	July 2021 (FN)
7	How is State defined under Article 12 of Indian Constitution	3	July 2021 (AN)
8	What is the basic difference between Fundamental Rights and Directive Principles of State Policy?	3	July 2021 (AN)
9	Describe the Rights to Constitutional Remedies and explain its significance	6	July 2021 (AN)
10	Explain the needs and importance of fundamental duties of Indian Citizen	8	July 2021 (AN)
11	What are the fundamental duties of an Indian citizen?	7	June 22
12	Explain the term fundamental rights and its classification.	8 7	July 2021 (AN) June 22
13	State the Directive Principles of State Policy and explain its significance	6 7	July 2021 (AN) June 22
14	Differentiate Rights and Duties with example.	3	June 22
15	What protection are available to the Indian citizen against conviction?	3	June 22
16	Explain right against exploitation and right to constitutional remedies.	7	June 22

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	Give the duties of Attorney General.	3	June 22
4	Explain the powers of President of India.	8	July 2021 (FN)
5	Explain the constitutional position and essential qualifications of Vice-president of India.	6	July 2021 (FN)
6	Explain the qualification and disqualification for membership in the house of the people.	8	July 2021 (FN)
7	Explain various kinds of jurisdiction of Supreme Court	6	July 2021 (FN)
8	Explain the procedure for impeachment of the President of India.	3	July 2021 (AN)
9	Mention the Powers and Functions of the Attorney General for India	3	July 2021 (AN)
10	Explain various kinds of jurisdiction of Supreme Court of India	7	July 2021 (AN)
11	Explain the constitutional duties and powers of the Prime Minister	7	July 2021 (AN)
12	Explain the functions and powers of the President of India.	8	July 2021 (AN)
13	Explain in detail about the Union Government structure and functions	6	July 2021 (AN)
14	Write five specialties of Supreme court.	3	June 22
15	Explain how Union Executive is elected and formed.	7	June 22

16	What are the different functions of Parliament?	7	June 22
17	Differentiate Rajya Sabha and Lok Sabha with five points.	7	June 22
18	How can a citizen can be qualified and disqualified as an MP?	7	June 22

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	Explain the powers and functions of the Governor of Kerala state.	6	July 2021 (FN)
4	Explain the composition and duration of state legislative council	8	July 2021 (FN)
5	Explain the qualification and disqualification for membership of the state legislature	7	July 2021 (FN)
6	Explain the constitution of the High court. What are the essential qualifications required for the appointment of High court Judge?	7	July 2021 (FN)
7	What are the constitutional provisions relating to freedom of trade, commerce and intercourse	3	July 2021 (AN)
8	List out the three types of emergencies under Indian constitution	3	July 2021 (AN)
9	Describe the duties and role of Comptroller and Auditor General of Indian (CAG)	8	July 2021 (AN)
10	Examine the administrative and financial relation between the Union and the State	6	July 2021 (AN)
11	Enumerate the powers and functions of Public Service Commission	8	July 2021 (AN)
12	Explain the characteristics of Administrative Tribunals. What are the reasons for the growth of Administrative Tribunals in India	6	July 2021 (AN)
13	Explain Writ Jurisdiction.	3	June 22

14	Explain the role of Governor.	3	June 22
15	Differentiate state Government and Union Territory.	7	June 22
16	Explain State Legislative Assembly in detail.	7	June 22
17	Discuss about Jurisdiction of High court.	7	June 22
18	Explain State Legislative Council in detail	7	June 22

	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	Explain parliamentary legislation in the state field	6	July 2021 (FN)
4	Discuss the effects of national and financial emergencies	8	July 2021 (FN)
5	Explain the procedure for amendment of the constitution	6 3	July 2021 June 22
6	What is the need for administrative tribunals? Explain the functions of state administrative tribunals	8	July 2021 (FN)
7	Why administrative tribunals are established ?	3	June 22
8	Why do we need to form separate Union Territories	3	July 2021 (AN)
9	Distinguish between an ' Ordinary Bill' and 'Money Bill'	3	July 2021 (AN)
10	Explain the various writs issued by High court of Kerala	6	July 2021 (AN)
11	Discuss the constitutional position and powers of Governor	8	July 2021 (AN)
12	Explain the functions of the State Legislature	8	July 2021 (AN)
13	Explain the responsibilities and functions of Council of Ministers to State Legislative Assembly	6	July 2021 (AN)
14	How is Central and State Government related on economic basis?	7	June 22
15	Explain how the constitution handles an emergency situation in the country.	7	June 22

16	Which are the functions of Comptroller and Auditor General of India	7	June 22
17	Explain the role of Public Service commission.	7	June 22

Subject: EE202 DC MACHINES AND

TRANSFORMERS S4 EEE

MODULE 1			
Sl.No	Question	Marks	Year
1	Explain the phenomenon of electromechanical energy conversion in the case of a DC generator. What are the torques involved?	5	KTU DEC 2020
2	a) Explain construction of DC machine with the help of neat diagram b) Name the parts of dc machine and state the functions of any two parts.	10	KTU DEC 2020
3	Equalizer ring is not needed for wave winding of a dc machine. Give reason.	5	KTU DEC 2020
4	An 8 pole lap wound armature having 40 slots with 12 conductors/ slot generates 500V. Determine speed at which machine is running if the flux per pole is 50 mWb.	5	KTU DEC 2020
5	Dummy coils are not used in lap winding. Justify with suitable example	5	KTU DEC 2020
6	What is armature reaction? What are the effects of armature reaction on the performance of dc machine?	5	KTU DEC 2019
7	What is equalizer rings? Why it is generally used in lap windings instead of wave windings?	5	KTU MAY 2019
8	Name the different losses occur in dc machine. How the magnetic losses are minimized in dc machine?	5	KTU MAY 2019
9	a) What is the function of equalizer ring in a lap wound dc machine? b) Explain why equaliser rings are not required in a wave wound DC machine	5	KTU MAY 2019
10	What are the effects of armature reaction on the operation of dc machine? What are the remedial measures taken to counter effects of armature reaction?	10	KTU MAY 2019

11	Draw the developed view of mmf and flux distribution of a loaded 2 pole machine.	10	KTU DEC 2018
12	Explain clearly, the necessity for introducing dummy coils in a 4-	3	KTU

	pole, double layer, wave wound armature of a DC machine, having 24 slots, with 2 coil sides per slot.		JULY 2021
13	What is the purpose of providing compensating winding in DC machines? In which part of the machine is the compensating winding embedded?	3	KTU JULY 2021
14	List the different losses in DC machines.	5	KTU JULY 2012
15	Draw the developed winding diagram for a 4-pole DC machine armature having 32 coil sides. Number of parallel paths required is 4. Prepare the winding table and mark the position of brushes	3	KTU JULY 2021

MODULE 2

Sl.No	Question	Marks	Year
1	Derive the expression for generated emf in DC generator.	5	KTU DEC 2020
2	Explain significance of back emf?	5	KTU DEC 2020
3	Explain different methods of speed control of dc shunt motor.	5	KTU DEC 2020
4	Derive the condition for gross mechanical power developed by motor is maximum?	10	KTU DEC 2020
5	The open circuit characteristics of a dc shunt generator running at 850 rpm is given below. If (A) 0 0.8 1.6 2.4 3.2 4 Emf (V) 0 28 57 76 90 100 Calculate i. emf to which the machine will excite, when the shunt field resistance is 22Ω ii. emf when an additional resistance of 8Ω is included in the shunt field circuit iii. shunt field resistance for a normal voltage of 100V iv. Critical speed with shunt field resistance for a voltage of	8	KTU DEC 2020

		100V		
6	Explain the characteristics curves of a dc series motor with the help of relevant equations?	5	KTU DEC 2020
7	Write any three differences between wave winding and lap winding.	5	KTU DEC 2019
8	What is the necessity of a starter for motor? With a suitable diagram, explain the working of 3 point starter.	5	KTU DEC 2019
9	With the help of speed-armature current characteristics, explain why the series motors should not be started without any load.	5	KTU MAY 2019

10	Why a starter is required to start a DC motor? What is the essential element of a starter?	5	KTU MAY 2019
11	Draw the developed view of a double layer lap winding of a 4 pole 12 slot armature. Commutator and brushes need not be drawn.?	5	KTU DEC 2018
12	Define commutation. Explain the process of commutation with neat sketches.	10	KTU MAY 2019
13	Explain with neat sketch how speed control of a dc motor is done.	5	KTU DEC 2019
14	Explain armature reaction in a DC generator. What are its effects? Derive expressions for cross magnetising and demagnetising ampere turns/ pole.	14	KTU JULY 2021
15	The OCC of a shunt excited DC machine that runs at l200rpm is as follows: (14) The field winding resistance is 55Q. Determine: i) The value of field regulating resistance to enable the machine to generate a maximum voltage of 120V on open circuit, when run at l200rpm. iD The value of the open circuit voltage, when the regulator is set to 20Q, and the speed is reduced to 800rpm.	14	KTU JULY 2021
16	A current transformer with a bar primary has 400 turns in the secondary. The resistance and reactance of secondary circuit are 1.4ohms and 1.0ohms respectively including the transformer winding with 6A flowing in secondary winding. The magnetizing mmf is 110A and Iron loss is 1.3W. Find the ratio and phase angle errors (Assume nominal ratio to be equal to turns ratio).	5	KTU DEC 2019

Sl.No	Question	Marks	Year
17	Which are the different methods of electric braking in DC motor any one of them	3	KTU JULY 2021

MODULE 3

Sl.No	Question	Marks	Year
1	Derive the emf equation of dc generator.	5	KTU DEC 2020
2	A 4 pole wave connected armature of a dc generator has 120 conductors and runs at 1200 rpm. If the flux per pole is 0.015 Wb, find the emf generated. Keeping the flux constant, suggest a change in the armature of the generator so that the generator is capable to generate half of the no load voltage when running at the same speed.	5	KTU DEC 2020
3	What is self excitation? What are the conditions for building up of voltage in dc shunt generator?	5	KTU DEC 2020

Sl.No	Question	Marks	Year
4	With suitable diagram, how the Swinburne's test can be employed to predetermine the efficiency at full load condition when running as a generator	7	KTU MAY 2019
5	During Swinburne's test a 250V DC machine was drawing 3A from the 250V supply. The resistances are 250 Ω and 0.2 Ω. Find the constant loss of the machine. Also find the efficiency of the machine when it is delivering a 20A at 250V.	10	KTU DEC 2019
6	With neat diagram explain the construction of dc generator.	10	KTU DEC 2019
7	Sketch the OCC of a DC shunt generator and explain the possible causes for the failure of the machine to build up voltage.	3	KTU JULY 2021
8	The armature winding of a 4-pole,250Y DC shunt motor is lap connected. There are 120 slots and each slot contains 8 conductors. The flux per pole is 0.02Wb and the current taken by the motor is 25A. Calculate the torque developed by the armature. The armature and field resistances are 0.1 and 125Q respectively. If the rotational losses amount to 810W, find the useful torque.	8	KTU JULY 2021
9	Compare the performance characteristics of different DC motors and enumerate the field of application of each of them'	6	KTU JULY 2021

10	A 500V, DC shunt motor has a no-load speed of l200rpm, the line current being 54. When fully loaded, the line current is 30A. If the shunt field resistance is 250Q. and the armature resistance is 1.1f1, calculate the full-load Speed	6	KTU JULY 2021
11	Describe with the aid of a circuit diagram, the Swinburne's test for estimating the efliciency of a DC shunt machine. What are the advantages and disadvantases of this method?	6	KTU JULY 2021

MODULE 4

Sl.No	Question	Marks	Year
1	Explain different methods of cooling of a transformer.	10	KTU DEC 2020
2	A) Derive the condition for maximum efficiency of a single-phase transformer. B) Derive the condition for maximum efficiency of transformer. How the efficiency of a transformer depends on load?	5	KTU DEC 2020
3	A) What is the difference between commercial efficiency and all day efficiency? B) Define all day efficiency. How this efficiency of a transformer	5	KTU DEC 2020

	varies with load? C) Define all day efficiency of transformer. Why this efficiency is less than commercial efficiency?		
4	A) Distinguish between core and shell type transformer? B) Differentiate between core type and shell type transformers. C) Distinguish between core and shell type transformer?	5	KTU DEC 2020

5	A. Draw the phasor diagram of an ideal transformer on no load. Also, draw a phasor diagram of a practical transformer supplying lagging power factor load. B. Draw the phasor diagram of a transformer on no load. Show the two components of the no load current and write their names. C. Draw the phasor diagram of a single phase transformer supplying to inductive load. D. Draw the phasor diagram of a practical transformer under no load condition. Name the no-load components and write its equation.	8	KTU DEC 2020
6	What are the different cooling methods used in transformer?	10	KTU DEC 2019
7	What are the essential and desirable conditions to be satisfied for parallel operation of single phase transformers?	5	KTU DEC 2019
8	What is vector grouping? Name the vector groups commonly used in three phase transformers?	10	KTU DEC 2019
9	A. Why transformer rating is in kVA and not in KW? Why the rating of transformer in kVA? B. Why transformers are rated in kVA not in KW?	5	KTU DEC 2019
10	The OC and SC test results of a 5kVA, 200/400V, 50Hz single phase transformer is as follow. OC Test SC Test V1 (V) I1 (A) W1 (W) V2 (V) I2 (A) W2 (W) 220 0.7 60 22 10 120 Draw the equivalent circuit of transformer as referred to low voltage side.	10	KTU DEC 2019
11	Draw the circuit diagram of Sumpner's test and derive the equation for efficiency of each transformer?	5	KTU DEC 2019
12	A. List out the necessary and desirable conditions for parallel operation of two single phase transformers. B. What are the necessary and desirable conditions for successful	5	KTU MAY 2019

	parallel operation of two single phase transformers?		
13	Explain the working of a transformer on no-load and load condition.	6	KTU MAY 2019

14	Why the star delta three phase transformer is used to step down the voltage in transmission system	5	KTU MAY 2019
15	What is meant by negative voltage regulation? For what type of load you may get negative voltage regulation?	5	KTU MAY 2019
16	Find the rated line currents on high voltage and low voltage sides of a 500kVA 11kV/400V delta-star transformer.	5	KTU DEC 2018
17	Explain how the efficiency of a transformer at different loads may be estimated from OC and SC test readings.	3	KTU JULY 2021
18	Develop the equivalent circuit of a transformer.	10	KTU DEC 2019
19	Calculate the efficiency, voltage at secondary terminals and primary input current when supplying full- load secondary current at power factors i) unity and ii) 0.8pf lag for a 4KVA, 200/400V, single- phase transformer. The following are the test results: Open circuit with 200V applied to lv side(primary), 0.8A, 70W. Short circuit with 20Vapplied to hv side(secondary), 10A, 60W	12	KTU JULY 2021

MODULE 5

Sl.No	Question	Marks	Year
1	A. What are the necessary conditions to be satisfied for parallel operation of a three phase transformer? B. What are the necessary conditions for parallel operation of three phase transformer?	5	KTU DEC 2020
2	What are the advantages and disadvantages of delta-delta connection?	5	KTU DEC 2020
3	Derive an expression for the saving of copper in an autotransformer as compared to an equivalent two winding transformer.	7	KTU DEC 2020
4	Explain the working of off-load tap changing transformer with help of neat diagram.	7	KTU DEC 2020
5	Draw the connection diagram for T-T connection of transformers and explain the formation of three-phase four wire system with two single phase transformers. Point out its advantages and disadvantages.	10	KTU DEC 2020

6	The primary and secondary voltages of an autotransformer are 1200V and 600V respectively. Calculate the economy of Cu when the secondary current is 120A. Draw the circuit and show the current distribution in the winding.	5	KTU DEC 2019
7	A. With the aid of three phase transformer connections and phasor diagram, explain the vector group Dy11. B. What is meant by vector group? What is Yd1 vector group?	5	KTU DEC 2019
8	A. What is the purpose of tertiary winding in three winding transformer? B. What is the purpose of tertiary winding on transformer?	5	KTU MAY 2019
9	Can a Yd transformer be operated in parallel with a Dy transformer? What additional condition is to be satisfied over and above the conditions listed in question	3	KTU APR 2018
10	In Scott connection prove that the 3-phase currents will be balanced if the 2- phase currents are balanced. Assume upf load.	10	KTU DEC 2018
11	What is an auto transformer? Derive an expression for the saving of copper in an autotransformer as compared to an equivalent two winding transformer?	5	KTU APR 2018
12	Explain the working of Off-Load tap changing transformer with help of neat diagram.	5	KTU DEC 2017
13	In detail explain scott connection in three phase transformer.	5	KTU DEC 2017
14	What are the advantages and disadvantages of delta-delta connection?	5	KTU DEC 2017
15	How many vector groups are there in transformers and which are they?	3	KTU JULY 2021
16	Explain the essential and desirable conditions for parallel operation of three phase transformers. 200V. Find-the current in different sections of the winding when the load is 20kW at upf. Neglect losses and magnetising current	6	KTU JULY 2021
17	An autotransformer is used to step down the voltage level from 230V to	5	KTU JULY 2021
18	Explain Ydl1 and Dyl grouping of transforrners with neat circuit and phasor	5	KTU SEP 2020
19	Explain the purposes of a third winding in three winding transformer	10	KTU SEP 2020