

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

Accredited by NAAC with 'B++' Grade

(A Unit of Vidya International Charitable Trust)

DEPARTMENT OF CIVIL ENGINEERING

S1 CE (2024 - 28)

QUESTION BANK

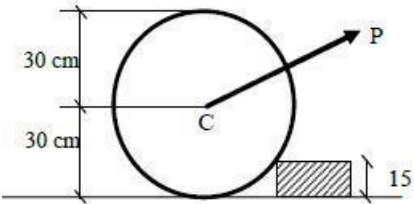
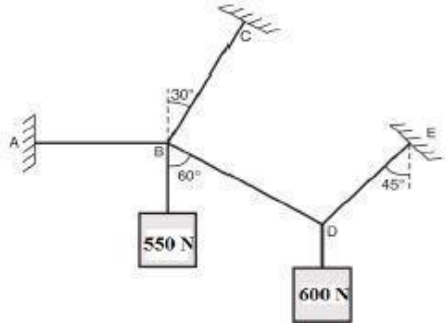
Module I			
Sl. No	Questions	Marks	Year
1	Describe the significance of problem-solving strategies?	3	Model Question
2	Use cases for Trial and Error, Algorithm, Heuristic and Means-ends analysis can be applied in proffering solution to problems?	10	Model Question
3	Explain means-ends analysis with an example problem?	6	Model Question
4	Explain backtracking or working backward strategy?	6	Model Question
5	Explain algorithmic approach in problem solving and its advantages?	6	Model Question
6	Explain the various steps in problem solving process?	4	Model Question
7	Identify five use cases for Trial and error, Heuristic, backtracking and means-ends analysis?	8	Model Question
8	How do you find the length of a string in Python?	6	Model Question
9	How do you take user input in Python?	3	Model Question
10	What is string slicing? Provide an example?	6	Model Question
Module II			
1	What is the main difference between a flowchart and pseudocode in representing an algorithm?	3	Model Question
2	Write a pseudocode for calculating the average of three numbers input by a user?	8	Model Question
3	What are the advantages of using pseudocode over natural language when describing an algorithm?	8	Model Question
4	What is the purpose of using standardized symbols in flowchart?	3	Model Question
5	How would you represent a switch or case statement in pseudocode?	4	Model Question
6	How does pseudocode differ from actual programming code?	6	Model Question
7	In pseudocode, how would you represent a basic if-else statement?	4	Model Question
8	Design a flowchart for printing the largest of N numbers entered by the user?	10	Model Question
9	Draw a simple flowchart for determining whether a number is even or odd?	6	Model Question
10	Create a pseudocode for finding the largest number in a list of 10 numbers?	6	Model Question

Module III			
1	Describe the various selection and iteration statements in Python?	6	Model Question
2	Write a program to create,append,and remove lists in Python using Numpy?	8	Model Question
3	Write a program to calculate the factorial of a number entered by the user?	6	Model Question
4	What is Numpy and why is it used in Python for numerical computations?	4	Model Question
5	How can you create a Numpy array from a Python list?	3	Model Question
6	What is problem decomposition,and why is it an effective strategy for solving complex problems?	5	Model Question
7	What are the key benefits of modularization in programming?	3	Model Question
8	How does modularization relate to the concept of divide and conquer?	6	Model Question
9	Write a recursive function to find the sum of the digits of a positive number?	8	Model Question
10	Write a Python function using recursion to find the n th Fibonacci number?	8	Model Question
Module IV			
1	How does the Merge Sort Algorithm exemplify the Divide-and conquer Approach?	3	Model Question
2	What are the main characteristic of the Brute-force Approach in problem-solving?In what scenarios might a Brute-force Approach be particularly useful or necessary?	4	Model Question
3	Describe the fundamental principle of the Greedy Algorithm?	3	Model Question
4	What is the key idea behind Dynamic Programming?	4	Model Question
5	How does the hat-check party problem illustrate the concept of randomization in problem-solving?	5	Model Question
6	In the task completion example for Greedy Algorithm,what is the general strategy to maximize the number of completed tasks?	6	Model Question
7	How do Greedy Algorithm differ from Dynamic Programming in terms of decision-making?	4	Model Question
8	What are the potential benefits of using a randomized approach over deterministic algorithm?	6	Model Question
9	In the context of Randomized Algorithm ,what is meant by “expected number” or “expected outcome”?	5	Model Question
10	How does Dynamic Programming differ from simple recursion when solving problem like the Fibonacci series?	8	Model Question

QUESTION BANK

EST 100 ENGINEERING MECHANICS

MODULE 1

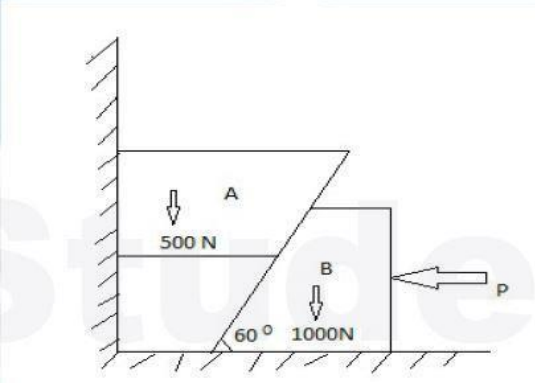
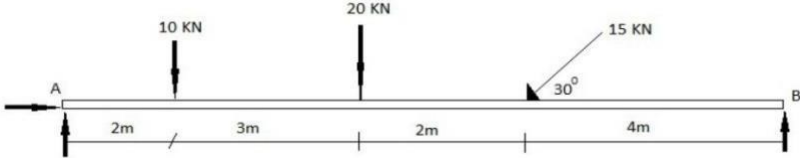
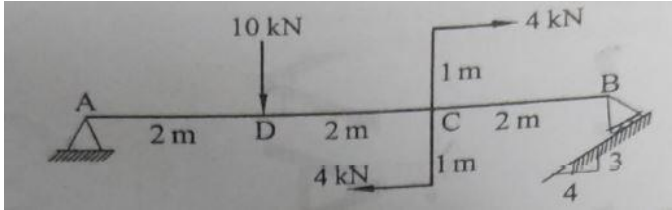
1	A rope 9m long is connected at A and B, two points on the same level, 8 m apart. A load of 300 N is suspended from a point C on the rope 3m from A. Calculate load connected to a point D on the rope 2 m from B is necessary to keep portion CD parallel to AB.	5 marks	KTU 2024
2	Define a free body diagram with sketches	3 marks	KTU 2024
3	State and explain Lami's theorem.	3 marks	KTU July 2023
4	A uniform wheel 60 cm diameter weighing 1000 N rests against a rectangular obstacle 15 cm height as shown in fig. Determine the least force required which when acting through the centre of the wheel will just turn the wheel over the corner of the block 	5 marks	KTU Dec 2021
5	The system of connected flexible cables shown in Fig. is supporting two loads of 550 N and 600 N at points B and D, respectively. Determine the tensions in the various segments of the cable. 	9 marks	KTU Dec 2019
6	Concurrent forces of 1,3,5,7,9,11 N are applied to the center of a regular hexagon acting towards its vertices as shown in fig . Determine the magnitude and direction of the resultant.	9 marks	KTU Dec 2019

7	<p>A rope 9m long is connected at A and B, two points on the same level, 8 m apart. A load of 300 N is suspended from a point C on the rope 3m from A. Calculate load connected to a point D on the rope 2 m from B is necessary to keep portion CD parallel to AB.</p>	5 marks	KTU July 2021
8	<p>The resultant of a system of four forces is 5 kN directed towards right along x direction. Calculate the force P and its direction ϕ</p>	9 marks	KTU July 2021
9	<p>Three cylinders are piled in a rectangular ditch as shown in fig. Neglecting friction, determine the reaction between cylinder A and vertical wall</p>	14 marks	KTU July 2021
10	<p>Two identical rollers each of weight 100 N are supported by an inclined plane, making an angle of 30° with the vertical, and a vertical wall. Find the reaction at the points of contact A, B, C. Assume all the surfaces to be smooth</p>	14 marks	KTU Model question paper

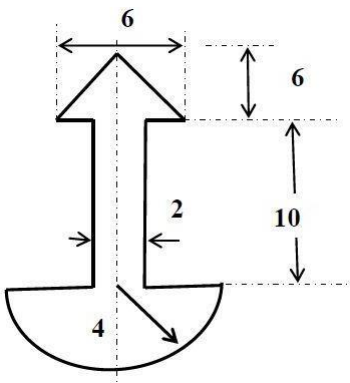
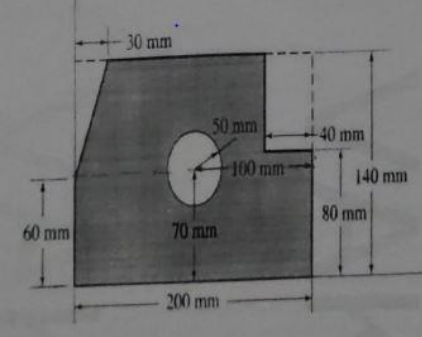
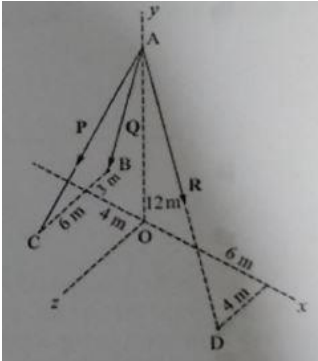
11	<p>A string tied to a wall is made to pass over a pulley placed 2m away from it. A weight P is attached to the string such that the string stretches by 2m from the support on the wall to the location of attachment of weight. Determine the force P required to maintain 200 kg body in position for $\Theta = 30^\circ$. The diameter of pulley B is negligible.</p>	14 marks	KTU Model question paper

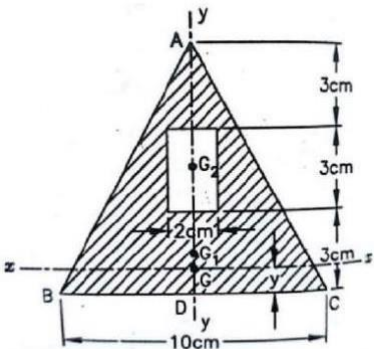
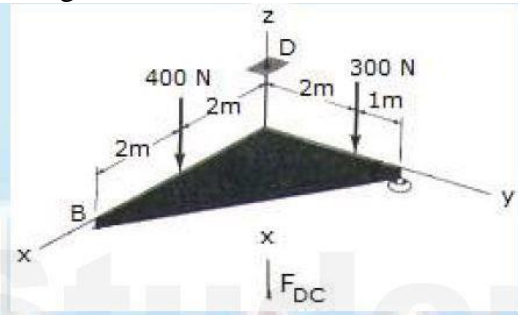
MODULE II

1	<p>A uniform ladder 4 m long weighs 200 N. It is placed against a wall making an angle of 60° with the floor. The coefficient of friction between the wall and the ladder is 0.25 and that between the ground and the ladder is 0.35. The ladder in addition to its own weight, has to support a man of 1000 N at the top at B. Calculate: (i) The horizontal force P to be applied to the ladder at the ground level to prevent slipping. (ii) If the force P is not applied, what should be the minimum inclination of the ladder with the horizontal, so that it does not slip with the man at the top?</p>	14 marks	KTU 2023
2	<p>Find the force required to move a load of 30N up a rough inclined plane, applied parallel to the plane. The inclination of the plane is such that when the same body is kept on a perfectly smooth plane inclined at an angle, a force of 6N applied at an inclination of 30° to the plane keeps the same in equilibrium. Assume coefficient of friction between the rough plane and the load is equal to 0.3.</p>	7 marks	KTU 2022
3	<p>For the beam with loading shown in Fig., determine the reactions at the supports</p>	7 marks	KTU Dec 2020
4	<p>Briefly explain the analysis of forces acting on a wedge with a suitable example</p>	3 marks	KTU dec 2021

5	Distinguish static and dynamic friction.	3 marks	KTU Model Question Paper
6	<p>Two blocks A & B are resting against a wall and the floor as shown in figure below. Find the value of horizontal force P applied to the lower block that will hold the system in equilibrium. Coefficient of friction are : 0.25 at the floor, 0.3 at the wall and 0.2 between the blocks.</p> 	14 marks	KTU Model Question Paper
7	<p>A beam is hinged at A and roller supported at B. It is acted upon by loads as shown below. Find the reactions at A & B</p> 	14 marks	KTU Model Question Paper
8	<p>A rough inclined plane, rises 1 cm for every 5 cm along the inclined length. Calculate the effort required to drag a body weighing 100 N up the plane, when the effort is applied parallel to the plane ($\mu = 0.25$).</p>	7 marks	KTU July 2021
9	<p>A beam 6 m long is loaded as shown in fig. Calculate the reaction at A and B</p> 	7 marks	KTU July 2021
10	<p>The uniform ladder is of mass 10Kg and 2m long leaning against a vertical wall. The coefficient of static friction at A(wall) is 0.6 and at B (floor) is 0.4. Determine the smallest angle for which ladder can remain in the equilibrium</p>	7 marks	KTU July 2021

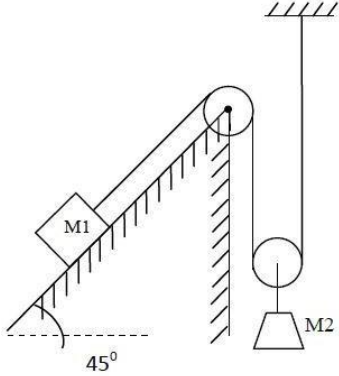
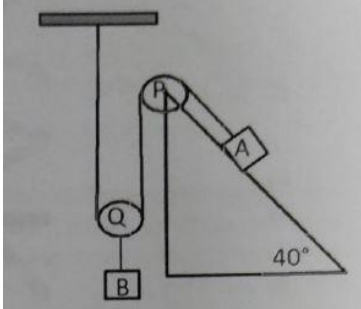
MODULE III

1	<p>Find the moment of inertia of shaded area about the horizontal and vertical centroidal axis. All dimensions in cm</p> 	14 Marks	KTU 2024
2	<p>A force P is directed from a point A(4,1,4) meters towards a point B (-3,4,1)metres. Determine the moment of force P about x and y axis if it produces a moment of 1000Nm about z axis</p>	14 Marks	KTU 2023
3	<p>A force $2i+4j-3k$ is applied at the point A(1,1,-2). Find the moment of the force about the point (2,-1,2)</p>	3 marks	KTU Dec 2022
4	<p>Calculate the area moment of inertia of a rectangular cross-section of breadth 'b' and depth 'd' about the centroidal horizontal axis</p>	3 marks	KTU Dec 2019
5	<p>Find the centroid of the shaded area shown</p> 	14 marks	KTU July 2021
6	<p>State Pappus Guldinus theorems.</p>	3 marks	KTU July 2021
7	<p>Find the resultant of the force system shown in fig in which P= 280N,Q= 260 N and R= 210 N</p> 	14 Marks	KTU July 2021

8	<p>A rectangular hole is made in a triangular section as shown. Find moment of inertia about the section x-x passing through the CG of the section and parallel to BC</p> 	14 Marks	KTU Model Question Paper
9	<p>Support A has ball and socket connection. Roller support at B prevents motion in the - z direction. Corner C is tied to D by a rope. The triangle is weightless. Determine the unknown force components acting at A, B, and C</p> 	14 Marks	KTU Model Question Paper
10	State and explain perpendicular axis theorem	3 marks	KTU Model Question Paper

MODULE IV

1	<p>An object of mass 5 kg is projected with a velocity of 20m/s at an angle of 60° to the horizontal. At the highest point of its path the projectile explodes and breaks up into two fragments of masses 1kg and 4kg. The fragments separate horizontally after explosion. The explosion releases internal energy such that KE of the system at the highest point is doubled. Calculate the separation distance between two fragments when they reach the ground</p>	14 Marks	KTU 2024
2	<p>A block of mass M_1 resting on an inclined plane is connected by a string and pulleys to another block of mass M_2 as shown in Fig. Find the tension in the string and acceleration of the blocks. Assume</p>	14 Marks	KTU 2023

	<p>the coefficient of friction between the blocks M1 and the plane to be 0.2. $M_1 = 1500\text{N}$, $M_2 = 1000\text{N}$. Angle of inclined plane = 45°.</p> 		
3	<p>Determine the tension in the inextensible string and the acceleration of the masses. Consider the pulley as massless and coefficient of friction as 0.20. Block A = 200kg and block B = 100 Kg.</p> 	14 marks	KTU July 2021
4	<p>A glass ball is dropped on to a smooth horizontal floor from which it bounces to height of 9 m. On the second bounce, it rises to a height of 6m. From what height the ball was dropped and what is the coefficient of restitution between the glass and the floor</p>	5 marks	KTU July 2021
5	<p>Two cars A and B travelling in same direction get stopped at a traffic signal. When signal turns green, car A accelerates at 0.75m/s^2 and 1.75 seconds later, car B starts and accelerates at 1.1m/s^2, Determine i) when and where B will overtake and ii) the speed of each car at that time</p>	9 marks	KTU July 2021
6	<p>Differentiate between curvilinear motion and Projectile motion</p>	3 marks	KTU July 2021
7	<p>A body is projected at an angle such that the horizontal displacement is 3 times that of maximum height. Find the angle of projection</p>	3 marks	KTU July 2021
8	<p>A cricket ball is thrown by a fielder from a height of 2 m at an angle of 30° to the horizontal with an initial velocity of 20 m/s, hits the wickets at a height of 0.5 m from the ground. How far was the fielder from the wicket?</p>	14 marks	KTU model question paper

9	An engine of weight 500 kN pull a train weighing 1500 kN up an incline of 1 in 100. The train starts from rest and moves with constant acceleration against a resistance of 5 N/kN. It attains a maximum speed of 36 kmph in 1 km distance. Determine the tension in the coupling between train and engine and the traction force developed by the engine.	14 marks	KTU model question paper
10	Explain D'Alembert's principle	3 marks	KTU Model question paper

QUESTION BANK

First Semester GY MAT 101 : MATHEMATICS FOR ELECTRICAL SCIENCE AND PHYSICAL SCIENCE

Module 1			
Sl. No	Questions	Marks	KU/KTU
1	Solve the system of equations by Gauss elimination method $\begin{aligned}x+2y+3z &= 1 \\23y+2z &= 2 \\3x+3y+4z &= 1\end{aligned}$	7	KTU Mar 2017 Dec 2019 Dec 2021 Feb 2022
2	What kind of conic section or pair of straight lines is given by the quadratic form $3x^2 + 22xy + 3y^2 = 0$ express $(x, y)^T$ in terms of new coordinates.	7	KTU Dec 2016 Dec 2021 Dec 2022
3	Determine the rank of the matrix $A = \begin{bmatrix} 1 & 1 & 1 \\ 1 & 2 & 3 \\ 1 & 2 & 5 \end{bmatrix}$ $B = \begin{bmatrix} 3 & 0 & 2 & 2 \\ -6 & 42 & 24 & 54 \\ 21 & -21 & 0 & -15 \end{bmatrix}$	3 +3	KTU Mar 2017 Dec 2019 Sept 2021 Feb 2022 May 2024
4	Find the eigenvalues and eigenvectors of $A = \begin{bmatrix} 4 & 2 & -2 \\ 2 & 5 & 0 \\ -2 & 0 & 3 \end{bmatrix}$	7	KTU Mar 2017 Dec 2019 Sept 2021 Dec 2022

5	<p>Find the values of β and μ for which the system of equations</p> $2x + 3y + 5z = 9$ $7x + 3y + -2z = 8$ $+ 2x + 3y + \beta z = \mu$ <p>has (i) no solution, (ii) a unique solution (iii) infinite solution</p>	7	<p>KTU Dec 2019 Dec 2022 Feb 2023</p>
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6	<p>Find the matrix of transformation that diagonalize the matrix .</p> $A = \begin{bmatrix} 3 & 1 & -1 \\ -2 & 1 & 2 \\ 0 & 1 & 2 \end{bmatrix}$ <p>Also, find the diagonal matrix</p>	7	<p>KTU Dec 2018 Dec 2019 May 2024</p>
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7.	<p>Find the matrix of transformation that diagonalize the matrix</p> $A = \begin{bmatrix} -19 & 7 \\ -42 & 16 \end{bmatrix}$ <p>Also write the diagonal matrix.</p>	7	<p>KTU Dec 2019 Dec 2022</p>
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8	<p>If 2 is an eigen value of $\begin{bmatrix} 3 & -1 & 1 \\ -1 & 5 & -1 \\ 1 & -1 & 3 \end{bmatrix}$, without using its characteristic equation, find the other eigen values. .</p>	7	<p>KTU Sept 2021 Dec 2024</p>
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9	<p>Reduce to echelon form and hence find the rank of the matrix</p> $A = \begin{bmatrix} 3 & 0 & 2 \\ -6 & 4 & 2 \\ 24 & 2 & 1 \\ -2 & 1 & 0 \end{bmatrix}$	7	<p>KTU Mar 2017 Sept 2021 Sep 2023</p>
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10	<p>Solve the following system of equations? y</p> $+ z - 2w = 0$ $2x - 3y - 3z + 6w = 2$ $+ y + z - 2w = 4$	7	<p>KTU Mar 2017 Dec 2018 Sept 2021</p>
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Module 2			
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1	Solve $(D^3 + 8)y = \cos x + e^{-2x}$	7	KTU MAY-2017 Dec 2024
2	Solve $y'' + 4y' + 4y = x^2 + e^{-x} \cos x$	7	KTU June 2023 Sep 2021
3	Solve the initial value problem $y'' + 5y' + 6y = 0$, $y(0) = 1$, $y'(0) = 2$	3	KTU-June 2022 Dec 2018

4	Solve $y''' - y' = 0$	3	KTU-June 2022 May 2024
5	Solve the initial value problem ,by method of undetermined coefficients $y'' + 4y = 8x^2$, $y(0) = -3$, $y'(0) = 0$	7	KTU May 2024
6	Solve $y'' + y' - 6y = 12e^{3x} + 12e^{-2x}$	7	KTU 2023 June Mar 2017
7	Using the method of variation of parameters ,find the general solution of the non homogeneous ODE $y'' + 4y = \tan 2x$	7	KTU May 2024 Dec 2019
8	Find the wronskian corresponding to the solution of the equation $y'' + 3y' + 2 = 0$	3	KTU 2023 JUNE

9	Using the method of undetermined coefficients solve, $y'' - 4y = xe^x$	7	KTU-June 2022 Dec 2019
10	Using the method of variation of parameters solve, $y'' - 4y' + 5y = \frac{e^{2x}}{\sin x}$	7	KTU may 2024
Module 3			
1	Find the laplace transform of $\sin 4t \cos 3t$	3	KTU may 2024 Dec 2019
2	Evaluate $L^{-1} \frac{2}{((s+4)^3)}$	3	KTU may 2023 Mar 2017
3	Find the inverse Laplace transform of $\frac{s}{(s^2+a^2)^2}$ (using convolution)	7	KTU may 2022
4	Using laplace transform solve $y'' + 5y' + 6y = e^{-t}$, $y(0) = 0$, $y'(0) = 1$	7	KTU dec 2023 Dec 2018
5	Evaluate $L^{-1} \frac{2s+1}{s^2+2s+5}$	7	KTU may 2024
6	Find $L^{-1} \left[\frac{s^2-1}{s^2-5s+6} \right]$	7	KTU may 2024 June 2022
7	Find $L^{-1} \frac{1}{(s+1)^2}$	3	KTU march 2017

			2023 Feb
8	Use convolution theorem to find $L^{-1}\left[\frac{1}{(s^2+4)^2}\right]$	7	KTU Dec 2023
9	Using Laplace transform solve the initial value problem $y'' - 2y' - 3y = 2 \sin t$, $y(0) = 0$, $y'(0) = 0$	7	KTU Sep 2021 May 2023
10	Evaluate $L(e^{2t} \cos 3t)$	3	KTU May 2024
Module 4			
1	(a) Find the half range cosine series of $x \sin x$ in $(0, \pi)$	3	KTU Dec 2023
2	(a) Find the Taylor series for $f(x) = \ln x$ at $x=1$	3	KTU Dec 2019
3	Obtain the half range Fourier sine series of $f(x) = \begin{cases} x, & 0 < x < \frac{\pi}{2} \\ \pi - x, & \frac{\pi}{2} < x < \pi \end{cases}$	7	KTU Dec 2021 May 2024
5	Obtain the half range Fourier sine series of $f(x) = \begin{cases} x, & 0 < x < 1 \\ 2 - x, & 1 < x < 2 \end{cases}$	7	KTU Dec 2021 Dec 2022
6	Find the Fourier series of $f(x) = x - x^2$ in the interval $(-\pi, \pi)$. Hence evaluate $\frac{1}{1^2} - \frac{1}{2^2} + \frac{1}{3^2} - \dots$.	7	KTU Dec 2023
7	Find the Fourier series of $f(x) = x $ in the interval $(-\pi, \pi)$. Hence evaluate $1 + \frac{1}{3^2} + \frac{1}{5^2} + \dots$	7	KTU may 2024 Mar 2017
8	Find the Fourier series of $f(x) = \begin{cases} -k & \text{if } -\pi < x < 0 \\ k & \text{if } 0 < x < \pi \end{cases}$ in $(-\pi, \pi)$	7	KTU Dec 2022 June 2023

9	Find the Taylor series for $\frac{1}{1+x}$ about the point $x = 1$	3	KTU Dec 2023
10	(a) Find the Fourier <u>half</u> range sine series of $x \cos x$ in $-\pi < x < \pi$	3	KTU may 2024

IME Question Bank

Module 1

Sl. No	Question	Marks	Year
1	Derive the expression for efficiency of Carnot Cycle.	10	2019,2021,2024
2	Explain the Working theory of Carnot	3	2023
3	An engine working on diesel cycle has a diameter of 150mm and stroke 200mm. The clearance volume is 10% of the swept volume. Determine the compression ratio and air standard efficiency of the engine if the cut off takes place at 6% of the stroke.	10	2022
4	Explain the working and Parts of 2 stroke and 4 stroke petrol and diesel engine.	10	2021 S
5	Difference between 2 stroke and 4 stroke engine and SI and CI engine.	3	2020
6	Explain the working and difference of CRDI and MPFI engines	3	2022
7	Explain the impracticability of Carnot Cycle	3	2022
8	Explain the term Refrigeration. What is the Unit of Refrigeration	3	2019,2021
9	Explain the working Reversed Carnot Cycle with PV Diagram	5	2019 S
10	Explain the working of Vapour Compression Refrigeration System	5	2021,2022

11	What is Psychrometry and explain Psychrometric Chart	3	2022,2021 S
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Module 2

Sl. No	Question	Marks	Year
1	Explain the working of Reciprocating Pumps	5	2024
2	Explain the working of Centrifugal Pumps.	5	2022 S
3	Explain the working of Francis Turbine	5	2022
4	Explain the working of Kaplan Turbine	5	2021
5	Explain Drive Mechanism of Chain Drive, Gear drive.	5	2020
6	Explain the working of Single Plate Clutch	5	2019 S
7	Explain Sand Casting with Diagram	10	2023
8	Explain Welding Process. What are the different types of welding processes?	10	2021 S
9	Explain Additive Manufacturing with examples	3	2022
10	Difference between Brazing and Soldering	3	2019
11	Diagram and Working of Lathe Machine, Drilling Machine and Milling Machine	10	2022 S

GCEST104: BASICS OF CIVIL ENGINEERING

MODULE 3

SL NO.	QUESTIONS	YEAR	Mark
1	List out & explain any 6 disciplines of civil	2022,2023,2024	6
2	Explain the classification of building as per NBC based on occupancy.	2024,2023	6
3	List out the role of civil engineering in infrastructural development?	2024,2022,2020	3
4	Factors effecting site selection.	2021	6
5	How can you classify the buildings based on occupancy?	2022,2023	3
6	Describe the components of a residential building with neat	2023,2021	4
7	Explain (a) Plinth area, (b) built-up area, (c) floor area, (d) floor area ratio (FAR) for a building as per Kerala Building Rules (KBR).	2022	4
8	What are the norms of Coastal Regulatory Zone (CRZ)?	2022	4

MODULE 4

1	What are constituents of good brick earth?	2023,2021	3
2	Explain quality classification of bricks.	2021	3

3	What is the composition of OPC?	2023,2021	3
4	What are the different types of cement available & their use?	2021	5
5	What are the Market Forms of STEEL available?	2021,2022	6
6	List out any two examples for prefabricated building components stating any two advantages of using them in construction.	2024, 2022	4
7	Differentiate plain cement concrete and reinforced cement concrete.	2022	4
8	List any 4 types of timber, stating their use in building construction	2023)	4

**GZPHT121-PHYSICS FOR PHYSICAL SCIENCE
QUESTION BANK**

MODULE 1-LASER AND FIBER

OPTICS

Sl. No	Questions	Marks	KTU, Year
1	Explain the construction and working of a ruby laser with schematic and energy level diagrams.	10	KTU AUG 23 KTU AUG 22
2	With a block diagram explain the working of an optical fiber communication system. Why fiber optic communication system is preferred over other types of communication techniques? Give any three applications of optical fibers.	8	KTU DEC 23 KTU MAY 24
3	What is the numerical aperture and acceptance angle of optic fibre cable? How are they related? Derive an expression for numerical aperture of an optical fibre cable in terms of refractive indices of core and cladding.	10	KTU DEC 23 KTU DEC 22 KTU MAY 24
4	Draw the block diagram of a laser system. Explain the roles of (i) Active medium (ii) Pump source and (iii) Resonator cavity in the working of a laser.	10	KTU DEC 23
5	Explain the working of a semiconductor laser. Mention any two of its applications with the property of the laser used.	6	KTU JUNE 22 KTU DEC 23
6	Numerical aperture of an optic fibre cable is 0.5565 and refractive index of cladding is 1.464 . Calculate the refractive index of core and acceptance angle	4	KTU AUG 23 KTU DEC 23
7	The numerical aperture of the optical fibre is 0.295 and refractive index of core is 1.54. calculate the refractive index of cladding and acceptance angle	4	KTU DEC 23 KTU MAY 24
8	Using a well labeled diagram explain how radiation is interacted with matter in the process of spontaneous emission and stimulated emission? Which of the process maximized for laser emission?	4	KTU AUG 23 KTU JUNE 24
9	What are the advantages of an optical fiber communication system?	3	KTU DEC 23 KTU MAY 24
10	What are the differences between spontaneous and stimulated emission? Distinguish between step index and graded index fibers	3	KTU AUG 23 KTU MAY 24
11	Differentiate between spontaneous emission and stimulated emission.	3	KTU AUG 23 KTU MAY 24

MODULE 2-INTERFERENCE AND DIFFRACTION

1	Explain the formation of Newton's rings and show that the radius of the dark ring is proportional to the square root of natural numbers. How can we use Newton's rings experiment to determine the refractive index of a liquid?	10	KTU AUG 23 KTU AUG 22
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2	Describe the experiment to find the refractive index of a liquid using Newton's rings arrangement	10	KTU DEC 23 KTU JUNE 24
3	Derive grating equation with proper diagram. What is the effect of increasing the number of lines on the dispersive power of grating?	10	KTU DEC 2023 KTU DEC 22
4	Explain principle of superposition of waves. Derive the conditions for constructive and destructive interference of reflected light from a thin film.	10	KTU DEC 23 KTU AUG 23 KTU JUNE 24
5	Explain the construction of a diffraction grating and derive grating equation.	10	KTU JUNE 22 KTU DEC 23
6	At what angle will 650 nm light produce a second order maximum when falling on a grating whose grating element is 1.2×10^{-3} cm.	4	KTU AUG 23 KTU DEC 23
7	In Newton's ring experiment, the diameter of the 5 th dark ring due to wavelength 5020 \AA in air is 0.2 cm .Find radius of curvature of lens.	8	KTU DEC 2023
8	Explain with a neat diagram Rayleigh criterion of resolution.	4	KTU AUG 2023 KTU JUNE 24
9	Why interference fringes of Newton's rings are circular in shape?	3	KTU DEC 23
10	How can you test the optical planeness of a glass plate by air wedge method?	3	KTU AUG 23
11	Distinguish between Fresnel and Fraunhofer classes of diffraction	3	KTU AUG 23 KTU DEC 22 KTU MAY 24

MODULE 3-QUANTUM MECHANICS

1	<p>a) What are matter waves? Obtain an expression for de Broglie wavelength. Derive expressions for the de Broglie wavelength of an electron (i) accelerated from rest through a potential of V volts (ii) having kinetic energy T.</p> <p>b) An electron is confined to one dimensional potential box of width 25 \AA. Calculate the energies corresponding to the first and second quantum states in eV.</p>	10	KTU AUG 23
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2	State Heisenberg's uncertainty principle. Write its mathematical form with different pairs of variables. With the help of it, explain the absence of electrons inside the nucleus of an atom.	10	KTU DEC 2023 KTU DEC 22
3	Write down Schrodinger's time dependent equation and hence derive Schrodinger's time independent equation.	10	KTU DEC 2023 KTU DEC 22

4	Formulate the time dependent Schrodinger's equation starting from the plane wave equation and deduce the time independent Schrodinger equation.	5 9	KTU AUG 2023 KTU DEC 22
5	Write the differential equation representing a particle confined within one dimensional infinite square well potential and obtain the permissible energy values and their corresponding normalized wave functions.	10	KTU JUNE 24 KTU AUG 2023
6	The time gap between the excitation of an atom and emission of radiation is 10-8 second. Find the uncertainty in the frequency of radiation.	4	KTU JUNE 24 KTU AUG 2022
7	Calculate the voltage that must be supplied to an electron microscope to produce an electron of wavelength 3 \AA .	4	KTU DEC 2023
8	What are the conditions of a well behaved wave function?	3	KTU DEC 2023
9	What is meant by quantum mechanical tunneling? Name two electronic devices based on this phenomenon	3	KTU AUG 2023
10	An electron and a Proton are moving with the same kinetic energy. Which one has a shorter wavelength? Why ?	4	KTU DEC 2021

MODULE 4-WAVES AND ACOUSTICS

1	a) Explain any six factors affecting the acoustics of a building and give their remedies.	10	KTU MAY 24 KTU AUG 202
	b) A hall has a volume of 7500m^3 . What should be the total absorption in the hall, if a reverberation time of 2.3s is to be maintained?	4	KTU AUG 22
2	a) Obtain an expression for fundamental frequency of transverse vibrations in a stretched string.	10	KTU MAY 24 KTU AUG 2023
	b) A string of mass 0.65 kg is stretched between two supports 30 m apart. If the tension in the string is 160 N, find the velocity of the wave in the string? How long will a pulse take to travel from one support to the other?	4	KTU AUG 22
3	a) With a neat circuit diagram explain the principle and working of piezoelectric oscillator.	10	KTU MAY 24
	b) An ultrasonic source of 0.09MHz sends down a pulse towards the sea bed which return after 0.55s. The velocity of sound in water is 1800m/s. Calculate the depth of the sea.	4	KTU AUG 2023

4	Define Reverberation, Echo, Loudness, Echelon effect and Noise that affect the acoustics of an auditorium. Explain how they are controlled?	10	KTU AUG 2023 KTU AUG 22
5	A string when stretched by a weight of 2 kg gives a note of frequency 112 Hz. What weight will produce a frequency twice the above frequency?	4	KTU MAY 24 KTU AUG 2022
6	The displacement of a wave is represented by $y = 0.25 \times 10^{-3} \sin(0.025x - 500t)$, where x is measured in meters and t in secs. Deduce amplitude, time period, velocity and wavelength?	4	KTU JUNE 2022 KTU AUG 2022
7	An auditorium has dimensions of $35 \times 15 \times 6$. The average absorption coefficient of wall, ceiling and floor are 0.03, 0.36, and 0.26 respectively. Evaluate reverberation time of the hall	4	KTU MAY 24 KTU AUG 2023
8	What would be the fundamental frequency of transverse vibration of stretched string for following – When length of string is reduced by one-half of its initial value. When tensional force applied is increased by twice of its initial value.	3	KTU JUNE 24 KTU AUG 23
9	List two differences between longitudinal and transverse waves. Give one example for each.	3	KTU AUG 23
10	What is SONAR? Write any one application of SONAR.	3	KTU MAY 24 KTU AUG 21