Question Bank

SUBJECT: MAT202 - PROBABILITY, STATISTICS AND NUMERICAL METHODS - 2023

CLASS : S4 ME & CE

Sl. No	Questions	Marks	KU/KTU (Month/ Year)	Instructional Objectives
	MODULE 1			
1	A random variable X takes values 0,1, 2 and 3 with probabilities $P(X = 0) = \frac{8}{15}, P(X = 1) = \frac{1}{3}, P(X = 2) = P(X = 3) = \frac{1}{15}$ i.Find the mean and variance of X. If $Y = 1000 + 300X$ i. 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 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 $p(X = x) = k^2x\ ,\ x = 0,1,2,3,4$	7	KTU-MAY 2017	Evaluate

	Find (i) the value of k (ii) the probability that X is even and (iii) E(X).			
8	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 $Y = y$	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 6cm and 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 is a positive constant. Find (i) the value of k (ii) $P(X \leq 2)$ (iii) $E[X]$ and (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 at least 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	Understand
16	The joint probability distribution of two discrete random variables X and Y is given by $p(x,y) = 130$ (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	Understand
18	In a city, 4% of all licensed drivers will be involved in at least one road accident in any given year. Use Poisson distribution to determine the probability that among150 licensed drivers randomly chosen in this city(i)only 5 will be involved in at least one road accident in any given year.	8	KTU-AUG2021	Apply

19	The joint distribution of two random variables X and Y is given by $f(x, y) = (x+y)/21$, x = 1, 2, 3 and y = 1, 2. Find the marginal distributions of X and Y. Also find E(X) and $E(Y)$.	8	KTU-AUG2021	Apply
20	The probability distribution function of a random variable X is given below. X: 0 | 1 | 2 | 3 f(x): 0.1 | 0.3 | 0.4 | 0.2 Find $E(Y)$ where Y = $X^2 + X$.	3	KTU- JUNE 2022	Analyse
21	8 coins are tossed 256 times. In how many tosses do you expect no heads?	3	KTU- JUNE 2022	understand
22	Find a, b if $Y = aX + b$ has mean 4 and variance 16, where X is a random variable with mean 8 and variance 4.	7	KTU- JUNE 2022	Apply
23	It is known that 2% of the bolts produced by a company are defective. The bolts are supplied in boxes of 200 bolts. What is the probability that a randomly chosen box contains not more than 5 defective bolts? In a consignment of 1000 such boxes how many can be expected to have more than 5 defective bolts? (Use Poisson distribution)	7	KTU- JUNE 2022	Apply
24	A random variable X has the following probability distribution: X: -2 | -1 | 0 | 1 | 2 | 3 f(x): 0.1 | $15k^2$ | 0.2 | 2k | 0.3 | 3k (i) Find the value of k, (ii) the mean and variance of X.	7	KTU- JUNE 2022	Apply
25	The joint pdf of X, Y is given by $f(x, y) = k(x + 2y),\ x = 1,2,3;\ y = 1,2,3$. Find (i) k (ii) marginal pdf of X, Y (iii) $P(X < 3, Y \geq 2)$.	7	KTU- JUNE 2022	Apply
	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	Apply
2	The time required to repair a machine is exponentially distributed with a parameter0.5. What is the probability that a repair time exceeds 2 hours? What is the conditional probability that a repair time takes at least 10 hours given that the duration exceeds 9 hours?	7	KTU-AUG2021	Apply

3	In an intelligence test administered to 1000 children the average mark was 60 and SD was 20. Assuming the marks the SD was 20 Assuming the marks obtained follow Normal distribution. Find the number of children who have scored (i)Above 90 marks (ii)below 40 marks (iii)between 50 and 80 marks?	7	KTU-AUG2021	Analyse
4	A random sample of size 100 is taken from a population whose mean is 60 and variance is 400. Using Central Limit Theorem, find with what probability can we assert that the mean of the sample will not differ from μ = 60 by more than 4?	7	KTU-AUG2021	Apply
5	Find the mean and variance of a random variable X which is uniformly distributed in the interval $[a,b]$	5	KTU-March 2017,2021	Understand
6	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) = $\begin{cases} kx^2, x \geq 400 \\ 0, \ otherwise \end{cases}$ (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	KTU-JULY 2017	Evaluate
7	Find the mean and variance of uniform distribution	5	KTU-May 2017	Remember
8	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, JUNE 2022	Understand
9	Find the mean and variance of exponential distribution	5	KTU –May 2017, June 2022	Remember
10	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
11	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
12	The probability density function of a random variable is given by f(x) = $\begin{cases} kx^2, 0 < x < 1 \\ 0, otherwise \end{cases}$ Find a) k b) Mean c) p (14<X<34) d) p(X >23)	7	KTU-July 2017	Evaluate

13	Find the mean and variance of the continuous random variable X with probability density function $f(x)=\begin{cases}2x-4, & 2\le x\le 3\\ 0, & otherwise\end{cases}$	3	Model qp	Evaluate
14	The random variable X is exponentially distributed with mean 3. Find $P(X > t + 3 \mid X > t)$ where t is any positive real number.	3	Model qp	Evaluate
15	The joint density function of random variables X and Y is given by $f(x,y)\ \begin{cases}e^{-(x+y)}, x>0, y>0\\ 0, \quad otherwise\end{cases}$ Find $P(X+Y\le 1)$. Are X and Y independent? Justify	7	Model qp	Evaluate
16	A continuous random variable X is uniformly distributed with mean 1 and variance 4/3. Find $P(X<0)$	7	Model qp	Evaluate
17	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
18	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, KTU- June 2022	Evaluate
19	A pair of random variables X and Y have a joint probability density function given by $f(x,y)=\begin{cases}\frac{1}{\pi}, & x^2+y^2\le 1\\ 0, & otherwise\end{cases}$ Show that X and Y are not independent , but uncorrelated .	8	KTU-March 2018	Understand
20	The joint pdf of two continuous random variables X and Y is $F(x,y)=\begin{cases}8xy, 0<y<x<1\\ 0, \quad otherwise\end{cases}$ 1)Check whether X and Y are independent 2) Find p(X +Y) <1)	8	KTU-APRIL 2018	Analyze
21	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. (ii) 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
22	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

23	The joint probability density function of a two-dimensional random variable (X, Y)is given by $f(x, y)$=x$y^2 + \frac{x^2}{8}$,$0 \le x \le 2,\ 0 \le y \le 1$ Compute (i) P(X > 1) (ii) P(Y<12) (iii) P(X < Y)	7	KTU-AUG2021	Apply
24	The joint probability density of a two-dimensional random variable is $f(x) = \begin{cases} \frac{xy}{96}, & 0 < x < 4,\ 1 < y < 5 \\ 0, & Otherwise \end{cases}$ Find $P(1 < X < 2, 2 < Y < 3)$.	3	KTU- JUNE 2022	Analyse
25	For a normally distributed population, 31% of the items have their values less than 45 and 8% are above 64. Find the mean and standard deviation of the distribution.	7	KTU- JUNE 2022	Apply
26	If X is a random variable with PDF $f(x) = \begin{cases} \frac{x^2}{3}, & -1 < x < 2 \\ 0, & Otherwise \end{cases}$ Find (i) Mean of X (ii) Variance of X (iii) Cdf of X.	7	KTU- JUNE 2022	Apply
MODULE 3				
1	A Sample of 20 items has mean 42 and SD 5.Test whether the sample us from a population with mean 45 (5% level of significance)	7	KTU JULY 2021	Analyse
2	The mean life time of certain products is 1800 hours with SD of 100 hrs. By applying a new technique, it is claimed that the mean life has increased. To test the claim a sample of 50 products were taken and it is found that the mean life time is 1850 hrs .Can we support the claim at 1% level of significance?	7	KTU JULY 2021	Understand
3	In a university 325 out of 600 students are boys. Does this information support the conclusion that majority of students in this university are boys ?(Use 5% level of significance)	7	KTU JULY 2021	Understand
4	Random samples drawn from two countries gave the following data relating to height of adult males. Is the difference between the means significant?(5% level of Significance)	7	KTU JULY 2021	Analyse
5	The proportion of a characteristic of a population is $p = 0.37$. Find the mean and variance of the sample proportion obtained from a sample of size 100	3	KTU JULY 2021	Apply
6	A Sample of size 49 is taken with mean 35 and standard deviation 11 from a population .Find the 99% confidence interval for the population mean.	3	KTU JULY 2021	Evaluate
7	The mean blood pressure of 100 randomly selected person from a target population is 127.3 units .Find a 95% confidence interval for the mean blood pressure of the population .	7	Model Question	Apply

	Country A	Country B
Mean Height	67.42	67.25
Standard Deviation	2.58	2.5
Number in Samples	1000	1200

<table>
<tr><td>8</td><td>The CEO of a large electric utility claims that 80 percent of his 1,000,000 customers are very satisfied with the services they receive. To test this claim, the local newspaper surveyed 100 customers, using simple random sampling. Among the sampled customers ,73 percent say they are very satisfied .Based on these findings, do you think that the CEO is making a false claim of high satisfaction level among his customers ?Use a 0.05 level of significance.</td><td>7</td><td>Model Question</td><td>Apply</td></tr>
<tr><td>9</td><td>Two types of cars are compared for acceleration rate 40 test runs are recorded for each car and the result for the mean elapsed time recorded below:
<table>
<tr><td></td><td>Simple Mean</td><td>Sample standard Deviation</td></tr>
<tr><td>Car A</td><td>7.4</td><td>1.5</td></tr>
<tr><td>Car B</td><td>7.1</td><td>1.8</td></tr>
</table>
Determine if there is a difference in the mean elapsed times of the two cars at 95% confidence level.</td><td>7</td><td>Model Question</td><td>Analyse</td></tr>
<tr><td>10</td><td>The 95% confidence interval for the mean mass (in grams) of tablets produced by a machine is [0.56 ,0.57], as calculated from a random sample of 50 tablets .What do you understand from this statement</td><td>3</td><td>Model Question</td><td>understand</td></tr>
<tr><td>11</td><td>A company manufacturing tyres claims that its deluxe tyre averages at least 50000 miles before it needs to be replaced. From the past studies of this tyre, the standard deviation is known to be 8000. A survey of owners of the tyre design is conducted. From the 38 tyres surveyed, the mean lifespan was 46500 miles. Using the level of significance 1% test the claim of the company.</td><td>7</td><td>KTU-JUNE 2022</td><td>Evaluate</td></tr>
<tr><td>12</td><td>The manufacturer of a certain type of metal wire claims that the mean breaking strength of the wire is more than 575 kg. A sample of 6 metal tires give the mean of 573 with a variance of 14. Test whether the manufacturer's claim can be accepted at 5% level of significance.</td><td>7</td><td>KTU-JUNE 2022</td><td>Analyse</td></tr>
<tr><td>13</td><td>A shopkeeper claims that at most 60% of customers entering the shop leaves without making a purchase. Out of a random sample of 50 customers, 35 found to left without making a purchase. Does this data support the claim of the shopkeeper at 5% level of significance?</td><td>7</td><td>KTU-JUNE 2022</td><td>Evaluate</td></tr>
<tr><td>14</td><td>From the given data test at 5% level of significance whether there is any significance difference between means of A and B.
<table>
<tr><td>Sample</td><td>Sample size</td><td>Mean</td><td>SD</td></tr>
<tr><td>A</td><td>645</td><td>7.90</td><td>0.47</td></tr>
<tr><td>B</td><td>450</td><td>7.88</td><td>0.42</td></tr>
</table></td><td>7</td><td>KTU-JUNE 2022</td><td>Analyse</td></tr>
<tr><td colspan="5">MODULE 4</td></tr>
<tr><td>1</td><td>Using Newton-Raphson method, compute a real root of $e^{2x} - x - 6 = 0$ lying between 0 and 1.</td><td>7</td><td>KTU-APRIL 2018</td><td>Evaluate</td></tr>
<tr><td>2</td><td>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 $f(2) = -6$</td><td>5</td><td>KTU- MAY 2017</td><td>Evaluate</td></tr>
</table>

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 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.		KTU-APRIL 2018	Understand
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 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	10	KTU-MAY 2017	Apply
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 $\int_0^6 \frac{1}{1+x^2}\,dx$ 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 θ : 45 50 55 60 65 sinθ :0.7071 0.7660 0.8192 0.8660 0.9036	7	KTU-MAY 2017	Apply
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 $\int e^{\frac{-x^2}{2}}dx$ 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 $f(1.5)$ fothe following data x: 0 1 2 33 $y = f(x)$: 0 0.9826 0.6299 0.5532	7	Model qp	Evaluate
11	Consider the data given in the following table 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.	7	Model qp	Evaluate
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. x: 0 | 0.25 | 0.50 | 0.75 | 1 $f(x)$: 1 | 0.9412 | 0.8 | 0.64 | 0.5	3	Model qp	Evaluate

	Evaluate $\int_1^3 f(x)dx$ using trapezoidal rule.			
14	Use Newton's forward difference formula to find y at x = 1.5. x: 0, 1, 2, 3, 4 y: 7, 10, 13, 22, 43	7	KTU-AUG2021	Evaluate
15	Find a positive root that lies between 0 and 1 of $3x$=1+ cosx using Newton Raphson's method correct to 4 decimal places.		KTU-AUG2021	Apply
16	Given $f(0) = 1$, $f(1) = 3$, $f(3) = 55$. Use Lagrange's Interpolation method to find $f(2)$.		KTU-AUG2021	Apply
17	Using regula falsi method compute the real root of the equation $e^{2x} - x - 6 = 0$ correct to 4 decimal places.	7	KTU - JUNE 2022	Apply
18	Calculate $y(0.015)$ using Newton's forward interpolation formula. x: 0.01, 0.02, 0.03, 0.04, 0.05 y: 1.2, 2.5, 3.6, 4.6, 5.3	7	KTU - JUNE 2022	Evaluate
19	Evaluate $\int_1^2 \frac{dx}{x}$ using Simpson's $\frac{1}{3}$ rule. (Take $h = 0.25$)	7	KTU - JUNE 2022	Evaluate
20	The following table gives the values of $\cos\theta$ where θ is in degrees. Using Newton's backward interpolation formula estimate the value of cos 5 3°. θ: 10, 20, 30, 40, 50, 60 $\cos\theta$: 0.9848, 0.9397, 0.8660, 0.7660, 0.6428, 0.5000	7	KTU - JUNE 2022	Apply
21	Solve $x^3 = 25$ by Newton-Raphson method correct to 3 decimal places.	3	KTU - JUNE 2022	Evaluate
22	23% of people used a particular brand of tea. After providing a special offer 312 out of 1200 randomly selected people found to be consumers of the brand. State the null hypothesis and alternative hypothesis to test whether the data provide sufficient evidence to conclude that there is an increase in the proportion of people using the brand after providing the offer.	3	KTU - JUNE 2022	Analyse
	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 $y1 = 3x + 0.5\,y$, $y(0) = 1$ (Take $h = 0.2$)	7	KTU-MAY 2019	Apply
5	Given the initial value problem $y_j = y + x$, $y(0) = 0$, 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

<table>
<tr><td>7</td><td>Using Gauss-Seidel method, solve the following system of equations
$20x + y - 2z = 17$
$3x + 20y - z = -18$
$2x - 3y + 20z = 25$</td><td>7</td><td>Model qp</td><td>Evaluate</td></tr>
<tr><td>8</td><td>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.</td><td>7</td><td>Model qp</td><td>Evaluate</td></tr>
<tr><td>9</td><td>Use Runge-Kutta method of fourth order to find $y(0.2)$ given the initial value problem. $\frac{dy}{dx} = xy1 + x^2\ \ y(0) = 1$. Take step-size, $h = 0.1$.</td><td>7</td><td>Model qp</td><td>Evaluate</td></tr>
<tr><td>10</td><td><u>Solve the initial value problem</u>
$\frac{dy}{dx} = x + y,\ \ y(0) = 0\ , 0 \le x < 1$, taking step-size h = 0.2. Calculate $y(0.2), y(0.4)\ and\ y(0.6)$ using Runge-Kutta second order method, and $y(0.8)$ and $y(1.0)$ using Adam-Moulton predictor- corrector method.</td><td>7</td><td>Model qp</td><td>Evaluate</td></tr>
<tr><td>11</td><td>Use Runge-kutta method to find $y(0.2)$ for the equation
$\frac{dy}{dx} = y - xy + x,\ \ y(0) = 1$ take $h = 0.2$</td><td></td><td>KTU-AUG2021</td><td>Apply</td></tr>
<tr><td>12</td><td>Find the approximate value of $0464 - x^2$ dx by Trapezoidal rule (using $h = 0.5$)</td><td></td><td>KTU-AUG2021</td><td>Evaluate</td></tr>
<tr><td>13</td><td>Using Gauss-Seidal iteration method, find an approximate solution to the following system of equations correct to 4 decimal places.
$8x - 3y + 2z = 20, 4x + 11y - z = 33, 6x + 3y + 12z = 36$</td><td>7</td><td>KTU- JUNE 2022</td><td>Apply</td></tr>
<tr><td>14</td><td>Use Runge-Kutta method of order 4 to find $y(0.7)$ if $\frac{dy}{dx} = y - x^2$ given $y(0.6) = 1.737$. (Choose $h = 0.1$)</td><td>7</td><td>KTU- JUNE 2022</td><td>Apply</td></tr>
<tr><td>15</td><td>Fit a second degree parabola of the form $y = a + bx + cx^2$ to the following data.
<table><tr><td>x</td><td>0</td><td>1</td><td>2</td><td>3</td><td>4</td></tr><tr><td>y</td><td>1.2</td><td>1.7</td><td>2.1</td><td>2.8</td><td>5.9</td></tr></table></td><td>7</td><td>KTU- JUNE 2022</td><td>Analyse</td></tr>
<tr><td>16</td><td>Solve $\frac{dy}{dx} = x^2(1 + y)$ for $x = 1.4$ using Adams-Moulton Method, given $y(1) = 1, y(1.1) = 1.233,\ y(1.2) = 1.548$ and $y(1.3) = 1.979$.</td><td>7</td><td>KTU- JUNE 2022</td><td>Apply</td></tr>
<tr><td>17</td><td>Write the normal equations for fitting the curve $y = a + bx^2$</td><td>3</td><td>KTU- JUNE 2022</td><td>Understand</td></tr>
<tr><td>18</td><td>Use Euler's method with $h = 0.2$, to find $y(0.2)$ if $\frac{dy}{dx} = y + e^x \cos x\ ,\ y(0) = 0$</td><td>3</td><td>KTU- JUNE 2022</td><td>Apply</td></tr>
</table>

CET204:GEOTECHNICAL ENGINEERING 1

MODULE -1

Sl. No.	Question	Mark	Year
1	Using phase diagram, define the terms (i) void ratio,(ii)degree of saturation (iii) water Content (iv) Specific Gravity	10	Sep.2020
2	A partially saturated soil sample from a borrow pit has natural water content 14% and bulk unit weight 19 kN/m3.specific gravityof solids is 2.70. Determine the void ratio and degree of saturation	10	Dec.2019
3	Derive the relationship between e,w,G and s	10	Dec.2018
4	Distinguish between residual and Transported soil.	8	Dec.2018, Dec.2019
5	Define *sensitivity* and *Activity* of soil.	6	May 2018
6	Define the terms Sensitivity and thixotrophy in realtion to geotechnical Engineering	6	Dec.2018
7	Explain three phase diagram and define density index and degree ofsaturation	8	Dec.2018
8	A fully saturated clay sample has a mass of 101.5g and volume of 50 cc. After oven drying, clay of mass 84.5g. Assuming that the volume does not change during drying, determine the specific gravity, void ratio, porosity, dry unit weight of soil	10	
9	A compaction test in laboratory give max dry density of 18.5 kN/m3 of water content 15%. The specific gravity of soil is 2.7. Find out degree of saturation, air content ,percentage air voids	10	May 2018
10	Define Water Content, Degree of Saturation and Air Content.	3	Dec.2018
11	Define Water Content, Degree of Saturation and Air Content	3	June.2022
12	a) Draw the three phase block diagram and derive the relation between Void Ratio, Specific Gravity, Water Content and Degree of Saturation. b) The field dry unit weight of a soil is 15.50 kN/m3. The weight of dry soil filled in a container of volume 1 litre in its loosest state and densest state are 14N and 18 N respectively. What is the density index of the soil? G = 2.70	5 9	June.2022
13	a) Compare the engineering features of any three major soil deposits of India. b) A partially saturated sample has a natural water content of 10% and bulk unit weight of 17 kN/m3. The specific gravity of solids is 2.67. Determine the void ratio and degree of saturation. What will be the Saturated unit weight of the sample?	5 9	June.2022

MODULE -2			
1	Explain the basis of hydrometer analysis. How will you classify soilaccording to this?	5	May 2018
2	Differentiate between (i) Plastic limit and plasticity index (ii) Liquid limit and water plasticity ratio	10	May 2018
3	Differentiate (i) well graded and gap graded soil (ii) shrinkage index and toughness index (iii)uniformity coefficient and coefficient of curvature	5	May 2019
4	A fully saturated clay has a water content of 30% and bulk unit weight of18.64kN/m3.After drying the dry unit weight is 17.66kN/m3.Find the specific gravity and shrinkage limit	5	Dec. 2018
5	For a soil sample , the liquid limit is 52 %, plastic limit 30%, shrinkage limit is 18%.If the specimen of the soil shrinks from a volume of 39.5 cm3at the liquid limit to a volume of 24.2cm3 at the shrinkage limit .calculate the true specific gravity	14	May 2019
6	The Atterberg Limit of a clay soil are LL=75%, PL=45%,SL=25%.if a sample of this soil has a volume of 30cm3 at the liquid limit and volume of 16.6 cm3at the shrinkage limit , determine the specific gravity of soilds , shrinkage ratio, volumetric shrinkage	5	Dec. 2018
7	Explain Consistency limits of soils? how will you describe consistency ifthe soil has a LL =50%,PI=30% ,Natural water content =25%	9	May 2018
8	State the law governing the one dimensional flow through soils and alsodiscuss the various factors affecting permeability	7	Dec. 2018
9	What are the different methods to determine the coefficient of permeability in laboratory? Explain them in detail	7	May 2018
10	Define Liquidity Index, Consistency Index and Flow Index	3	June 2022
11	List the factors affecting permeability of soils	3	June 2022
12	a) A clay has a liquid limit of 60% and shrinkage limit of 20%. If a specimen of this soil shrinks from a volume of 15000 mm3 at liquid limit to 9000 mm3 at shrinkage limit determine the specific gravity of soil solids. b) Sketch the plasticity chart used for classifying a fine-grained soil. Classify the soil as per IS classification system Percentage of soil finer than 75-micron sieve = 15% Percentage of soil finer than 4.75 mm sieve = 73% Liquid limit = 28%, Plasticity index = 12%	7 7	June 2022
13	a) A soil sample in a variable head permeameter is 100mm in diameter and 120mm high. The permeability of the sample is	7	June 2022

	known to be 3 x 10-3mm/sec. If it is desired that the head in the stand pipe should fall from 550mm to 300mm in 200 seconds, determine the diameter of the stand pipe to be used. b) Determine the ratio of average coefficient of permeability in the horizontal to vertical direction for a deposit consists of three layers 2m, 1.5m and 4m and having coefficient of permeability 3.5x10-5 m/sec, 4.5x10-5 m/sec, 1.5x10-5 m/sec.	7	
MODULE -3			
1	Discuss the effect of capillarity water on effective stress of soil	5	Dec.2018
2	A 6m thick sand layer having dry unit weight of 17kN/m3 lies above a clay layer. The water table is 1m below ground level and the unit weight of saturated sandabove water table is 20kN/m3. Plot the effective stress variation in sand layer assuming sand is saturated by the capillary action	10	Dec.2018, Dec.2019
3	Distinguish clearly between capillarity and permeability	5	May 2018
4	Differentiate between total, effective and pore water pressure in soil	5	Dec.2018
5	A soil profile has a surface layer of clay 4 m. thick and density 19.5 kNms and a sand layer of 2 m. thick with a density of 18.5 kN/ms lies below the clay layer. Water table is at the ground surface, if a stand pipe is driven into the clay up to the sand layer water level in the stand pipe rises 2 m. Above the ground surface. Find the stresses.	14	Dec.2018
6	Explain Quick Sand Condition and Critical Hydraulic Gradient.	5	Dec.2018
7	A sand deposit of 8 m thick was loaded with a uniform surcharge of 10kN/m2 . Water table (WT) is at 3 m below GL. Density of sand is 18kN/m3 above WT and 19kN/m3 below WT. Draw Total, Neutral and Effective Stress Diagrams up to 8 m below GL. Take □w = 10kN/m3.	9	Dec.2018,

8	A concentrated load of 500 kN is applied at ground surface. Compute the vertical pressure (i) at a depth of 5m below the load, (ii) at a distance of 3m at the same depth. Use Boussinesq's theory.	7	May 2018
9	A water tank is founded on a circular ring type of foundation. The ring is of 2.5m width and its external diameter is 10m. Compute the vertical stress at 4m depth beneath the centre of the foundation, if pressure on the foundation is 100kPa	7	Dec.2018
10	Explain Total Stress, Effective Stress and Neutral Stress	3	Dec.2018
11	With a neat sketch explain isobar and pressure bulb	3	
12	a) Explain Quick Sand Condition. b) A soil profile consists of top layer of sand 3 m thickness having bulk unit weight 16kN/m3, an intermediate layer of clay 3.5m thickness having saturate unit weight 20kN/m3 and bottom layer of sand 5 m thickness having saturated unit weight of 18kN/m3. The water table is observed at 3m below ground level. Determine the total stress, neutral stress and effective stress at top, bottom and interface of layers and plot the variation of these stresses with depth.	5 9	May 2018
13	a) Determine the vertical stress intensity at a point 4 m below ground level and 1.5m away from the line of action of a vertical point load of 250kN acting on the ground surface by Boussinesq's equation b) A water tank is supported on a circular ring type of foundation. The ring is of 1.5mwidth and its external diameter is 8m. Compute the vertical stress at 1.5m depth beneath the centre of the foundation, if pressure on the foundation is 150kPa.	5 9	June 2022
	MODULE -4		
1	An oedometer test is performed on a 4 cm thick clay sample. After 5 minutes, 50% consolidation is reached. After how long a time would the same degree of consolidation is achieved in the field where the clay layeris 8 m thick? Assume the sample and the clay layerhas the same drainage boundary conditions (double drainage).	8	Dec. 2018

<table>
<tr><td>2</td><td>(a) Explain Compression Index and Swelling Index
(b) Define coefficient of consolidation and give its relations with other soil parameters</td><td>4
4</td><td>Sep.2020</td></tr>
<tr><td>3</td><td>A 20 cm. thick specimen of clay taken into reach 50 % consolidation in 2 mins, when drained on both sides, when percentage of volume compressibility is 2.5 x 10-2kg. Calculate coefficient of consolidation and coefficient of permeability.</td><td>8</td><td>May 2018</td></tr>
<tr><td>4</td><td>A 20m thick isotropic clay stratum overlies an impervious rock. The coeffecient of consolidation is 5 x10 $^{-2}$ mm2/s. Find the time required for 50% and 90 % consolidation</td><td>10</td><td>May 2018</td></tr>
<tr><td>5</td><td>(a) Differentiate between primary and secondary consolidation
(b)Discuss Terzaghi theory of consolidation</td><td>3
5</td><td>Dec. 2018</td></tr>
<tr><td>6</td><td>A 8 m thick clay layer with double drainage settles by 120 mm in 2 years. Cv = 1.5 x 10-3 cm2 /sec. Calculate the likely ultimate consolidation settlementand find out how long it will take to undergo 90% of this settlement.</td><td>5</td><td>Dec. 2018</td></tr>
<tr><td>7</td><td>A 3m square footing at a depth of 2m from ground level carries a net load intensity of 150 kN/m2 . If a compressible clay layer 3m thick exists at a depth of 5m below the footing, determine the settlement of the footing due toconsolidation of clay layer. Assume the water table at a depth of 3m below GL. For sand, density = 18 kN/m3 above water table and 19 kN/m3 below water table. For clay layer, LL = 65%, wn = 40% and G = 2.7. Take γw = 10 kN/m3 .</td><td>9</td><td>Dec. 2018</td></tr>
<tr><td>8</td><td>Explain the field compaction methods.</td><td>5</td><td>May 2019</td></tr>
<tr><td>9</td><td>The following are results of a standards proctor compaction test performedon a sample of soil
<table>
<tr><td>Water Content %</td><td>6</td><td>8</td><td>10</td><td>12</td><td></td></tr>
<tr><td>Bulk Density (kN/m^3)</td><td>17.7</td><td>19.8</td><td>21</td><td>21.3</td><td></td></tr>
</table>
Plot the water content – dry density curve and obtain Moisture content andMaximum dry density. Also plot the zero air voids curve. Take G = 2.65.</td><td>9</td><td>May 2018</td></tr>
<tr><td>10</td><td>Explain Normally Consolidated, Over Consolidated and Under Consolidated
Clays</td><td>3</td><td>June 2022</td></tr>
<tr><td>11</td><td>Draw the Compaction Curve and explain Optimum Moisture Content and Maximum Dry Density</td><td>3</td><td>June 2022</td></tr>
<tr><td>12</td><td>a) Explain the method of determination of pre-consolidation pressure on clay</td><td>5</td><td>June 2022</td></tr>
</table>

	b) In a soil profile, the top layer consists of sand up to 1.5m depth and is underlain by 3m thick normally consolidated clay. The water table is at 1m below ground level. The density of sand is 18kN/m3 above the water table and 19kN/m3 below the water table. The natural water content and specific gravity of clay are 30% and 2.70 respectively. The liquid limit of clay is 65%. Estimate the probable settlement of clay layer, if the pressure at mid-height of clay layer increases by 50kPa.	9	
13	a) Explain the Proctor Needle method of Field Compaction Control with neat sketches. b) Distinguish the laboratory and field equipment needed for compaction in sandy and clayey soils.	7 7	June 2022
	MODULE -5		
1	(a) Explain the basic mechanism of shear strength of soils. (b) Explain Mohr Coulomb's shear failure theory. (c) Explain three drainage conditions for conductingshear testing of soils.	8 4 3	
2	The following data refers to a CU test on a normally consolidated clay. Compute the total stress and effective shear strength parameters. Sample no Cell pressure Deviator stressPore pressure (kPa) (kPa) (kPa) 1 100 130 48 2 300 485 140 3 500 645 290	10	July 2019
3	A saturated specimen is permanently under water. Its water content is 50% and G=2.72. What is the effective stress at 8 m below the clay surface? How many meters of clay must be removed by dredging to reduce the intergranular pressure at that point by 25 kPa. The water levels remain unchanged.	10	Dec. 2019
4	When do you use the following shear tests and give reasons: (a) shear box; (b) vane shear test; (c) unconfined compression test .	6	Sep 2020
5	A particular soil failed under a major principal stress of 300kN/m2 with minor principal stress of 100kN/m2. Iffor the same soil , the minor principal stress had been 200kN/m2 , Determine what the major principal stress would have been if (i) ϕ= 30 (ii) ϕ=0	10	Dec. 2019
6	(a) Discuss and differentiate UU test, CU test, CD test	6	Sep 2020

<table>
<tr><td></td><td></td><td></td><td></td></tr>
<tr><td>7</td><td>Determine the shear strength parameters using the following data using graphical method:
<table><tr><th>Sample</th><th>Confining Pressure σ_c (kN/m^2)</th><th>Deviator Stress σ_d (kN/m^2)</th></tr><tr><td>1</td><td>100</td><td>600</td></tr><tr><td>2</td><td>200</td><td>750</td></tr><tr><td>3</td><td>300</td><td>900</td></tr></table></td><td>9</td><td>Sep 2020</td></tr>
<tr><td>8</td><td>a) Explain the Swedish circle method for the analysis of slopes for a c-□ soil.
b)Determine factor of safety of vertical foundation trench 5m deep if
c=50kN/m2 , □ = 25□, □ = 17kN/m3 . Assume Taylor’s stability no. Sn = 0.166.</td><td>5

9</td><td>Dec. 2019</td></tr>
<tr><td>9</td><td>A cylindrical specimen of soil fails under axial vertical stress of 150 kN/m2 ,
when it is laterally unconfined. Failure plane makes an angle of 53□ with the horizontal. Determine shear strength parameters c & □.</td><td>5</td><td>July 2019</td></tr>
<tr><td>10</td><td>Explain Consolidated Undrained, Unconsolidated Undrained and Consolidated Drained Shear tests for soils</td><td>3</td><td>Dec 2019</td></tr>
<tr><td>11</td><td>Explain the Rotational failure of slopes</td><td>3</td><td>June 2022</td></tr>
<tr><td>12</td><td>a) In a drained triaxial compression test on dense sand the cell pressure was
200kPa and the deviator stress to cause failure was 550kPa. Calculate the angle
of shearing resistance. Also find the angle made by the failure plane with
respect to the major principal plane.</td><td>9</td><td>June 2022</td></tr>
<tr><td>13</td><td>b) Compare the merits and demerits of a triaxial compression test.</td><td>5</td><td>June 2022</td></tr>
<tr><td>14</td><td>a) Explain Friction Circle method of slope stability analysis.
b) A slope is to be made in clay for which the cohesion is 25kN/m2 and Φ=0. The
density of soil is 18 kN/m3. Find the maximum height of slope if the side slope is
1.5 to 1, and the factor of safety is to be 1.5. Take Taylor's stability number as 0.17</td><td>9

5</td><td>June 2022</td></tr>
</table>

CET 202 ENGINEERING GEOLOGY

MODULE -1

Sl No.	Question	Mark	Year
1	Define weathering of rocks	3	Jan 2022
2	. Describe different types of weathering and their products.	7	Sep 2022
3	Explain chemical weathering	3	Dec.2018
4	Explain soil erosion and classification of soils	7	Dec.2018, Dec.2019
5	Define soil profile with neat diagram.	5	May 2018
6	Classify landslides	6	Dec.2018
7	Describe various methods used to protect the coastal areas from marine erosion	10	Dec.2018
8	Evaluate the negative effects of seawalls and groins as shore protection structures.	10	
9	Give brief account of relevance of Geology in civil engineering	10	May 2018
10	. What are the causes of landslides? Add a note on their preventive measures	10	Dec.2018

MODULE -2

1	Discuss seismic waves and their properties	5	Sep 2022
2	What is an earthquake	3	Jan 2022
3	Describe the terms: intensity and magnitude of earthquake	5	May 2019
4	Write a note on plate tectonics	7	Dec. 2018
5	Discuss seismic waves? How do body waves differ from surface waves	10	May 2019
6	Briefly explain the concept of plate tectonics	5	Dec. 2018
7	Explain hardness of minerals	9	May 2018
8	Discuss any five rocks of Kerala	7	Dec. 2018
9	Examine liquid nature of outer core	7	May 2018
10	Compare P and S waves	3	June 2022

MODULE -3

1	Describe vertical distribution of groundwater	5	Sep 2022
2	Give an account of factors controlling groundwater movement	10	Dec.2018, Dec.2019
3	Write notes on different groundwater zones.	5	May 2018
4	What is an aquifer? Describe the different types of aquifers.	5	Dec.2018
5	Explain Artesian aquifer.	14	Dec.2018
6	Explain Hydraulic conductivity	5	Dec.2018

7	Describe the methods to control of subsurface water.	9	Dec.2018,
8	Differentiate unconfined and confined aquifer with figure	7	May 2018
9	Explain how ground water can pose problems during the construction of tunnels.	7	Dec.2018
10	Explain unconfined aquifer.	3	Dec.2018
	MODULE -4		
1	Explain cleavage, lineation and foliation scale of hardness.	8	Dec. 2018
2	Explain chemical formula of calcite and quartz.	4 4	Sep.2020
3	Elucidate classification of rocks based on their origin.	8	May 2018
4	Write the distinguishing properties with the chemical composition of the following minerals. a) Orthoclase b) Hornblende c) Kaolinite	10	May 2018
5	Why colour and streak of minerals are not always identical	3 5	Dec. 2018
6	How do sedimentary rocks differ from metamorphic rocks	5	Dec. 2018
7	Write short note on rock types of Kerala	9	Dec. 2018
8	Describe any three physical properties which affect the strength of minerals.	5	May 2019
9	Discus the origin of igneous rocks and sedimentary rocks	9	May 2018
10	Explain strike and dip with figures	3	June 2022
11	Discuss Mohr scale of hardness	3	June 2022
	MODULE -5		
1	Explain fold,fault,joints	3	Jan 2022
2	Elucidate on engineering significance of dip and strike Explain the significance of faults in civil engineering	10	July 2019
3	Explain the significance of faults in civil engineering	10	Dec. 2019
4	What are the geological factors to be considered in Dam construction	6	Sep 2020
5	Discuss the origin of folding and faulting of rocks	10	Dec. 2019
6	Briefly discuss why the knowledge on rock joints is important for the construction of engineering structures	6	Sep 2020
7	Describe geological factors considered in the construction of dams and tunnels		
8	Describe any two geological factors considered essential in the construction of tunnels	9	Sep 2020
9	Examine strike slip fault Explain the significance of faults in civil engineering	5	Dec. 2019
10	Examine significance of faults with regard to the construction of engineering structures	5	July 2019

VIDYA ACADEMY OF SCIENCE AND TECHNOLOGY TECHNICAL CAMPUS, KILIMANOOR, THIRUVANANTHAPURAM-695602

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QUESTION BANK

PROFESSIONAL ETHICS

MODULE 1

1	Academic integrity	**KTU Model question paper**	**5 marks**
2	Importance of Work Ethics	**KTU Model question paper**	**5 marks**
3	Distinguish Caring and Sharing	**KTU Model question paper**	**5 marks**
4	What do you mean by Empathy	**KTU Model question paper**	**5 marks**
5	Significance of Service Learning	**KTU Model question paper**	**5 marks**
6	Explain Cooperation and commitment	**KTU Model question paper**	**5 marks**
7	Differentiate morals and values	**KTU Model question paper**	**`5 marks**
8	Compare between courage and self – confidence Exemplify a comprehensive review about integrity and respect for others.	**KTU Model question paper**	**14 marks**
9	What is the significance of work ethic in an organisation Compare between caring and sharing	**KTU model question paper**	**14 marks**
10	Classify the relationship between ethical values and law?	**KTU model question paper**	**14 marks**
11	Distinguish between morality and ethics	**KTU June 2022**	**3**
12	List the factors that enhance the self confidence in a person	**KTU June 2022**	**3**

13	Explain the qualities of service learning. Describe the qualities required live a peaceful life	**KTU June 2022**	**7** **7**
14	Explain the steps for developing a strong work ethic. Classify courage based on the type of risk	**KTU June 2022**	**8** **6**

MODULE 2

1 **2**	Explain the three main levels of moral developments, deviced by Kohlberg Differentiate moral codes and optimal codes.	**KTU model question paper** **KTU Model qn paper**	**10 marks** **4 marks**
3	Extrapolate the duty ethics and right ethics.	**KTU Model qn paper**	**8marks**
4	Discuss in detail the three types of inquiries in engineering ethics	**KTU Model question paper**	**6 marks**
5	Explain Moral dilemmas	**KTU Model question paper**	**14 marks**
6	What do you mean by Moral Autonomy	**KTU Model question paper**	**14 marks**
7	Profession and Professionalism	**KTU Model question paper**	**12 marks**
8	Theories about right action	**KTU Model question paper**	**5 marks**
9	Examine the Gilligan theory of moral development	**KTU Model question paper**	**3 marks**
10	Describe the professional roles to be played by an engineer	**KTU Model question paper**	**13 marks**

11	Evaluate the Utilitarian Ethics	**KTU Model question paper**	**8 marks**
12	Differentiate consensus and controversy in Engineering ethics	**KTU June 2022**	**3**
13	List out the models of professional roles	**KTU June 2022**	**3**
14	Explain the causes of Moral Dilemmas. Describe the different types of inquiries in solving ethical problems	**KTU June 2022**	**7** **7**
15	Explain the types of Ethical theories. Compare Gilligan's theory with Kohlberg's theory on moral development	**KTU June 2022**	**8** **6**

MODULE 3

1	Summarize the following features of morally responsible engineers. (i) Moral autonomy (ii) Accountability	**KTU Model question paper**	**8 marks**
2	Explain the rights of employees	**KTU Model question paper**	**6 marks**
3	Explain the reasons for Chernobyl mishap ?	**KTU Model question paper**	**8 marks**
4	.Describe the methods to improve collegiality and loyalty	**KTU Model question paper**	**6 marks**
5	Codes of Ethics	**KTU Model question paper**	**10 marks**
6	Plagiarism	**KTU Model question paper**	**5 marks**
7	Role of experiments in engineering	**KTU Model question paper**	**9 marks**
8	Investigate the Challenger space shuttle explosion	**KTU Model question paper**	**15 marks**

9	Investigate the Bhopal gas tragedy	**KTU Model question paper**	**5 marks**
10	Why do we need Code of ethics?	**KTU Model question paper**	**10 marks**
11	What are the essential conditions for a valid informed consent?	**KTU June 2022**	**3**
12	List out the limitations of Codes of Ethics	**KTU June 2022**	**3**
13	Describe the causes and fatal effects of Bhopal Gas Tragedy Illustrate the role of engineers as experimenters	**KTU June 2022**	**7** **7**
14	Evaluate the importance of accountability in a professional's life. Explain the role of Codes of Ethics in the service life of a professional Engineer	**KTU June 2022**	**6** **8**

MODULE 4

1	Execute collegiality with respect to commitment, respect and connectedness.	**KTU Model question paper**	**8 marks**
2	Identify conflicts of interests with an example	**KTU Model question paper**	**6 marks**
3	Explain in detail about professional rights and employee rights.	**KTU Model question paper**	**8 marks**
4	Exemplify engineers as managers	**KTU Model question paper**	**6 marks**
5	Steps to Manage conflict in an organisation.	**KTU Model question paper**	**7 marks**
6	Collective bargaining – Methods	**KTU Model question paper**	**15 marks**
7	Professional rights	**KTU Model question paper**	**5 marks**
8	Forms of IPR	**KTU Model question paper**	**5 marks**

9	Explain the ways of IPR protection	**KTU Model question paper**	**15 marks**
10	Elaborate on methods of managing conflict	**KTU Model question paper**	**15 marks**
11	Define collegiality and loyalty	**KTU June 2022**	**3**
12	Differentiate between Patents and Trademarks	**KTU June 2022**	**3**
13	Explain the different steps in managing conflicts in an organization. Describe the major steps involved in the process of collective bargaining	**KTU June 2022**	**7** **7**
14	Exemplify conflicts of interest and conflicts in interest. Illustrate various rights of an engineer as a professional	**KTU June 2022**	**7** **7**

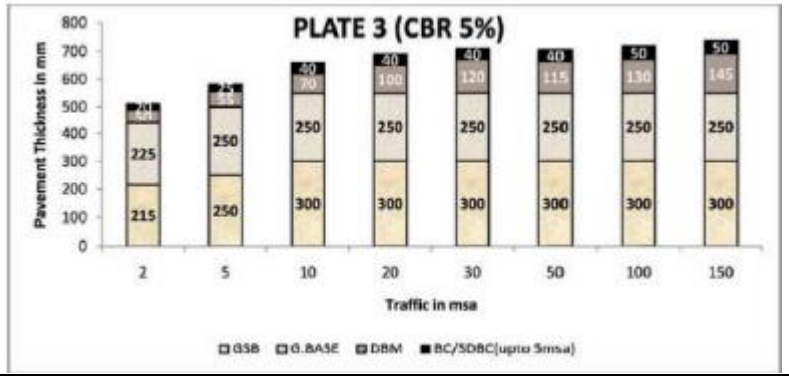
MODULE 5

1	Evaluate the technology transfer and appropriate technology.	**KTU Model question paper**	**8 marks**
2	Explain about computer and internet ethics	**KTU Model question paper**	**6 marks**
3	Investigate the causes and effects of acid rain with a case study.	**KTU Model question paper**	**8 marks**
4	Conclude the features of ecocentric and biocentric ethics.	**KTU Model question paper**	**6marks**
5	Multinational Corporations – Advantages & Disadvantages	**KTU Model question paper**	**8marks**
6	Computer Ethics	**KTU Model question paper**	**8marks**
7	Role of Engineers as Managers	**KTU Model question paper**	**3 marks**
8	Moral leadership	**KTU Model question paper**	**10 marks**

9	Importance of Business Ethics	**KTU Model question paper**	**5 marks**
10	Discuss the Advantages and disadvantages of MNCs	**KTU Model question paper**	**5 marks**
11	Describe the various requirements for engineers who act as advisors	**KTU June 2022**	**3**
12	List out the importance of Business Ethics.	**KTU June 2022**	**3**
13	Describe the two world views on Environmental Ethics.	**KTU June 2022**	**8**
	Explain the different types of issues in Computer Ethics.		**6**
14	Explain the features, advantages and limitations of MNCs	**KTU June 2022**	**14**

SUB CODE	CET206	SUBJECT NAME	TRANSPORTATION ENGINEERING

	MODULE 1	Marks	Year	Instructional Objectives
1	What are the special considerations to be taken while aligning roads on hilly areas?	5	KTU 2018, 21	
2	Enumerate the factors governing the width of carriage way. State the IRC specifications for width of carriage way for various classes of roads.	5	KTU 2018	
3	What are the points to be kept in view while selecting the alignment between two terminal stations?	5	KTU 2018	
4	Discuss the various highway cross sectional elements with neat figures	10	KU 2015	
5	Which are the factors controlling highway alignment	8	KU 2015	
6	Explain the classification of roads	5	KU 2017, KTU 2019	
7	Write a note on factors considered in design controls and criteria of highways	5	KU 2017, KTU 2019	
8	Draw a neat cross sectional view of an highway showing its elements	6	KTU 2021	
9	What is camber? How is it provided on roads? List factors affecting camber	3	KTU 2022	
10	Why are overtaking Zones provided? Draw a neat sketch showing the signs to be installed and their positions	5	KTU 2018	
11	Derive an equation for equilibrium superelevation. Determine the superelevation required for a horizontal curve of radius 300m with a design speed of 80kmph under mixed traffic condition in an urban area.	7	KTU 2022	
12	Define stopping sight distance (SSD). List the factors affecting stopping distance. Derive an expression for SSD on level roads.	7	KTU 2022	
13	Why transition curves are provided on a horizontal curve? What are the requirements of an ideal transition curve? How do you determine the length of transition curves?	7	KTU 2022	
14	While aligning a highway in a built up area, it was necessary to provide a horizontal curve of radius 300 m for a design speed 65Km/hr, length of wheel base-6m and pavement width 10.5m. Assume rate of introduction of super elevation as 1 in 100 and super elevation is provided by rotating about centre line. Design super elevation, extra widening of pavement and length of transition curve.	8	KTU 2018	
15	Distinguish between intermediate sight distance and overtaking sight distance	6	KU 2017	
16	Calculate the SSD for a two way traffic in a one way road having design speed 75kmph, gradient 2%. Assume all other data if necessary	8	KU 2015	
17	Derive an expression for super elevation design	8	KU 2015	
18	Design super elevation for a highway having design speed of 80kmph	8	KTU 2019	
19	Two cars A and B running at a speed of 80kmph and 60kmph tries to overtake. Assume f as 0.35, reaction time as 2.5S, width of road as 6m, rate of change of centrifugal acceleration as 1	7	KTU 2019	
20	Write a note on transition curves and its functions	8	KTU 2021	
21	Calculate the extra width of pavement required on a horizontal radius of 650m on a two lane highway having design speed of 70kmph. Assume all other data.	7	KTU 2022	
	MODULE 2			
1	Outline the IRC 37-2012 recommendations for determining the thickness of Flexible pavements.	8	KTU 2018	
2	List out the desirable properties of aggregates to be used in pavement construction. Also specify various tests for judging the suitability of aggregates.	7	KTU 2018	

<table>
<tr><td>4</td><td>Describe about the factors influencing the design of pavements</td><td>7</td><td>KTU 2017</td><td></td></tr>
<tr><td>5</td><td>Distinguish between flexible and rigid pavements</td><td>7</td><td>KTU 2017</td><td></td></tr>
<tr><td>6</td><td>Which are the desirable properties of aggregates used in road construction</td><td>8</td><td>KTU 2018, 19</td><td></td></tr>
<tr><td>7</td><td>Briefly describe the various tests on road aggregates to be used for road construction</td><td></td><td>KU 2017</td><td></td></tr>
<tr><td>8</td><td>Write the procedure for conducting CBR test on flexible pavements</td><td>6</td><td>KTU 2021</td><td></td></tr>
<tr><td>9</td><td>The soil subgrade sample was obtained from the project site and the CBR tests conducted at field density gave the following readings. Draw the load penetration curve and determine the CBR value and find the total thickness of the pavement by CBR method as recommended by IRC for commercial vehicles 1500 per day, with 7% growth rate. The pavement construction is to be completed in three years after last traffic count.
<table>
<tr><th>Penetration (mm)</th><th>Load (Kg)</th><th>Penetration (mm)</th><th>Load (Kg)</th></tr>
<tr><td>0.0</td><td>0.0</td><td>3.0</td><td>58.0</td></tr>
<tr><td>0.5</td><td>5.0</td><td>4.0</td><td>70.0</td></tr>
<tr><td>1.0</td><td>16.0</td><td>5.0</td><td>77.0</td></tr>
<tr><td>1.5</td><td>30.0</td><td>7.5</td><td>89.0</td></tr>
<tr><td>2.0</td><td>42.0</td><td>10.0</td><td>100.0</td></tr>
<tr><td>2.5</td><td>50.0</td><td>12.5</td><td>110.0</td></tr>
</table></td><td>10</td><td>KTU 2018</td><td></td></tr>
<tr><td>10</td><td>Explain the bitumen tests to be conducted for quality checking</td><td>9</td><td>KTU 2021</td><td></td></tr>
<tr><td>11</td><td>Differentiate between tack coat and prime coat.</td><td>3</td><td>KTU 2022</td><td></td></tr>
<tr><td>12</td><td>Define CBR. Design a flexible pavement for the construction of a new highway with the following data: Category of road - four lane dual carriage way, number of commercial vehicles in the year of completion of construction = 2400 CVPD per direction, design life = 15 year, annual growth rate of vehicles = 5%, design CBR value of soil subgrade = 5%, vehicle damage factor = 3.5, lane distribution factor = 0.75

</td><td>7</td><td>KTU 2022</td><td></td></tr>
<tr><td>13</td><td>State the major differences between flexible and rigid pavements</td><td>7</td><td>KTU 2022</td><td></td></tr>
<tr><td>14</td><td>Describe the specifications of materials and construction steps of granular sub base course.</td><td>7</td><td>KTU 2022</td><td></td></tr>
</table>

SUB CODE	CET206	SUBJECT NAME	TRANSPORTATION ENGINEERING

MODULE 3

1	What is OD survey? List the methods of OD survey. Explain any one method in detail.	5	KTU 2018	
2	List out the various factors which affect the road user characteristics in traffic engineering. What are the effects of road user characteristics in traffic performance?	6	KTU 2018	
3	List out the various traffic characteristics to be considered in traffic engineering	5	KU 2017	
4	Briefly explain the various traffic surveys conducted for highway alignment	7	KU 2017	
5	What are the basic requirements of Intersection at Grade?	7	KTU 2018	
6	What are the advantages and disadvantages of traffic signals?	6	KTU 2018	
3	Explain with sketches the basic patterns of runway configurations	7	KTU 2018	
4	What is (i) Saturation flow, (ii) Lost time, and (iii) Phase in a signal design?	3	KTU 2018	
5	Enumerate the various factors which would be kept in view while selecting suitable site for an airport.	3	KTU 2018	
6	A fixed time 2-phase signal is to be provided at an intersection having four arms. The design hour traffic and saturation flow are North: Design hour flow (pcu/hr) 800, Saturation flow (pcu/hr) 2400 South: Design hour flow (pcu/hr) 400, Saturation flow (pcu/hr) 2000 East: Design hour flow (pcu/hr) 750, Saturation flow (pcu/hr) 3000 West: Design hour flow (pcu/hr) 600, Saturation flow (pcu/hr) 3000 Time lost per phase due to starting delay is 2 sec and All red period is 4 sec. Design two phase traffic signal using Webster's method. Draw the phase diagram also.	10	KTU 2018	
7	Write a note on types of traffic control devices	8	KTU 2018	
8	Briefly explain the procedure for signal design using Webster's method	6	KTU 2018	
9	Explain various Levels of Services (LOS) as per HCM. What are the factors affecting capacity and LOS?	7	KTU 2022	
10	A fixed time 2 phase signal is to be provided at an intersection having a N-S and E-W road where only straight ahead traffic is permitted. The hour flows are given in the table. Calculate the optimum cycle time and green time for the minimum overall delay. The integration time should be the minimum necessary for efficient operation. The time lost per phase due to starting delays can be assumed to be 2 seconds. The value of the amber period is 2 seconds. Sketch the timing diagram for each phase. N: Design hour flow (q) in PCUs/ hour 800, Saturation flow (s) in PCUs/ hour 2400 S: Design hour flow (q) in PCUs/ hour 400, Saturation flow (s) in PCUs/ hour 2000 E: Design hour flow (q) in PCUs/ hour 750, Saturation flow (s) in PCUs/ hour 3000 W: Design hour flow (q) in PCUs/ hour 1000, Saturation flow (s) in PCUs/ hour 3000	7	KTU 2022	
11	Explain how spot speed data are presented and the results used in traffic engineering	7	KTU 2022	
12	List the various devices used in traffic controlling and their general requirements. What are the different systems of traffic signal coordination?	7	KTU 2022	
13	What is the significance of passenger car unit in traffic studies?	3	KTU 2022	

14	Discuss the advantages and disadvantages of rotary intersections	3	KTU 2022	
	MODULE 4			
1	What are the functions of ballast in a railway track?	3	KTU 2018	
2	What are the component parts of a railway track?	3	KTU 2021	
3	What is coning of wheels? Why it is necessary?	3	KTU 2018	
4	Draw the layout of an artificial harbour and label its various elements	3	KTU 2018	
5	Explain the different types of grades used? What is grade compensation and its advantages	7	KTU 2018	
6	Define wheel gauge. What are the different wheel gauges used in India?	3	KTU 2019	
7	Draw typical cross sections of tunnels and mention their applications.	6	KTU 2021	
8	Draw the cross section of a permanent way on an embankment. List the component parts of a railway track and explain their function	7	KTU 2022	
9	List the different types of breakwaters. What factors would guide the selection of a particular type?	7	KTU 2022	
10	List and explain the different stages of setting out of centreline of tunnels.	7	KTU 2022	
11	What are docks? Differentiate between dry dock and wet dock.	7	KTU 2022	
	MODULE 5			
1	The length of a runway under standard conditions is 1500m. The airport is to be provided at an elevation of 110m above mean sea level. The airport reference temperature is 320 C. Following data refers to the proposed longitudinal section of runway. Determine the corrected length of runway End to end of runway (m) | Grade(%) | End to end of runway (m) | Grade(%) 0 to 300 | +1 | 1500 to 1800 | +1 300 to 900 | -0.2 | 1800 to 2100 | -0.3 900 to 1500 | +0.5	10	KTU 2018	
2	Write a note on wind rose diagrams	6	KU 2017	
3	Discuss the factors considering during the design of taxiways	6	KU 2017	
4	Prepare a layout of an airport building with all features	7	KU 2017	
5	Write a note on corrections to be considered for fixing runway length	8	KU 2017	
6	List out the factors considered in runway orientation	5	KU 2017	
7	Explain with sketches the basic patterns of runway configurations	5	KTU 2018	
8	Which are the factors to be considered in selection of site for an airport	10	KU 2017	
9	Distinguish between runway and taxiway	3	KTU 2022	
10	What is wind rose diagram? Explain its uses	3	KTU 2022	
11	Explain with sketches, the basic patterns of runway configurations.	7	KTU 2022	
12	Draw the layout of a typical airport and label the different components. Explain the functions of (a) Aprons (b) Hangars.	7	KTU 2022	

13	The runway length required for landing at sea level in standard atmospheric conditions is 3000m. Runway length required for take-off at sea level in standard atmospheric condition is 2500m. Aerodrome reference temperature is 25 0C and that of the standard atmosphere at aerodrome elevation of 150m is 14.025 0C. If the effective runway gradient is 0.5 percent, determine the runway length to be provided.	7	KTU 2022	
14	Explain any six site selection criteria related with the airport site selection	7	KTU 2022	

MCN 202 CONSTITUTION OF INDIA

Module 1			
S. No	Questions	Marks	Reference
1	Define Constitution. Why is it necessary for a Country	6	July 2021
2	Explain the salient features of Indian Constitution	8	July 2021
	Give any five features of Constitution of India	3	June 2022
3	Give detail account on the historical background of Indian Constitution	6	July 2021
4	Define Constitution of India with comparison with other countries	7	June 2022
5	What is the objective of Indian Constitution	6	
6	What do you mean by federal system of government? Give an example	3	July 2021
7	What is preamble? Explain the importance of preamble in the implementation of Constitution	6	July 2021
	Explain the need and importance of Preamble	3	July 2021, June 2022
	What is Preamble? Can it be used for the interpretation of the constitution? Also explain its significance	8	July 2021
8	Explain the term citizenship and its types	7	June 2022
9	Explain different ways for acquiring Indian citizenship.	8	July 2021 June 2022
10	Write notes on methods of termination of Indian citizenship	6	July 2021
11	Discuss the term Union and its Territory	7	June 2022
	Differentiate State Government and Union Territory	7	June 2022
	Why do we need to form separate Union Territories	3	July 2021
12	Explain the procedure for amendment of the constitution	6	July 2021 June 2022

Module 2			
S. No	Questions	Marks	Reference
1	How is State defined under Article 12 of Indian Constitution	3	July 2021
2	Explain the term fundamental rights and its classification.	7	June 2022
	What are Fundamental Rights? Examine each of them	8	July 2021
	Explain the concept of " Equality before Law"	3	July 2021
	"No person shall be prosecuted and punished for the same offence more than once". Discuss this clause	3	July 2021
	What do you mean by right against exploitation? Explain	7	July 2021 June 2022
	What protection are available to the Indian citizen against conviction?	3	June 2022
	What are the constitutional provisions relating to freedom of trade &commerce	3	July 2021
3	Explain the situation for Suspending the Fundamental Rights	6	
4	Discuss the classification of Directive Principles of State Policy in detail	8	July 2021

	State the Directive Principles of State Policy and explain its significance	6	July 2021 June 2022
5	Distinguish between fundamental rights and directive principles of state policy	7	July 2021
6	Describe the Rights to Constitutional Remedies and explain its significance	6	July 2021
7	Explain the needs and importance of fundamental duties of Indian Citizen	8	July 2021
	What are the fundamental duties of an Indian citizen?	7	June 2022
8	Differentiate Rights and Duties with example.	3	June 2022
9	Explain the various writs issued by High court of Kerala	6	July 2021

Module 3			
S. No	Questions	Marks	Reference
1	Explain how Union Executive is elected and formed	7	
2	Explain the procedure for impeachment of the President of India.	3	July 2021
3	Explain the Powers and Functions of the Attorney General for India	3	July 2021 June 2022
4	Explain the functions and the powers of President of India	8	July 2021
5	Explain the constitutional position and essential qualifications of Vice-president of India.	6	July 2021
6	Explain the qualification and disqualification for membership in the house of the people.	8	July 2021 June 2022
7	Explain various kinds of jurisdiction of Supreme Court	6	July 2021
8	Write five specialities of Supreme court	3	June 2022
9	What are the different functions of Parliament?	7	June 2022
10	Differentiate Rajya Sabha and Lok Sabha with five points.	7	June 2022
11	Explain the constitutional duties and powers of the Prime Minister	7	July 2021
12	Explain in detail about the Union Government structure and functions	6	July 2021
13	Describe the duties and role of Comptroller and Auditor General of Indian (CAG)	8	July 2021 June 2022

Module 4			
S. No	Questions	Marks	Reference
1	Explain the functions of the State Legislature	8	July 2021
2	Explain State Legislative Assembly in detail.	7	June 2022
	Explain State Legislative Council in detail	7	June 2022
	Explain the composition and duration of state legislative council	8	July 2021
	Explain the qualification and disqualification for membership of the state legislature	7	July 2021
3	Explain the procedure for the appointment of chief minister	3	July 2021
4	Explain the responsibilities and functions of Council of Ministers to State Legislative Assembly	6	July 2021
5	Explain the duties of advocate general of the state.	3	July 2021
6	Explain the powers and functions of the Governor of Kerala state	6	July 2021 June 2022
7	Explain the constitution of High court. What are the essential qualifications required for the appointment of High court Judge?	7	July 2021
8	Discuss about Jurisdiction of High court.		
9	Examine the administrative and financial relation between the Union and the State	6	July 2021
10	Explain the concept of appeal by special leave	6	July 2021

Module 5			
S. No	Questions	Marks	Reference
1	Explain the distribution of tax revenue with respect to centre-state financial relation.	3	July 2021
2	How is Central and State Government related on economic basis?	7	June 2022
3	Explain parliamentary legislation in the state field	6	July 2021
4	Discuss the effects of national and financial emergencies	8	July 2021
5	What is the need for administrative tribunals? Explain the functions of state administrative tribunals	8	July 2021
6	Explain the characteristics of Administrative Tribunals. What are the reasons for the growth of Administrative Tribunals in India	6	July 2021
7	Distinguish between an ‘ Ordinary Bill’ and ‘Money Bill’	3	July 2021
8	Explain the role of Public Service Commission.	7	June 2022
9	Enumerate the powers and functions of Public Service Commission	8	July 2021
10	List out the three types of emergencies under Indian constitution	3	July 2021
11	Explain how the constitution handles an emergency situation in the country.	7	June 2022