QUESTION BANK

S3 CE

QUESTION BANK

THIRD SEMESTER (2020)

MAT201 PARTIAL DIFFERENTIAL EQUATIONS & COMPLEX ANALYSIS

(For EEE, ECE, CE & ME)

MODULE I			
1	Solve $(y-z)p + (x-y)q = (z-x)$	3	KTU JULY 2017
2	Form the partial differential equation from $z = xg(x) + yf(x)$	3	KTU JULY 2017
3	Solve $(mz-ny)p + (nx-lz)q = ly-mx$	5	KTU JULY 2017
4	Find the partial differential equation representing the family of spheres whose Centre lies on z- axis	3	KTU JULY 2018
5	Find the general solution of $(y^2 + z^2)p - xyz\ q = -xz$	6	KTU JULY 2018
6	Find the partial differential equation z=x f(x) +y e^2	3	Model qp 2020
7	Solve 3z = xp + yq	3	Model qp 2020
8	Solve $(p^2 + q^2)$y = qz	7	Model qp 2020
9	Derive pde from the relation z = f(x + at) + g(x + at)	3	Model qp 2020
10	Use Charpit's methods to solve $q + xp = p^2$	7	Model qp 2020
11	Find the differential equation of all spheres of fixed radius having their centers in the xy plane.	7	Model qp 2020
12	Find the PDE by eliminating arbitrary function f and g from $z = f(x) + g(y)$	3	KTU Dec 2021
13	Solve $y^2p - xyq = xz$	7	KTU Dec 2021
14	Find the complete integral of $px + qy = pq$ using Charpit's method	7	KTU Dec 2021
15	Form the PDE corresponding to family of sphere with centre on z-axis and radius a	7	KTU Dec 2021
16	Solve $\frac{\partial^2 z}{\partial x^2} = xy$	3	KTU Dec 2021
17	Solve by method of separation of variables $\frac{\partial u}{\partial x} + \frac{\partial u}{\partial y} = 0$, $u(x,0) = 4e^{-3x}$	7	KTU Dec 2021
MODULE 2			
1	Write any three assumptions involved in the derivation of the one dimensional wave equation.	3	KTU July 2018
2	A string of the length *l* fastened at both ends. The midpoint of the string is taken to a height *h* and the released from the rest in that position .Writethe boundary condition and the initial conditions of the string to find the displacement function y(x, t) satisfying the one dimensional wave equation.	3	KTU July 2018

3	Using method of separation of variables, solve $\frac{\partial u}{\partial x} = 2\frac{\partial u}{\partial t} - u$, $u(x,0) = 5e^{-3x}$	2	KTU July 2018
4	A tightly stretched string of length l fastened at both ends is initially in aposition given by y = kx, 0< $x < l$. If it is released from the rest from this position ,find the displacement y(x, t) at any time t and any distance x fromthe end x=0	5	KTU July 2018
5	Solve the one dimensional wave equation $\frac{\partial^2 u}{\partial t^2} = c^2\frac{\partial^2 u}{\partial x^2}$ with boundary conditions $u(0,t) = 0,\ u(l,\ t) = 0$ for all t and the initial conditions $u(x,0) = f(x), \frac{\partial u}{\partial t}$	10	KTU July 2018
6	A string of length 20 cm fixed at both ends is displaced from its position of equilibrium position. Find the displacement $u(x,t)$ of this string if it is set vibrating by giving each of its points a velocity $v_0 \sin(\frac{\pi x}{a})$	10	KTU June 2016
7	A tightly stretched string of length 'a' with fixed ends is initially in equilibrium position. Find the displacement u(x, t) of the string if it is setvibrating by giving each of its points a velocity $v_0\ sin^3(\frac{\pi x}{a})$	10	KTU Aug 2016
8	A tightly stretched string of length L is fixed at both ends. Find thedisplacement u(x, t) if the string is given an initial displacement f(x) and an initial velocity g(x).	10	KTU Dec 2018
9	A string of length 20 cm fixed at both ends is displaced from its position of equilibrium, by each of its points an initial velocity given by $(x) = \begin{cases} x,\ 0 \le x \le 10 \\ 20 - x, 10\ \le x \le 20 \end{cases}$, x being the distance from one end. Determine the displacement at any subsequent time.	10	KTU May 2017
10	A tightly stretched string with fixed endpoints x=0 and x=l is initially in aposition given by $u = v_0 sin^3\left(\frac{\pi x}{a}\right), 0 \le x \le l$. If it is released from rest from this position, find the displacement function u(x, t).	10	KTU Dec 2018
11	Solve one dimensional heat equation when k > 0	3	KTU May 2017
12	Write down possible solutions of one dimensional heat equation	3	KTU May 2017
13	Derive one dimensional heat equation	10	KTU May 2017, Dec 2021
14	Find the temperature in a laterally insulated bar of length L whose endsare kept at temperature 0℃, assuming that the initial temperature is $f(x) = \begin{cases} x,\ 0 < x < \frac{L}{2} \\ L - x,\ \frac{L}{2} < x < L \end{cases}$	10	KTU May 2017
15	Write down the fundamental postulates used in the derivation of one dimensional heat equation.	3	KTU July 2018
16	Find the temperature distribution in a rod of length 3m whose end pointsare maintained at temperature zero and the initial temperature is $f(x) = 100(2x - x^2), 0 \le x \le 2$	7	KTU March 2017

17	Write the 3 possible solution of one dimensional wave equation	3	KTU Dec 2021
18	Write any 2 assumptions used in the derivation of one-dimensional heat equation	3	KTU Dec 2021
19	Solve the boundary value problem described by $u_{tt} - c^2 u_{xx} = 0, 0 \leq x \leq l, t \geq 0, u(0,t) = u(l,t) = 0, t \geq 0, u(x,0) = 10 \sin\left(\frac{\pi x}{l}\right), \frac{\partial u}{\partial t}(x,0) = 0$	7	KTU Dec 2021
20	Find the temperature $u(x,t)$ in a homogeneous bar heat conducting material of length l whose ends kept at $0°C$ and whose initial temperature is given by $u(x,0) = lx - x^2$	7	KTU Dec 2021
21	Derive the one dimensional wave equation	7	KTU Dec 2021
22	The ends A and B of a rod 10 cm in length are kept at temperature 0℃ and 100℃ until the steady state condition prevails. If B is suddenly reduced to 0℃ and kept so. Find the temperature distribution in the rod at time t.	7	KTU Dec 2021
MODULE 3			
1	Show that $u = y^3 - 3x^2y$ is harmonic and hence find its harmonic conjugate.	8	KTU DEC 2016
2	Define an analytic function and prove that an analytic function of constant modulus is constant.	8	KTU DEC 2016
3	Check whether the following functions are analytic or not. Justify your answer i) $f(z) = z + \bar{z}$ ii) $f(z) = \lvert z \rvert^2$	4+4	KTU March 2017
4	Show that $f(z) = \sin z$ is analytic for all z. Find $f'(z)$	7	KTU March 2017
5	Show that $v = 3x^2y - y^3$ is harmonic and find the corresponding analytic function	8	KTU March 2017
6	Let $(z) = u(x, y) + i\, v(x, y)$ be defined and continuous in some neighborhood of a point $z = x + iy$ and differentiable at z itself. Then provethat the first order partial derivatives of u and v exist and satisfy Cauchy- Riemann equations	7	KTU April 2018
7	Prove that $u = \sin x \cosh y$ is harmonic. Hence find its harmonic conjugate.	8	KTU April 2018
8	Check whether the function $f(z) = \begin{cases} \frac{Re(z^2)}{\lvert z \rvert^2}, if\ z \neq 0 \\ 0,\ if\ z = 0 \end{cases}$ is continuous at $z = 0$.	7	KTU April 2018
9	Let f (z) = u + iv is analytic, prove that u = constant, v = constant are families of curves cutting orthogonally	7	KTU July 2017
10	Prove that the function u(x, y) = $x^3 - 3xy^2 - 5y$ is harmonic everywhere. Also find the harmonic conjugate of u.	8	KTU July 2017
11	Find the points, if any in complex plane where the function $f(z) = 2x^2 + y + i(y^2 - x)$ is (i) Differentiable (ii) Analytic	8	KTU July 2017

12	Find the analytic function whose imaginary part is $v(x, y) = log(x^2 + y^2) + x - 2y$.	7	KTU May 2019
13	Find the image of $\left\|z - \frac{1}{2}\right\| \leq \frac{1}{2}$ under the transformation $w = \frac{1}{z}$, also find the fixed points of the transformations $w = \frac{1}{z}$	7	KTU Dec 2016
14	Find the image of the lines x = c and y = k where c and k are constants under the transformation w = $sin\ z$	7	KTU Dec 2016
15	Find the image of $0 < x < 1, \frac{1}{2} < y < 1$ under the mapping $w = e^z$	7	KTU March 2017, Sept 2020
16	Find the image of the rectangular region $-\pi \leq x \leq \pi, a \leq y \leq b$ under the mapping $w = sin\ z$	8	KTU March 2017
17	Find the image of the region $\left\|z - \frac{1}{3}\right\| \leq \frac{1}{3}$ under the transformation $w = \frac{1}{z}$	8	KTU April 2018
18	Under the transformation $w = z^2$, find the image of the triangular region bounded by $x = 1, y = 1$ and $x + y = 1$	8	KTU May 2019, KTU Sept 2020
19	Find the image of the half plane Re(z) ≥ 2, under the map w = iz	8	KTU July 2017
20	Under the transformation $w = 1/z$, find the image of $\|z - 2i\| = 2$.	8	KTU May 2019
21	Check whether the function $f(z) = \begin{cases} \frac{Re(z^2)}{1-\|z\|}, if\ z \neq 0 \\ 0,\ if\ z = 0 \end{cases}$ is continuous at $z = 0$	7	KTU Sept 2020
22	Determine a so that $u = e^{-ax} \cos ay$ is harmonic and find the harmonic conjugate.	8	KTU Sept 2020
23	Show that $f(z) = e^z$ is analytic for all z	8	KTU Sept 2020
24	Test the continuity at $z = 0$ of $f(z) = \begin{cases} \frac{Im(z)}{\|z\|}, & z \neq 0 \\ 0, & z = 0 \end{cases}$	3	KTU Dec 2021
25	Check whether $f(z) = \bar{z}$ is an analytic function.	3	KTU Dec 2021
26	Show that an analytic function $f(z) = u + iv$ is a constant if its modulus is constant.	7	KTU Dec 2021
27	Find the image of $1 \leq \|z\| \leq 2, \frac{\pi}{6} \leq \theta \leq \frac{\pi}{3}$ under the mapping $w = z^2$	7	KTU Dec 2021
28	Verify whether $u = x^3 - 3xy^2$ is harmonic and find its conjugate harmonic function v.	7	KTU Dec 2021
29	Find the image of the region between real axis and a line parallel to real axis at $y = \frac{\pi}{2}$ under the mapping $W = e^z$.	7	KTU Dec 2021
MODULE 4			
1	Evaluate $\int_c Re(z)\, dz$ where c is the straight line from $0\ to\ 1 + 2i$	7	KTU Dec 2016
2	Show that $\int_0^\infty \frac{1}{1+x^4} dx = \frac{\pi}{2\sqrt{2}}$	8	KTU Dec 2016

3	Integrate $\frac{z^2}{z^2-1}$ counter clockwise around the circle $\|z-1-i\|=\frac{\pi}{2}$	7	KTU Dec 2016
4	Evaluate $\int_c \|z\|dz$ (i) Where c is the line segments joining i and $-i$ (ii) Where c is the unit circle in the left of the half plane.	4+3	KTU March 2017
5	Verify Cauchy-Integral theorem for z^2 taken over the boundary of the rectangle with vertices $-1, 1, 1+i, 1-i$ in the counter clockwise sense.	8	KTU March 2017
6	Evaluate $\int_c Im(z^2)dz$ where c is the triangle with vertices 0, 1, i counter clockwise	7	KTU April 2018
7	Find the Taylor series and Laurent series of $f(z)=\frac{-2z+3}{z^2-3z+2}$ with centre 0 in (i) $\|z\|<1$ (ii) $1<\|z\|<2$	8	KTU April 2018
8	Use Cauchy's Integral formula evaluate $\int_c \frac{z^2}{z^3-z^2-z+1}\,dz$ where c is taken counter clockwise around the circle (i) $\|z+1\|=\frac{3}{2}$ (ii) $\|z-1-i\|=\frac{\pi}{2}$	8	KTU April 2018
9	Find the Laurent series expansion of $f(z)=\frac{1}{1-z^2}$ which is convergent in (i) $\|z-1\|<2$ (ii) $\|z-1-i\|>2$	8	KTU March 2017
10	If $f(z)=\frac{1}{z^2}$, find the Taylor series that converges in$\|z-i\|<R$ and the Laurent series that converges in $\|z-i\|>R$	8	KTU Dec 2016
11	Using Cauchy's Integral formula evaluate $\int_c \frac{e^z}{(z^2+4)(z-1)^2}\,dz$ where c is the circle $\|z-i\|=2$	7	KTU May 2019
12	Evaluate $\int_0^{2+i}(\bar{z})^2\,dz$ along (i) The real axis to 2 and then vertically to $2+i$ (ii) The line $2y=x$	8	KTU May 2019
13	Evaluate $\int_0^{1+2i}\bar{z}\,dz$ along $z=t^2+it$	7	KTU Sept 2020
14	Evaluate $\int_{c^-}^{4+2i}\frac{2z-1}{z^2-z}\,dz$ along the curve c: $\|z\|=3$ using Cauchy's Integral formula	8	KTU Sept 2020
15	Find the Maclaurin series of $f(z)=\sin z$	3	KTU Dec 2020
16	Evaluate $\oint_c \ln z\,dz$, where c is the unit circle $\|z\|=1$.	3	KTU Dec 2020
17	Evaluate $\int_C \|z\|^2\,dz$, where C is the circle $\|z\|=2$.	7	KTU Dec 2021
18	Evaluate $\int_C \frac{z^2+2}{(z-3)^2}dz$, where C is the circle $\|z\|=4$ using the Cauchy's integral formula.	7	KTU Dec 2021
19	(a) Evaluate $\oint_c \frac{e^z}{(z-1)(z-4)}dz$, where c is $\|z\|=2$ using the Cauchy's integral formula.	7 + 7	KTU Dec 2021

	(b) Evaluate $\int \frac{3z^2+7z}{z+1} dz$ over (i) $\|z\| = 1.5$ (ii) $\|z+i\| = 1$		
20	Evaluate $\oint_c \frac{e^z}{z-5} dz$, where c is the circle $\|z\| = 4$	3	KTU Dec 2021
21	Find the Taylor series expansion of e^z about $z = \pi$.	3	KTU Dec 2021
Module 5			
1	Define three types of isolated singularities with an example for each	7	KTU Dec 2016
2	Determine the nature and type of singularities of (i) $\frac{e^{-z^2}}{z^2}$ (ii) $\frac{1}{z}$	7	KTU March 2017
3	Use Residue theorem to evaluate $\int_c \frac{30z^2-23z+5}{(2z-1)^2(3z-1)} dz$ where c is $\|z\| = 1$.	7	KTU March 2017
4	Evaluate $\int_0^\infty \frac{1}{(1+x^2)^2} dx$ using residue theorem	8	KTU March 2017
5	Determine and classify the singular points for the following functions (i) $f(z) = \frac{\sin z}{(z-\pi)^2}$ (ii) $g(z) = (z+i)^2 e^{\frac{1}{z+i}}$	7	KTU April 2018
6	Evaluate $\int_{-\infty}^{\infty} \frac{1}{(1+x^2)^3} dx$	8	KTU April 2018
7	Evaluate $\int_{-C} \frac{\tan z}{z^2-1} dz$ counter clockwise around c: $\|z\| = \frac{3}{2}$ using Cauchy's Residue theorem	7	KTU April 2018
8	Using contour integration evaluate $\int_{-\infty}^{\infty} \frac{x^2-x+2}{x^4+10x^2+9} dx$	7	KTU July 2017
9	Evaluate $\int \log z \ dz$, where C is the circle $\|z\| = 1$.	7	KTU May 2019
10	Evaluate $\int \frac{1}{5-3\sin\theta} d\theta$	8	KTU May 2019
11	Find all singular points and residues of the functions (a) $f(z) = \frac{(z-\sin z)}{z^2}$ (b) $f(z) = \tan z$	8	KTU May 2019
12	Evaluate $\int_{-\infty}^{\infty} \frac{x^2}{(x^2+1)(x^2+4)} dx$	8	KTU May 2019
13	Find the Laurent series expansion of $f(z) = \frac{1}{z^2+3z+2}$ in the region $1 < \|z\| < 2$	8	KTU Sept 2020
14	Find all singularities and corresponding residues $\frac{8}{1+z^2}$, $\tan z$	8	KTU Sept 2020

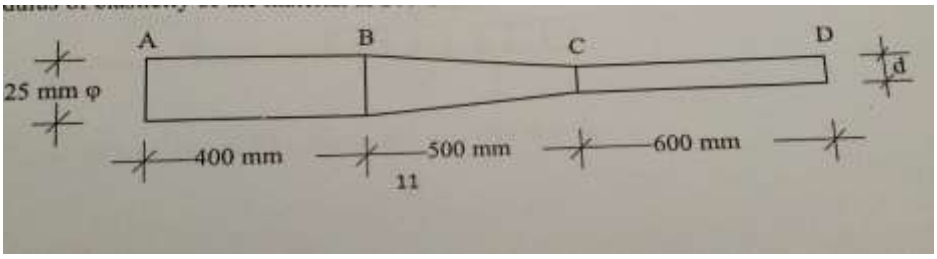
15	Evaluate $\int_c \frac{e^z}{\cos n\pi} dz$, where c is the unit circle $\|z\| = 1$ using Residue theorem.	8	KTU Sept 2020
16	Evaluate $\int_0^{2\pi} \frac{d\theta}{2+\cos\theta}$	8	KTU Sept 2020
17	Give example of (a) removable singularity (b) pole (c) essential singularity	3	KTU Dec 2021
18	Find the Laurent series expansions of $\frac{1}{z(z-1)}$ about $z = 0$		KTU Dec 2021
19	(a) Find the Laurent series expansion of $f(z) = \frac{1}{(z-1)(z-2)}$ valid in (i) $1 < \|z\| < 2$ (ii) $\|z\| > 2$ (b) Evaluate $\int \frac{1}{5-4\sin\theta} d\theta$	7 + 7	KTU Dec 2021
20	Evaluate $\int_{-\infty}^{\infty} \frac{x^2+2}{(x^2+1)(x^2+4)} dx$	7	KTU Dec 2021
21	Using residue theorem evaluate $\oint_c \frac{z+1}{z^4-2z^3} dz$, where c is the $\|z\| = \frac{1}{2}$	7	KTU Dec 2021

CET 201 - Mechanics of Solids

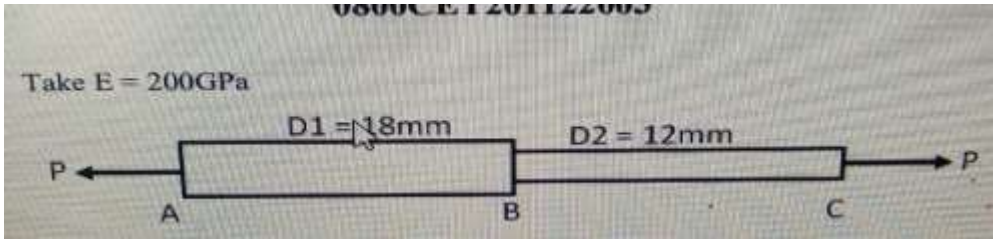
MODULE 1

1. a) State Hooke's Law
   b) What is complimentary shear stress
   c) What is elastic limit and elasticity

2. A straight bar 450mm long is 40mm in diameter for the first 250mm length and 20mm diameter for the remaining length. If the bar is subjected to an axial pull of 15kN. Find the maximum and minimum stresses produced in it and the total extension of the bar. Take E= 2x 10^5 N/mm^2.
3. a) Draw typical stress strain curve for high tensile steel and cast iron? Mark salient points.
   b) What is elastic limit and elasticity .
   c) Define the terms (i) Proportionality limit, (ii) Ultimate stress, (iii) Working Stress
4. Define Factor of Safety. Calculate the working load on a cantilever beam if it carries an ultimate load of 100 KN with a factor of safety of 2.
5. Explain , how the deformation of an axially loaded bar with uniformly varying cross section is calculated.
6. With help of stress-strain diagram, briefly explain Hooke's Law.
7. What is tangential stress and longitudinal Stress ?
8. Calculate the diameter of circular bar of length 10m , if the elongation of the bar due to axial load of 100 kN is 0.15mm . E= 200GN/mm2
9. A bar of Circular cross section has three segments as shown in fig. The portion AB has a constant diameter of 25 mm. The portion BC has diameter 25 mm at B and tapers uniformly to diameter 'd' at C. The portion CD has a constant diameter of 'd'. The bar was found to elongate by 0.539 mm under an axial tension of 20 KN. Find the value of 'd'. Take Young's modulus of elasticity of material as 200 GPa.



10. A steel rod of 25 mm diameter is placed in a hollow aluminium cylinder with internal diameter 30 mm and external diameter 40 mm. The steel rod projects 0.1 mm, beyond the aluminium tube. The compound cylinder carries a compressive force of 70 KN through a rigid bearing plate. Find the stresses in steel and aluminium bars , Es = 200 GPa and Eal = 120 GPa .
11. The steel bar shown fig:1 has the following dimensions: Total length – 2400mm; 18 mm diameter for half the length and 12 mm diameter for the remaining half.



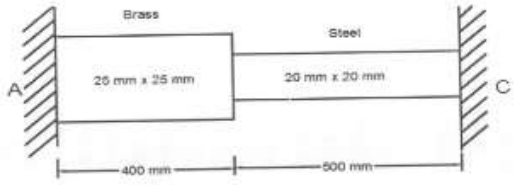
a) If the bar is subjected to a tensile force of 22.5kN, Calculate the normal stress and normal strain in the segment AB and BC respectively.
b) Also find the total extension of the bar when it is subjected to a tensile force of 22.5kN.
c) What would be the extension of a steel bar of uniform diameter having the same length and same volume when subjected to the same tensile force?

MODULE II

1. Define Thermal stress and derive an expression for the stress developed in a bar restrained at both the ends subjected to an increase in temperature.
2. Define Poisson's ratio. Also state the relationship between the elastic constants.
3. Explain the effect of temperature change on a composite bar made of two materials.
4. Use neat sketches to illustrate the concept of shear stress and shear strain.
5. What is Bulk Modulus of Elasticity ? Write the relationship between Bulk modulus of elasticity and Young's modulus of Elasticity
6. A steel bar of 30 mm square in section is subjected to an axial compressive load of 80 kN . Find the percentage change in volume if the bar is 400 mm long . What are the equal stresses that must be applied to the sides of the bar if the volumetric change to be zero ? Young's modulus is 200 Gpa and poison's ratio is 0.3

7. A Concrete cylinder of diameter 150 mm and height 300 mm is tested under axial compression. It was found that the diameter was increased by 0.0102 mm and the height was decreased by 0.165 mm under the action of a compressive load of 200 KN. Calculate the modulus of elasticity, poisson's ratio, bulk modulus and shear modulus of Concrete

8. A bar made of brass and steel as shown in figure is held between two rigid supports A and C. Find the stress in each material if the temperature rises by 40^0C. Take $E_b = 1x10^5$ N/mm^2, $\alpha_b = 19x10^{-6}/^0$C, $E_s = 2x10^5$ N/mm^2, $\alpha_s = 12x10^{-6}/^0$C.)



9. A cylindrical bar is 20mm diameter and 800mm long. During a tensile test it is found that the longitudinal strain is 4 times the lateral strain. Calculate the modulus of rigidity and bulk modulus, if its elastic modulus is $1x10^5$ N/mm^2. Find the change in volume, when the bar is subjected to hydrostatic pressure of 100N/mm^2.

10. A steel rod 5cm diameter and 6m long is connected to two grips and the rod is maintained at a temperature of 100^0C. Determine the stress and pull exerted when the temperature falls to 20^0C if :
    1. The ends do not yield and
    2. The ends yield by 0.15 cm.

    Take $E = 2x10^5$ N/mm^2 and $\alpha = 12x10^{-6}/^0$ C.

11. A metallic bar 250mmx80mmx30mm is subjected to a force of 20kN (tensile), 30kN (tensile) and 15kN (tensile) along the x, y and z directions respectively. Determine the change in the volume of the block. Take $E = 2x10^5$ N/mm^2 and Poisson's ratio = 0.25.
12. What is strain energy? Derive expression for strain energy developed in rod subjected to axial loading only.
13. A thick cylinder of internal diameter 400mm and external diameter 600 mm is subjected to an external pressure of 4 MPa. i) Sketch variation of radial pressure across the thickness of the wall. ii) Sketch variation of hoop stress across the thickness of the wall. iii) Find the internal pressure that can be applied for a limiting hoop stress of 15 MPa.

MODULE III

1. Draw SFD and BMD for the overhanging beam shown in figure. Locate the points of contra flexure. Also determine the maximum bending moment.

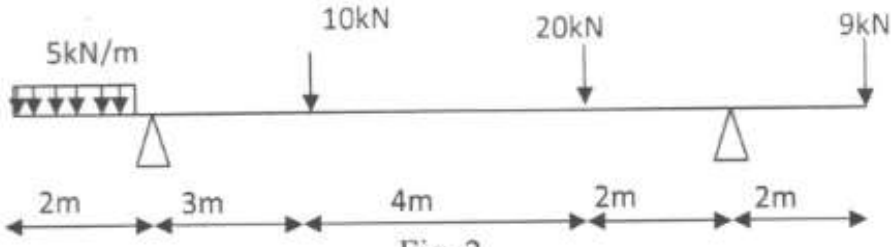


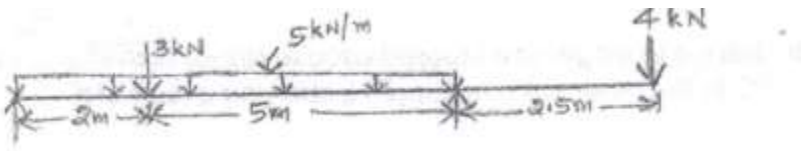
Fig. 2

(KTU; Jan. 20

2. Explain the concept of BM and SF in beams, with the help of a cantilever beam subjected to uniformly distributed load over the whole span.
3. Define Bending moment and Shear force.
4. What do you mean by point of contra flexure? State its significance.
5. **a)** Derive the relation between intensity of loading, shear force and bending moment at a section of uniformly loaded beam

   b) A simply supported beam of length 4m carries a uniformly distributed load of 3kN/m over the central 2m length and two point loads 2kN and 3kN at distances 0.5m and 3.5m from the left support. Draw SFD and BMD. Locate the point of maximum bending moment and find out the maximum bending moment.

6. Draw the shear force and bending moment diagrams for a simply supported beam with equal overhang on either side carrying uniformly distributed load ‘w’ per unit run over the whole length. Span length is ‘l’ and overhanging length is ‘a’. Consider the three cases of l > 2a
7. Determine the values of shear force and bending moment and draw the diagrams for the beam loaded as shown.



MODULE IV

1 .List three important assumptions used in the theory of pure bending and their significance.

2. What is pure bending? Give an Example .

3. Write the equation of simple bending and state each term involved in it.

4. Derive the expression for shear stresses for an I beam and plot the variation of stresses across the section

5. Using the case of a simply supported beam with constant width, illustrate the concept of beams of uniform strength.

6. A simply supported beam AB of 5m span is carrying a uniformly distributed load of 20kN/m. The beam is made up of rectangular cross section of dimensions 300mm x 450 mm.

a) Draw the bending stress distribution at the critical section for bending.

b) Draw the shear stress distribution considering the critical section for shear.

c) Also calculate bending stress and shear stress on layer located 50mm above the neutral axis on the cross section at the mid-point of the beam.

d) Assess whether the beam can safely carry the loads given the allowable stresses in bending and shear are 8MPa and 0.75 MPa respectively.

7. .At the critical section of a I beam, the value of vertical shear force is 40kN and the sectional dimensions are :- Flange width- 200mm, Flange thickness- 30mm, web thickness- 40mm and total depth- 300mm. Draw the shear stress distribution across the depth of the section.

8. Calculate the maximum bending stress in a cantilever beam of span 2m subjected to a UDL of 1kN/m over full length. Cross section of the beam is 100x150mm.

9 A circular cast iron column of diameter 250mm carries a vertical load of 600kN at a distance of 35mm from the axis. Find the extreme values of stresses induced in the section .

10 Derive the expression for strain energy due to bending deformation

MODULE V

1. Derive Euler's buckling load for slender columns with ends hinged

2. What is slenderness ratio? State its significance.

3. . What are principal stresses and principal planes ?

4. Distinguish between short and long column with reference to their behaviour under axial compression.

5. . A 1.5m long column has a circular cross section of 5cm diameter. One of the ends of the column is fixed in direction and position and other end is free. Taking factor of safety as 3, calculate the safe load using Rankin's formula, take yield stress as 560 N/mm2 and $\alpha = 1/1600$ for pinned ends

6. . Determine the buckling load for a strut of T-section,the flange width being 150mm, overall depth 100mm and both flange and web 13mm thick. The strut is 3m long and is hinged at both ends. Take E=200GPa

7. . Calculate the safe compressive load on a hollow cast iron column whose one end is rigidly fixed and other end is hinged. The external diameter is 200mm and internal diameter 150mm and 8m length. Use Euler's formula with a factor of safety of 3 and $E=2x10^5 N/mm^2$**.**

8. a) List the assumptions made in the Euler's buckling theory.

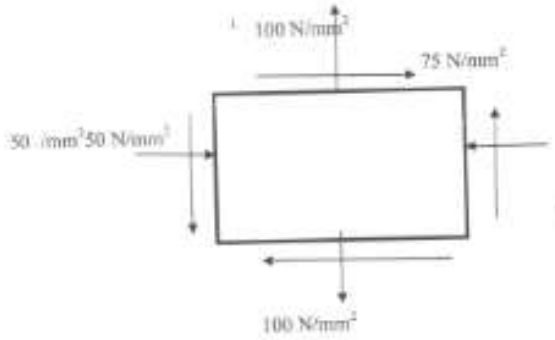
b) What is the limitation of Euler's theory?

9. .Determine the principal stresses and principal planes in an element subjected to stresses as shown. Also calculate

1. Maximum shear stress and its plane
2. Stress conditions in the plane shown

10..State of stress at a point in a material is $100N/mm^2$ (tensile) upon a horizontal plane and 50N/mm2 (compressive) upon a vertical plane. These planes also carry a shear stress of

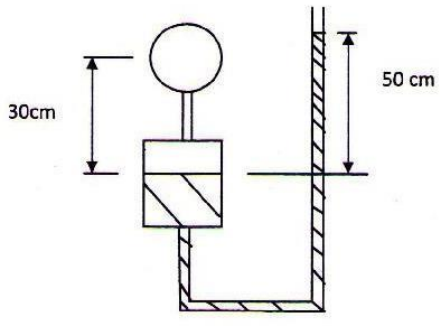
75N/mm^2 as shown in fig. Determine principal stresses, maximum shear stress, plane of maximum shear stress and the resultant stress on the plane of maximum shear stress.



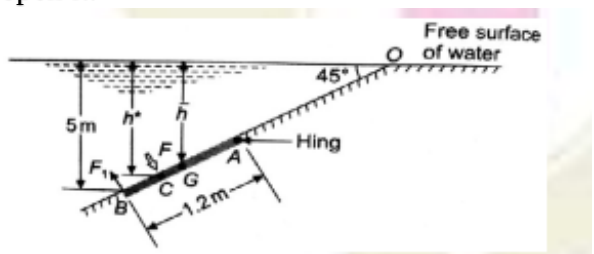
11. Define slenderness ratio . State the equations of euler's Crippling loas for columns with different end conditions
14. Explain Moment area theorems
15. A short column having a length of 0.5 m and made of solid aluminium rod of 25mm diameter is pinned at both the ends. Determine the Euler's critical load for the column. If in order to reduce the weight of the member by 25%, the cross section is changed to hollow circular section of 25 mm external diameter, determine the critical load of the modified column. Also determine the percentage reduction in critical load due to cross section modification. Take E = 72.8 GPa.
16. A hollow circular shaft of 30 mm outer radius transmits a power of 180 kW while rotating at a frequency of 25 Hertz. Find the thickness of the circular shaft if the allowable shear stress is 60MPa.

CET203: FLUID MECHANICS AND HYDRAULICS

MODULE -1

Sl. No.	Question	Marks	Year
1	A triangular plate of 1m base and 1.5 m altitude is immersed in water. The plane of the plate is inclined at 30°with free water surface and the base is parallel to and at a depth of 2m from water surface. Find the total pressure on the plate and the position of centre of pressure.	10	KTU2017
2	A hollow equilateral triangular plate of side 4 m on the outside and 2m in the hollow portion is immersed in water with its plane vertical, with its vertex downwards and base upwards, base being parallel to the free surface at a depth of 1m below the free surface. Determine the hydrostatic pressure force on one side of the plate and the depth of centre of pressure.	7	KTU2019 DEC
3	The pressure difference between two points A and B in a pipe conveying oil of specific gravity 0.9 is measured by an inverted U-tube and the column connected to B stands 1.2 m higher than that of A. A pressure gauge attached at A reads 9.81*105 N/m2, determine the pressure in the pipe at B.	5	KTU2019 DEC
4	Show that a cylindrical body of 1.25m diameter and 3.25m high weighing 11127 N will not float vertically in sea water weighing 10055N/m3 . Find the tension necessary. In a vertical chain attached to the centre of the base of the buoy that will just keep the cylinder vertical.	10	KTU Jan 2017
5	A circular plate of 2.5m in diameter is submerged in an oil of Sp. Gr. 0.8. The maximum and minimum depth of the plate are 2m and 1m from the free surface. Calculate the hydrostatic force on one face of the plate and the depth of the centre of pressure.	10	CUSAT 2019
6	A single column vertical manometer with a reservoir to is connected to a pipe containing oil of specific gravity 0.9. The area of reservoir is 100 times the area of the manometric tube. The reservoir contains mercury of specific gravity 13.6. The level of mercury in the reservoir is at a depth 30cm below the centre of pipe. If the difference of mercury levels in the reservoir and the right limb is 50cm, calculate the pressure in the pipe. 	12	KTU July 2017

7	State and prove Pascal's law.	8 marks	CUSAT 2008
8	An annular plate 3m external diameter and 1.5 m internal diameter is immersed inwater with it's greatest and least depths below the water surface as 3.6m and 1.2m respectively. Determine the total pressure and the position of the centre of pressure on one face of the plate.	10	KU Oct 2017
9	A hollow circular plate of 2m external diameter and 1m internal diameter is immersed vertically in water such that centre of plate is 4m deep from the water surface. Find the depth of centre of pressure and total pressure.	10	MG 2014
10	A cylinder contains a fluid at a gauge pressure of 350 kN/m2 Express the pressure in terms of head of (a) water, (b) mercury. What would be the absolute pressure in the cylinder if the atmospheric pressure is 101.3 kN/m2	5	KTU MAY 2019
11	A U-tube differential gauge is attached to the two sections A and B in ahorizontal pipe in which oil of specific gravity 0.8 is flowing. The deflection of the mercury in the gauge is 60 cm, the level nearer to A being the lower one.Calculate the difference in pressure between sections A and B.	5	KTU SEP 2020
12	A simple U-tube manometer containing mercury is used to find the negative pressure in a pipe containing water. The right limb is open to the atmosphere.Find the vacuum pressure in the pipe, if the difference of mercury level in the two limbs is 100 mm and height of water in the left limb from the centre of the pipe is found to be 40 mm below.	10	KTU Dec 21
13	Differentiate between: i) simple manometer and differential manometer ii) absolute pressure and gauge pressure	3	KTU DEC 2021
14	An isosceles triangular plate of base 3 m and altitude 3 m is immersed vertically in an oil of specific gravity 0.8. The base of the plate coincides with the free surface of oil. Determine the total pressure on the plate.	3	KTU DEC 2021
15	a) A simple U-tube manometer containing mercury is used to find the negative pressure in a pipe containing water. The right limb is open to the atmosphere. Find the vacuum pressure in the pipe, if the difference of mercury level in the two limbs is 100 mm and height of water in the left limb from the centre of the pipe is found to be 40 mm below. b) A tank contains water in the lower 0.8 m depth. An immiscible liquid of relative density 0.85 is filled on the top of water up to a height of 1.2 m. If the tank is 2 m wide calculate (i) the pressure force on one side of the tank and (ii) position of the centre of pressure	4 10	KTU DEC 2021

17	a) Find the absolute pressure at a depth of 5 m below the surface of a liquid of relative density 0.85. The barometer reading on the surface is 750 mm of mercury b) A 1m wide and 1.5 m deep rectangular plane surface lies in water in such a way that its plane makes an angle of 30° with the free water surface. Determine the total pressure and position of centre of pressure when the1m wide upper edge is 0.75 m below the free water surface.	4 10	KTU DEC 2021
18	a) Differentiate gauge pressure, atmospheric pressure and absolute pressure b) A U-tube manometer is used to measure the pressure of water in a pipeline which is in excess of atmospheric. The left limb is connected to the pipeline and right limb is open to atmosphere. The free surface of mercury in the right limb is in level with the centre line of the pipe and the level difference of mercury in the limbs of the manometer is 20 cm. Compute the water pressure in the pipeline. If the pressure of water is increased by 50 %, compute the manometric reading.	4 10	KTU Model Question paper
19	a) Obtain the expression for centre of pressure of a lamina placed in fluid in vertical position. b) An inclined rectangular sluice gate AB 1.2m by 5m as shown in fig is installed to control the discharge of water. The end A is hinged. Determine the force normal to gate applied at B to open it. 	4 10	KTU Model Question paper
20	Explain the method of estimation of hydrostatic force on curved surfaces	3	KTU Model Question Paper
21	Compare the use of piezometer and manometer for pressure measurement	3	KTU Model Question Paper
	MODULE -2		
1	A ship 60 m long and 10 m wide displaces 15000 kN of water. A weight of 200kN is displaced across the deck through a distance of 5 m and the ship is tilted through 4.50. The moment of inertia of the ship about the fore - and - aft axis is 80 % of the circumscribing rectangle. The centre of buoyancy is 2 m below the water surface. Determine the metacentric height and the position of the centre of gravity of the ship. Take specific gravity of water as 1.03.	8	May 2018

2	What is metacentre of a floating body? How would you estimate the metacentric height experimentally?	8	May 2018
3	A wooden block of 1m side cube of relative density 0.7 floats in water. Determine the volume of concrete of relative density 2.5 that needs to be placed on it so that the block is just immersed in water	8	May 2019
4	The velocity vector in an incompressible flow is given by V=(6xt+yz2)i +(3t+xy2)j+ (xy-2xyz-6tz)k Verify (i)whether continuity equation is satisfied (ii) Determine the acceleration and velocity at a point A (1,1,1) at t=1	10	Dec. 2018
5	Compare Lagrangian and Euler methods of describing fluid motion?	5	May 2019
6	What are the different mathematical conditions for irrational flow	12	Dec. 2018
7	Derive the continuity equation for three dimensional flow in Cartesian co-ordinates	6	May 2018
8	Explain the terms circulation and vorticity	12	Dec. 2018
9	a) Distinguish between velocity potential function and stream function? b) Differentiate between laminar and turbulent flow	12	May 2018
10	The velocity components in a two dimensional flow is given by $u=y33+2x-x2y$ and $v=xy2-2y-x33$ i) Show that it is a possible case of flow? ii) Prove that the flow is irrational? iii)Stream function is given by $\Psi=x2+y2$.Determine the velocity and direction of flow at (2, 2)	5	Dec. 2018
11	a) Explain with figures the stability of floating bodies. b) A wooden block in the form of a rectangular prism floats with its shortest axis vertical. The block is 40 cm long, 20 cm wide and 15 cm deep with a depth of immersion of 12 cm. Determine the metacentric height and analyse the stability of the block	6 8	KTU DEC 2021
12	a) Derive the continuity equation for a three-dimensional flow in Cartesian coordinates. b) An unsteady velocity field is given by $u = t^2 + 3y$ and $v = 4t + 5x$. Calculate the acceleration at the point (5,3) at time t = 2 units.	7 7	KTU DEC 2021
13	Explain the experimental method of determination of metacentric height	3	KTU Model question paper
14	Define streamline, streakine and pathline	3	KTU Model question paper

15	a) Find the acceleration at (1, 2, 3) after 1 sec for a 3D flow given by u=yz+t, v=xz-t, w=xy. b) Derive continuity equation in 3D Cartesian coordinates	6 8	KTU Model question paper
16	a) A solid cylinder 2 m in diameter and 2 m in length floats in water with its axis vertical. If the specific gravity of the material of the cylinder is 0.65, find the metacentric height and comment on the stability of the body. b) Explain the stability conditions of floating bodies and submerged bodies	6 8	KTU Model question paper
MODULE -3			
1	Name the minor and major losses during the flow of liquid through a pipeline.	5	Dec. 2018
2	Derive Euler's equation of motion and then obtain Bernoulli's equation by integrating it along a streamline. What are the assumptions made in deriving the equation?	10	Sep.2020
3	a) What is an orifice? How are the orifices classified? b) Derive Dupuit's equation for pipes in series.	5	May 2018
4	Derive the Darcy-Weisbach equation for head loss in pipes due to friction	6	May 2018
5	A city water supply main is 1000 m long and delivers a flow of 100 l/s between two reservoirs with a head difference of 15 m. It is proposed to increase the flow by 30 % by adding another pipe from the upstream reservoir in parallel and joining to the main pipe at a suitable location. Assume all pipes are of same diameter and same friction factor (f=0.02). Determine length of the additional pipe.	10	Dec. 2018
6	a) What are the practical applications of Bernoulli's equation. b) Explain Bernoulli's equation with its assumptions	10 5	Dec. 2018
7	A horizontal venturimeter with inlet and outlet diameter 30cm and 15cm respectively is used to measure the flow of water. The reading of differential manometer connected to the inlet and throat is 20cm of mercury. Determine the rte of flow. Take Cd=0.98 b) Define energy correction factor and momentum correction factor.	12 7	Dec. 2018
8	A venturimeter is used for measurement of discharge of water in horizontal pipe line. If the ratio of upstream pipe diameter to that of throat is 2:1, upstream diameter is 300mm, the difference in pressure between the throats and upstream is equal to 3m head of water and loss of head through meter is one-eighth of the throat velocity head, calculate the discharge in the pipe.	12	May 2019
9	An orifice meter with dia 10mm is inserted in a pipe of 20mm dia. The pressure gauges fitted upstream and downstream of the orificemeter gives reading of 19.62N/cm2 and 9.81N/cm2	10	May 2018

	respectively. Co-efficient of discharge for the meter is given as 0.6 ,find the discharge of water through pipe.		
10	Determine the rate of flow of water through a pipe of diameter 20 cm and length 50 m when one end of the pipe is connected to a tank and other end of the pipe is open to the atmosphere. The pipe is horizontal and the height of water in the tank is 4 m above the centre of the pipe. Consider all losses and take f=0.036	10	Dec. 2021
11	Explain the use and principle of Pitot tube.	3	KTU Model qn paper
12	Obtain the discharge equation of a large rectangular orifice	3	KTU Model qn paper
13	Gasoline (specific gravity 0.82) flows at a rate of 215 l/s in upward direction through an inclined venturimeter fitted to a 300 mm diameter pipe. The venturimeter is inclined at 60o to vertical and its 150 mm diameter throat is 1.2 m from the entrance along its length. Pressure gauges inserted at the inlet and throat show pressures of 0.141 N/mm2 and 0.077 N/mm2 respectively. Compute the coefficient of discharge of the venturimeter. If instead of pressure gauges, the entrance and throat are connected to two limbs of a mercury u-tube manometer, determine the manometric reading.	14	KTU Model qn paper
14	A pipeline of 600 m diameter is 1.5 km long. To increase the discharge, another pipe of same diameter is introduced in parallel to the first pipe, for the second half of length. If f=0.04, and head at inlet is 300 mm, calculate the increase in discharge. Neglect minor losses.	14	KTU Model qn paper
15	a) Define Hydraulic Gradient Line and Total Energy Line. b) A venturimeter 20 cm x 10 cm is provided in a vertical pipeline to measure the flow of oil of relative density 0.9. The difference in elevations of the throat section and entrance section is 30 cm, the direction of flow of oil being vertically upwards. The oil-mercury differential U tube manometer shows a gauge deflection of 10 cm. Calculate the discharge of oil and the pressure difference between the entrance section and throat section. Take the coefficient of discharge as 0.98 and specific gravity of mercury as 13.6.	3 11	KTU DEC 2021
16	a) A horizontal pipe with 6 cm diameter suddenly enlarges to 9 cm diameter at a section. The pressure just upstream of the expansion is 25 kN/m2. Calculate the pressure just after expansion if the discharge of water in the pipe is 0.0075 m 3/s. b) A rectangular orifice 0.6 m wide and 0.8 m deep is discharging water from a vessel. The top edge of the orifice is 0.4 m below the water surface in the vessel. Find the discharge through the orifice if coefficient of discharge is 0.62	9 5	KTU DEC 2021

17	Define the terms i) Total acceleration ii) local acceleration and iii) convective acceleration.	3	KTU DEC 2021
18	Explain kinetic energy correction factor	3	KTU DEC 2021
MODULE -4			
1	Define: i) Coefficient of discharge ii) Coefficient of velocity and iii) Coefficient of contraction	3	KTU DEC 2021
2	Differentiate between suppressed weir and contracted weir	3	KTU DEC 2021
3	a) The flow in a 2.2 m wide rectangular channel is measured by a rectangular weir with crest length 1 m and height 0.6 m. Find the discharge in the channel when the head over the weir is 0.3 m. Take Cd as 0.62. Consider end contractions and velocity of approach. b) Define the terms hydraulic depth and hydraulic radius.	10 4	KTU DEC 2021
4	a) Explain the characteristics of velocity distribution in open channels. b) A trapezoidal channel discharging water at the rate of 10 m 3/s is to be designed for most economical section. Find the bottom width of the channel and depth of water. The side slope is 600. Take bed slope as 1 in 750 and Chezy's constant as 66.	4 10	KTU DEC 2021
5	Explain conveyance and section factor for uniform flow and their practical applications	3	KTU Model qn paper
6	Obtain the condition for maximum velocity through circular channels	3	KTU Model qn paper
7	a) Explain the characteristics of velocity distribution in open channels	4	KTU Model qn paper
8	a) Obtain the discharge equation of a Cipoletti weir	4	KTU Model qn paper
9	A 40 m long weir is divided into 12 equal bays by vertical posts, each 0.6 m wide. Using Francis formula, calculate the discharge over the weir if the head over the crest is 1.2 m and velocity of approach is 2 m/sec	10	KTU Model qn paper
10	A lined canal n=0.014 is of trapezoidal section with one side vertical and other with a slope of 1.5H:1 V. If the channel is to deliver 9 m3/sec when laid on a slope of 0.0002, calculate the dimensions of the efficient section that requires minimum lining	10	KTU Model qn paper
MODULE -5			
1	State the assumptions involved in the derivation of dynamic equation of gradually varied low	3	KTU Model qn paper

2	Explain the classification of hydraulic jumps based on Froude's Number	4	KTU Model qn paper
3	a) State the characteristics of M type profiles b) A very wide rectangular channel carries a discharge of 8 cumecs per m width. The channel has a bed slope of 0.004 and Manning's roughness coefficient 0.015. Find the distance to a section were water depth is 0.9 m using single step method.	4 10	KTU Model qn paper
4	a) Show that minimum specific force for a given discharge indicate the critical flow in open channels b) The energy loss and Froude number after the jump in a horizontal rectangular channel are 9.00 and 0.12 respectively. Determine the depth before the jump will be and the power lost per m width of the channel	4 10	KTU Model qn paper
5	a) Derive the dynamic equation of gradually varied flow in a channel, stating the assumptions involved b) A rectangular channel 8 m wide carries a discharge of 15 m3/s. If the depth of flow is 1.2 m determine i) specific energy of water flowing through the channel ii) critical depth and critical velocity and iii) Froude number	8 6	KTU Model qn paper
6	a) Explain the specific energy diagram. b) In a hydraulic jump occurring in a horizontal rectangular channel, the initial and sequent depths are 0.2 m and 1.2 m respectively. Estimate the discharge per unit width and the energy loss.	6 8	KTU Model qn paper
7	The discharge through a rectangular channel 3.6 m wide is 9 m3/s. Find the depth of water at a section where specific energy is minimum	3	KTU Model qn paper
8	What are the practical applications of a hydraulic jump?	3	KTU Model qn paper

CET205: SURVEYING AND GEOMATICS

MODULE -1

Sl. No.	Question	Marks	Year
1	Explain with sketch, ranging a line if the end stations are not intervisible.	5	Sep.2020
2	Define local attraction. Which are the different methods of eliminating local attraction in a closed traverse?	8	Dec.2019
3	The following consecutive readings were taken with a level and 5m levelling staff on a continuously slopping ground at a common interval of 20 m, 0.385, 1.030,1.925,2.825,3730,4.685,0.625,2.005,3.110,4.485.. Prepare a page of field book and calculate the reduced level of points if first reading was taken on a bench mark of RL 208.125 m.	10	Dec.2018
4	Define bearing. Which are the different systems of designating bearings?	4	Dec.2018, Dec.2019
5	Distinguish between dip and declination, isogonic and agonic lines.	5	May 2018
6	The magnetic bearing of a line AB is S 280^0 30'E. Find the true bearing if declination is $70^0$30' W.	5	Dec.2018
7	Explain the different methods of orientation in plane table survey.	6	Dec.2018
8	What are the principles of surveying?		
9	Discuss survey stations and survey lines.	8	May 2018
10	What is meant by ranging out a survey line. Explain in detail direct and indirect ranging of survey lines with neat sketches	12	Dec.2018
11	What is orientation? Which are the methods of orientation?	4	Sep.2020
12		10	
13	What do you mean by bearing of a survey line? Explain the difference between whole circle bearing and quadrantal bearing. Also discuss fore bearing and back bearing.	10	Dec.2018
14	The following bearings were observed in running a closed traverse. At what stations do you suspect the local attraction? Correct the bearings and also find the interior angles. Line F.B B.B AB 75^o 5' 254^o 20' BC 115^o 20' 296^o 35' CD 165^o 35' 345^o 35' DE 224^o 50' 44^o 5' EA 304^o 50' 125^o 5'	11	May2018
15	A level is set up at O on a line AB 50m from A and 1400m from B. The staff reading on A is 0.585 m and that on B is 3.695 m. Find the true level difference between A and B.	10	May2018
17	The following consecutive readings were taken with a dumpy level at 20 m intervals. 1.535, 2.020, 2.720, 2.965, 3.015, 2.625, 1.620, 1.895, 2.320, 2.710, 1.960, 2.34.	12	May2019

	The instrument was shifted after the 4th, 7th and 9th readings. Reduced level of first point was 120 m. Calculate the reduced level of all stations and find the gradient of the line connecting first and last points.		
18	The following consecutive readings were taken with a level and a 4m levelling staff on a continuously sloping ground at common intervals of 30m. 8.855 (on A), 1.545, 2.335, 3.115, 3.825, 0.455, 1.380, 2.055, 2.855, 3.455, 0.585, 1.015, 1.850, 2.755, 3.845 (on B). The RL of A was 380.500m. Make entries in a level field book and apply the usual checks. Determine the gradient.	12	May2018, May2019
19	Write short notes on simple levelling & differential levelling with neat sketches.	5	May 2018
20	Differentiate between profile levelling & cross sectioning?		
21	Explain reciprocal levelling.	15	May 2018
22	What are the temporary adjustments of a dumpy level?	10	May 2018
23	How ranging of a line is accomplished across a rising ground? Illustrate with necessary diagrams.	3	Dec. 2021
24	Define a) Bench mark b) Level surface c) Reduced level	3	Dec. 2021
25	(a) The magnetic bearing of a line at a station point is 187°. The declination at that particular point is 4°E. Calculate the true bearing of the line. (b) ABCDEA is a closed traverse. The observed bearings of the lines of the traverse are shown below. Local attraction was suspected at that area. Find the corrected bearings of the lines. Line Fore bearing Back bearing AB $72^0 45'$ $252^o 00'$ BC $349^o 00'$ $167^o 15'$ CD $298^o 30'$ $118^o 30'$ DE $229^o 00'$ $48^o 00'$ EA $135^o 30'$ $319^o 00'$	4 10	Dec. 2021
26	(a) Explain profile levelling and cross sectioning with the help of sketches. (b)The following consecutive readings were taken with a level and 4 m levelling staff on continuously sloping ground at a common interval of 30 m 0.585, 0.935, 1.955, 2.840, 3.650, 3.940, 0.965, 1.035, 1.680, 2.535, 3.845, 0.965, 1.580, 3.020. The first reading was on A and the last reading was on B. The elevation of A is 500 m. Rule out a page of level field book and enter the above readings. Calculate the reduced levels of the points and show the check. Determine the gradient of the line AB.	4 10	Dec. 2021
27	What are the characteristics of contours?	3	Dec. 2020
28	Differentiate between plane surveying and geodetic surveying	3	Dec. 2020
29	Explain any one method for surveying a forest area	3	Dec. 2020
30	a) Define ranging and explain different types of ranging. b) The following readings were taken in a running closed compass traverse	6	Dec. 2020

	Line	FB	BB		
	AB	39 °35’	219 °55’	8	
	BC	168 °20’	348 °10’		
	CD	114 °35’	294 °30’		
	DE	145 °35’	325 °35’		
	EA	255 °15’	75 °10’		
	i) State the stations which were affected by local attraction. ii) Determine the corrected bearings				
31	a) What is reciprocal levelling? The following reciprocal levels were taken with one level.			7	Dec. 2020
	Instrument at	Readings on	Remarks		
	A	B			
	A	1.654	2.658		Distance AB=150m
	B	0.362	1.795	7	R.L. of A= 185.75m
	Determine, i) the true difference in elevation between A&B ii) the R.L. of Band iii) the collimation error b) Explain profile levelling and cross-sectional levelling with the help of figures.				
	MODULE -2				
1	Explain the steps in ascertaining the intervisibility between triangulation stations.			8	May 2018
2	What is Mass Haul diagram? What are the characteristics and discuss its uses?			8	May 2018
3	Define i) Contour ii) contour Interval iii) Contour Gradient iv) Horizontal Equivalent.			8	May 2019
4	Explain the factors affecting the choice of contour interval.			10	Dec. 2018
5	Explain repetition method of measurement of horizontal angle.			5	May 2019
6	Two triangulation stations A and B are 60 km apart and have elevation 240 m and 280 m respectively. Find minimum height of signal required at B so that line of sight may not pass near the ground than 2 m. The intervening ground has an elevation of 200 m.			12	Dec. 2018
7	Briefly explain any two methods for computation of area.			6	May 2018
8	A series of offsets were taken from a chain line to a curved boundary at 15 m intervals in the following order. 0, 2.65 , 3.80, 3.75, 4.65, 3.60, 4.95, 5.85 m. Compute the area enclosed between the ordinates using (1) average ordinate rule (2) trapezoidal rule (3) Simpson’s one third rule			12	Dec. 2018
9	A road embankment is 8 m wide and 200 m in length, at the formation level, with a side slope of 1.5:1. The embankment has a rising gradient of 1 in 100. The ground levels are given below. The formation level of zero chainage is 166 m. Calculate the volume of earthwork using end area formula and prismoidal formula.			12	May 2018

	Distance (m) 0 50 100 150 200 R.L (m) 164.5 165.2 166.8 167 167.2		
10	Define mass diagram. What are its uses?	5	Dec. 2018
11	Explain the different steps in triangulation survey.	10	May 2018
12	a) Explain prismoidal rule for calculating volume of a plot. 5 marks b) A railway embankment is 10 m wide with side slope 1.5(H):1 (V). Assuming the ground to be levelled in a direction transverse to centre line, calculate the volume contained in a length of 120 m, the centre height at 20 m interval being in metres 2.2, 3.7, 3.8, 4.0, 3.8, 2.8, 2.5 using trapezoidal and prismoidal formulae.	5 12	May 2019
13	Volume of earth work is to be calculated for a railway embankment 12m wide with side slope 1.5:1. Assuming the ground to be level in a direction transverse to the centre line, calculate the volume contained in a 180m length, the centre heights at 30m intervals in meters as 0.70,1.20,1.75,1.45,1.20,0.95,0.65 using a) prismoidal rule and b) trapezoidal rule	10	Dec. 2018
14	List the temporary adjustments of a theodolite	5	Dec. 2018
15	Explain the horizontal angle measurement procedure	6	May 2018
16	Two triangulation stations A and B are 60 km apart and have elevation 240 m and 280 m respectively. Find minimum height of signal required at B so that line of sight may not pass near the ground than 2 m. The intervening ground has an elevation of 200 m.	10	Dec. 2018
17	The elevation of two triangulation stations A and B, 100 km apart, are 180 m and 450 m respectively. The intervening obstruction situated at C, 75 km from A, has an elevation of 259 m. Ascertain if A and B are intervisible. If not, by how much B should be raised so that the line of sight must nowhere be less than 3 m above the surface of the ground, assuming A as the ground station.	10	May 2018
18	Explain the term strength of figure?	10	May 2018
19	Discuss the classification of triangulation figures?	5	May 2018
20	Write short notes on intervisibility of triangulation stations?		
21	What are the factors to be considered while selecting triangulation stations?	12	Dec. 2018
22	What are satellite stations and Reduction to centre?	10	Dec. 2019
23	What are well conditioned and ill conditioned triangles?	8	Dec. 2017
24	Explain Trapezoidal rule and Simpson's rule for the calculation of area.	3	Dec. 2021
25	How will you take field observations with a theodolite so as to eliminate error due to eccentricity of verniers and centres?	3	Dec. 2021
26	(a) The offsets taken from a chain line to an irregular boundary is shown below. Calculate the area between the chain line, the irregular boundary and the first and last offset by Simpson rule.	7 7	Dec. 2021

<table>
<tr><td></td><td>Distance
(m) 0 15 30 45 60 75 90 105 120
Offsets
(m) 3.18 4.62 6.06 5.61 4.92 6.24 6.72 5.79 5.28
(b) Explain stadia system and tangential system of tacheometric measurements.</td><td></td><td></td></tr>
<tr><td>27</td><td>(a) Explain the terms (i) satellite station ii) reduction to centre with the help of sketches
(b) Explain computation of volume of earthwork using i) Average end area method and ii) Prismoidal formula</td><td>6

8</td><td>Dec. 2021</td></tr>
<tr><td>28</td><td>a) For a proposed new road, the cross-sectional areas at different sections are as follows:
<table>
<tr><td>Chainage (m)</td><td>100</td><td>120</td><td>140</td><td>160</td><td>180</td><td>200</td><td>220</td></tr>
<tr><td>Area (m^2)</td><td>22.4</td><td>32.5</td><td>40.8</td><td>48.6</td><td>28.5</td><td>20.0</td><td>11.7</td></tr>
</table>
Calculate the volume enclosed between chainages 100m and 220m by the prismoidal and trapezoidal formulae.
b) What is meant by face left and face right of theodolite? How would you change face? What instrumental errors are eliminated by face left and face right observations?</td><td>8

6</td><td>Dec. 2020</td></tr>
<tr><td>29</td><td>a) What are the characteristics and uses of mass diagram?
b) An observer standing on the deck of a ship just sees the top of a lighthouse with his eyes at a height of 11m. The top of the light house is 58m above mean sea level. Find the distance of the observer from the lighthouse.</td><td>7

7</td><td>Dec. 2020</td></tr>
<tr><td colspan="4">MODULE -3</td></tr>
<tr><td>1</td><td>Write short note on weight of an observation</td><td>5</td><td>Dec. 2018</td></tr>
<tr><td>2</td><td>Explain the principle of least squares</td><td>5</td><td>Sep.2020</td></tr>
<tr><td>3</td><td>The following are the mean values observed in the measurement of three angles A, B, C at one station, Calculate the most probable value.
$A = 76^0 42' 46.2''$ weight 4
$A+B = 134^0 36' 32.6''$ weight 3
$B+C = 185^0 35' 24.8''$ weight 2
$A+B+C = 262^0 18' 10.4''$ weight 1.</td><td>10</td><td>May 2018</td></tr>
<tr><td>4</td><td>Form the normal equation for x, y, z in the following equation.
$3x+3y+z-4=0$ weight 2
$x+2y+2z-6=0$ weight 3
$5x+y+4z-21=0$ weight 1</td><td>10</td><td>May 2018</td></tr>
<tr><td>5</td><td>State the laws of weights with examples.</td><td>6</td><td>Dec. 2018</td></tr>
<tr><td>6</td><td>Determine the most probable values of A, B and C of a triangle ABC from the following measurements.
A=63º 54’ 40” weight 1, B=75º 34’29” weight 2, C= 40º 30’56” weight 1.</td><td>8</td><td>Dec. 2018</td></tr>
<tr><td>7</td><td>What is a true value? What is most probable value?</td><td>8</td><td>Dec. 2018</td></tr>
</table>

<table>
<tr><td>8</td><td>Find the most probable values of the angles A, B and C from the following observations at a station P using method of differences.
A = 38° 25’20” wt.1
B = 32 ° 36’12” wt.1
A+B = 71° 01’29” wt.2
A+B+C = 119 °10’ 43” wt.1
B+C = 80 ° 45’28” wt.2</td><td>12</td><td>May 2019</td></tr>
<tr><td>9</td><td>Form the normal equation for x, y, z in the following equations. a. 3x+3y+z-4 = 0,
b. x+2y+z-2 = 0
c. 5x+y+4z-21 = 0
Also form the normal equation, if weights of the equations are 2, 3 and 1 respectively.</td><td>10</td><td>May 2018</td></tr>
<tr><td>10</td><td>Distinguish between a) Closed traverse and open traverse b) closing error and relative error of closure</td><td>3</td><td>Dec. 2021</td></tr>
<tr><td>11</td><td>Define a) Most probable value b) Weight of an observation c) Conditioned quantity.</td><td>3</td><td>Dec. 2021</td></tr>
<tr><td>12</td><td>(a) Explain Bowditch’s method and Transit method for balancing a closed
Traverse
(b)The table below gives the lengths and bearings of the lines of a traverse ABCDEA, the length and bearing of EA have been omitted. Determine the length and bearing of the line EA.
Line Length (m) Bearing
AB 206 88°30’
BC 230 21°20’
CD 190 280°
DE 190 210°
EA ? ?</td><td>6

8</td><td>Dec. 2021</td></tr>
<tr><td>13</td><td>(a) Explain any three laws of weight with the help of examples
(b) Find the most probable value of the angles A and B from the following observations at a station O
A= 49°50’36.6″ weight 2
B = 55°37’46.3″ weight 3
A+ B = 104°25’27.5″ weight 4</td><td>6

8</td><td>Dec. 2021</td></tr>
<tr><td>14</td><td>Explain balancing of closed traverse by transit rule</td><td>3</td><td>Dec. 2020</td></tr>
<tr><td>15</td><td>What are the types of errors in surveying? Explain any one type.</td><td>3</td><td>Dec. 2020</td></tr>
<tr><td>16</td><td>a) Calculate latitudes, departures and closing error for the following traverse. Also, adjust the traverse using Bowditch’s rule.
<table>
<tr><td>Line</td><td>Length (m)</td><td>W.C.B.</td><td></td><td></td></tr>
<tr><td>AB</td><td>79.31</td><td>47°20’</td><td></td><td></td></tr>
<tr><td>BC</td><td>237.46</td><td>70°15’</td><td></td><td></td></tr>
<tr><td>CD</td><td>162.23</td><td>168°32’</td><td></td><td></td></tr>
<tr><td>DE</td><td>171.10</td><td>246°41’</td><td></td><td></td></tr>
</table></td><td>10</td><td>Dec. 2020</td></tr>
</table>

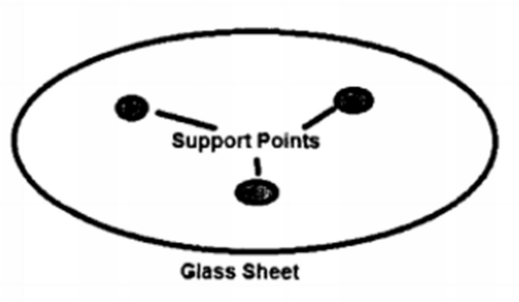
	EA	234.58	310°58’	4	
	b) Briefly explain different types of errors.				
17	a) Define traversing, closed traverse, open traverse and closing error. b) The following mean values of the three angles of a triangle were observed. <A= 64°22’35”, weight= 8 <B= 38°56’18”, weight= 6 <C= 88°06’32”, weight= 4 Determine the most probable value of each angle.			8 6	Dec. 2020
	MODULE -4				
1	Explain the operation of total station			10	May 2018
2	a) Explain different types of EDM instruments. b) Which are the different types of modulation of electromagnetic waves?			4 4	Dec. 2017
3	What is EDM? Discuss the principles of EDM?			4	May 2019
4	What is electromagnetic wave?			4	May 2019
5	Define “Geodimeter”.			4	May 2019
6	List out the total station Instruments			6	Dec. 2018
7	a) Write the parts of the Total Station? b) Explain in detail about Electromagnetic Spectrum and its applications. c) Explain in detail about the different types of EDM.			4 4 4	Dec. 2017
8	a) Why phase comparison and modulation is preferred over time measurement in EDM. b) Explain in detail about the sources of errors in Total station and EDM.			5 5	Dec. 2019
9	a) Explain in detail about the fundamental measurements of the Total Station. b) Explain the working principle of “Tellurometer”.			5 5	Dec. 2018
10	a) Explain the working principle of “Geodimeter '” b) Explain the working principle of “Wild Distomats”			5 5	Dec. 2017
11	a) Explain in detail about the properties of electromagnetic waves. How are they useful in measuring distances b) What are the advantages of using Total station survey.			15	May 2018
12	a) Briefly explain the field procedure of Total station survey for co ordinate determination b) Explain the steps to be followed for the set up of a total station over a point during field work.			20	Dec. 2018
13	What are the three classes of circular curves?			10	July 2019
14	What are the elements of a simple Circular curve?			8	Dec. 2019
15	What are the difficulties in setting out simple curves? Describe briefly the methods employed in overcoming them.			20	Dec. 2018
16	What are the functions of a transition curve? What are the types of transition curve?			15	Sep. 2020
17	Explain Rankine’s method for setting out simple circular curve.			10	Dec. 2019

18	Explain the elements of a compound circular curve	10	July 2019
19	Two tangents intersect at a chainage 59 (chains) + 70 (links). The deflection angle is 60°15'. Determine the chainages of point of curve and point of tangency, if the radius of the curve is 15.5 chains. The length of chain is 20 m	3	Dec. 2021
20	Explain the principle of distance measurement in EDM based on transit time of electromagnetic waves. Illustrate with sketch.	3	Dec. 2021
21	(a) Explain the method of setting out of a simple circular curve using Rankine's method of tangential angles. Support the answer with sketch. (b) Mark the elements of a compound curve on a neat sketch and write down the relationship between different elements	8 6	Dec. 2021
22	(a) Explain any two methods for determination of length of transition curve. (b) Explain the field procedure for finding out co-ordinates of points using a total station.	6 8	Dec. 2021
23	What are the elements of compound curves? Explain with a neat sketch.	3	Dec. 2020
24	a) Two tangents meet at chainage 1236m, the deflection angle being 42°. A circular curve of radius 400m is to be introduced in between them. Calculate the tangent length, length of circular curve, chainage of the tangent points and deflection angles for setting out the first three pegs and the last peg on the curve by Rankine's method (pegs are to be fixed at 20m interval). b) Describe briefly the salient features of total station.	10 4	Dec. 2020
25	a) What is a transition curve? Explain the various elements of a transition curve. b) Explain the principle and working of total station.	7 7	Dec. 2020
MODULE -5			
1	Briefly explain about Global Navigation System and its types?	20	
2	What you mean by Global Positioning System,	10	July 2019
3	Explain errors in GPS ranging, Explain any two in detail	10	Dec. 2019
4	Briefly explain about the various applications of GPS. Explain the principle of position determination by satellite ranging.	10	Sep 2020
5	Explain about the principles of GPS?	20	Dec. 2019
6	List the advantages and disadvantages of GPS surveying methods	15	Sep 2020
7	Explain static and rapid static methods of GPS surveying	20	Sep 2020
8	What you mean by visibility diagram? Illustrate with sketch	20	Dec. 2019
9	What is meant by DGPS? Explain code based and carrier based DGPS system	20	July 2019
10	Explain briefly about various phases of GPS survey?	20	Dec 2019
11	Enumerate the applications of GPS.	10	Sep 2020
12	What is meant by multi spectral scanning?	8	Sep 2020
13	Explain along track and across track scanning?	10	Sep 2020
14	What is meant by remote sensing?	5	Dec. 2019

15	Explain passive and active remote sensing?	15	July 2019
16	What is meant by spectral reflectance? Explain the reflectance characteristics of soil, vegetation and water with the help of spectral reflectance curve?	20	Dec. 2018
17	Explain the principle of position determination by satellite ranging.	3	Dec. 2021
18	Distinguish between passive and active remote sensing.	3	Dec. 2021
19	(a) What is meant by spectral reflectance? Explain the reflectance characteristics of vegetation, soil and water with the help of spectral reflectance curve. (b) What is meant by multispectral scanning? Explain along track and across track scanning.	7 7	Dec. 2021
20	(a) Explain static and rapid static methods of GPS survey. (b) Explain geographic coordinate system and projected coordinated system	7 7	Dec. 2021
21	List out the components of GIS.	3	Dec. 2020
22	Explain the principle of remote sensing.	3	Dec. 2020
23	a) Explain i) raster data ii) vector data in GIS b) Differentiate between active and passive systems of remote sensing	8 6	Dec. 2020
24	a) Discuss electromagnetic energy and electromagnetic spectrum. b) Describe the various methods of GPS surveying.	6 8	Dec. 2020

MODULE 1			
SL.NO	**QUESTIONS**	**MARK**	**YEAR**
1	Write about the basic design process.	3	MODEL
2	Describe how to finalize the design objectives	3	MODEL
3	List the constraints and objectives of designing a lunch box for the school students	3	KTU- May,2019
4	Design a length adjustable mop to clean ceiling fan	3	KTU- May,2019
5	Give the main objectives and constraints for the design a)Main entrance door of a house b)The door of a room with in the house c)The door to a bathroom within the house	3	
6	Show the designing of a wrist watch going through the various stages of the design process. Use hand sketches to illustrate the processes.	14	MODEL
7	Find the customer requirements for designing a new car showroom. Show how the design objectives were finalized considering the design constraints?	14	MODEL
8	Discuss the importance of design constraints.	3	KTU- Dec,2020
9	Describe how to select the "best possible design" from the generated design alternatives?	3	KTU- Dec,2020
10	Design two alternatives of a chair suitable for a five-year-old child, and then to narrow down to the best design based on objectives and constraints. Sketch both the designs	14	KTU- Dec,2020
11	Identify the objectives, functions and constraints for designing a water level indicator. Illustrate the various stages of the design process. Provide suitable sketches.	14	KTU- Dec,2020
12	Find the customer requirements for designing a website for an educational institution. Show how the design objectives were finalized considering the design constraints. Sketch a layout of the website showing dropdown menus.	14	KTU- Dec,2021
13	Show the designing of an iron box going through the various stages of the design process. Use hand sketches to illustrate the processes	14	KTU- Dec,2021
14	What are the basic vocabularies in engineering design?	3	KTU- Dec,2021
15	How to identify the customer requirements of design?	3	KTU- Dec,2021
MODULE 2			
1	State the role of divergent-convergent questioning in design thinking.	3	MODEL
2	Discuss how to perform design thinking in a team managing the conflicts	3	MODEL
3	Graphically communicate the design of a thermo flask used to keep hot coffee. Draw the detailed 2D drawings of the same with design detailing, material selection, scale drawings, dimensions, tolerances, etc. Use only hand sketches.	3	MODEL
4	Illustrate the design thinking approach for designing a bag for college students within a limited budget. Describe each stage of the process and the iterative procedure involved. Use hand sketches to support your	14	MODEL

	arguments.		
5	Construct a number of possible designs and then refine them to narrow down to the best design for a drug trolley used in hospitals. Show how the divergent-convergent thinking helps in the process. Provide your rationale for each step by using hand sketches only.	14	MODEL
6	Design a manual mango plucker (with height adjusting mechanism) which can be used by a common man to pluck and collect safely the mangoes from the mango tree in his yard. • Prepare a detailed design highlighting the benefits of our design • Draw a neatly labelled sketches showing your design	10	KTU- july,2018
7	Discuss how to manage the conflicts in a team executing the design thinking process.	3	KTU- Dec,2020
8	How does the design thinking approach help engineers in creating innovative and efficient designs?	3	KTU- Dec,2020
9	Design a water bottle that can be opened with one hand. Illustrate the various stages involved in design thinking. Sketch the final design.	14	KTU- Dec,2020
10	During the Covid-19 pandemic, people have to wear a mask, but wearing a mask is not comfortable. Empathize about this design problem and arrive at a solution using the design thinking process, so that people can select the level of protection provided by masks according to different situations. Illustrate the solution using sketches.	14	KTU- Dec,2020
11	Discuss how to manage the conflicts in a team executing the design thinking process.	3	KTU- Dec,2020
12	How does the design thinking approach help engineers in creating innovative and efficient designs?	3	KTU- Dec,2020
13	Illustrate the design thinking approach for designing a wearable technology for a college student. Describe each stage of the process. Illustrate the solution using sketches.	14	KTU- Dec,2021
14	Some of the vehicle drivers do not dim the headlights when facing another vehicle at night. Empathize about this design problem and arrive at a solution using the design thinking process. Illustrate the solution using sketches.	14	KTU- Dec,2021
15	Describe the iterative process involved in design thinking approach	3	KTU- Dec,2021
16	Describe the importance of empathize phase in design thinking	3	KTU- Dec,2021
MODULE 3			
1	Show how engineering sketches and drawings convey designs.	3	Model
2	Explain the role of mathematics and physics in design engineering process.	3	Model
3	Graphically communicate the design of a thermo flask used to keep hot coffee. Draw the detailed 2D drawings of the same with design detailing, material	14	Model

	selection, scale drawings, dimensions, tolerances, etc. Use only hand sketches		
4	Describe the role of mathematical modelling in design engineering. Show how mathematics and physics play a role in designing a lifting mechanism to raise 100 kg of weight to a floor at a height of 10 meters in a construction site	14	Model
5	A round glass of 600mm diameter and 6mm thick is available .This is to be designed as a table supported at three points by a steel tube bent in a convenient way .The height of the table is to be 300mm and the total length of the tube used should not exceed 1.8m,The tube should not be out or joined .Design the bent tube for supporting the table. 	10	KTU- Sep,2020
6	Design a foldable steel table. Draw the detailed 2D drawings of the same with design detailing, scale drawings and dimensions. Use only hand Sketches.	14	KTU- Dec,2020
7	Prepare a technical report for a newly designed website for online training of students with neat diagrams for presenting to a client.	14	KTU- Dec,2020
8	Clarify the part of mathematics and physics in the design engineering process.	3	KTU- Dec,2020
9	What are factors to be considered in preparing technical reports to communicate a design efficiently?	3	KTU- Dec,2020
10	Design an integrated water bottle with lunch box. Draw the detailed 2D drawings of the same with design detailing, material selection and dimensions. Use only hand sketches.	14	KTU- Dec,2021
11	Prepare a technical report for a newly designed portable ladder with neat sketches for presenting to a client.	14	KTU- Dec,2021
12	How can a design be communicated through engineering sketches and drawings?	3	KTU- Dec,2021
13	Explain the role of Prototyping in evaluating a Design	3	KTU- Dec,2021
MODULE 4			
1	What is meant by modular design?	5	KTU- May,2019
2	Apply the modular design concept for a product bicycle	5	KTU- May,2019
3	How modular design is realized in i) Umbrella and ii) Ink Pen? Draw the different modules involved in each of these products.	4	KTU- May,2019

4	Apply the principles of value engineering, design a school bag for the students residing in poor home. Neatly sketch the design and prepare a description for the same	5	KTU- July,2018
5	Show the development of a nature inspired design for a solar powered bus waiting shed beside a highway. Relate between natural and man-made designs. Use hand sketches	14	Model
6	Show the design of a simple sofa and then depict how the design changes when considering 1) aesthetics and 2) ergonomics into consideration. Give hand sketches and explanations to justify the changes in designs.	14	Model
7	Distinguish between project-based learning and problem based learning in design engineering.	3	Model
8	Describe how concepts like value engineering, concurrent engineering and reverse engineering influence engineering designs?	3	Model
9	Considering the principle of value engineering. Design a suitable product for easy cleaning of dust from windows, fans and lamp shades.	5	KTU- june ,2017
10	Draw the figure of a smart phone which is both aesthetic and ergonomic.	5	KTU- june ,2017
11	Describe the use of value engineering in the design process.	3	KTU- Dec,2020
12	How does intelligence in nature inspire engineering designs?	3	KTU- Dec,2020
13	Apply value engineering to a pen, and design a lightweight pen torch. Illustrate the solution using sketches.	14	KTU- Dec,2020
14	Design waste bins to be kept at bus stops for waste collection enabling source separation. The bin should be theft-resistant and protect the contents of the bin from external weather conditions. Design the bins with ergonomic consideration for waste collection workers. Sketch the design using hand drawings.	14	KTU- Dec,2020
15	Show the development of a nature-inspired design for a fashionable umbrella based on a banana leaf. Use hand sketches to support your arguments.	14	KTU- Dec,2020
16	Develop some design modification for sports utility bag, to improve its functionalities as well as product value. Sketch the design	14	KTU- Dec,2020
17	Explain the importance of project-based learning in design engineering	3	KTU- Dec,2021
18	Discuss the role of life cycle design approach in design decisions.	3	KTU- Dec,2021
MODULE 5			
1	Examine the changes in the design of a foot wear with constraints of 1) production methods, 2) life span requirement, 3) reliability issues and 4) environmental factors. Use hand sketches and give proper rationalization for the changes in design	14	Model
2	Show how designs are varied based on the aspects of	3	Model

	production methods, life span, reliability and environment?		
3	Explain how economics influence the engineering designs?	3	Model
4	Describe the how to estimate the cost of a particular design using any of the following: i) a website, ii) the layout of a plant, iii) the elevation of a building, iv) an electrical or electronic system or device and v) a car. Show how economics will influence the engineering designs. Use hand sketches to support your arguments	14	Model
5	Design a fan which automatically reduces speed or stops when the temperature reduces during the night for energy conservation. Use hand sketches to support your design.	14	KTU- Dec,2020
6	Describe how to estimate the cost of a pen and list the various parts. Show how the economics will influence the engineering designs. Use hand sketches to support your arguments.	14	KTU- Dec,2020
7	How to estimate the cost of a particular design?	3	KTU- Dec,2020
8	How do ethics play a decisive role in engineering design?	3	KTU- Dec,2020
9	Design a sustainable piping network for reuse of water in a residential building enabling water conservation. Sketch the design.	14	KTU- Dec,2021
10	Design a door handle with a lock which is easy to use. Use hand sketches and give rationalization for the various features in the design.	14	KTU- Dec,2021
11	What are the factors to be considered for a sustainable design?	3	KTU- Dec,2021
12	What are design rights, and how can an engineer put it into practice?	3	KTU- Dec,2021

Question Bank

MCN201 - **SUSTAINABLE ENGINEERING**

Module 1

Sl. No	Questions	Marks	KU/KTU (Month/Year)	Instructional Objectives
1	Comment on the challenges for sustainable development in our country and suggest a way to overcome the same.	2	KTU DEC 2019	
2	Write a short note on Millennium Development Goals.	10	KTU APRIL 2018, 2020, 2021	
3	Discuss the evolution of the concept of sustainability. Comment on its relevance in the modern world.	10	KTU DEC 2019	
4	Explain Clean Development Mechanism	5	KTU DEC 2017, 2020, 2021	
5	Explain with an example a technology that has contributed positively to sustainable development.	5	KTU DEC 2017	
6	Illustrate the nexus between agricultural technology and sustainability.	5	KTU DEC 2017, 2021	
7	Comment on the challenges for sustainable development in our country and suggest a way to overcome the same	5	KTU DEC 2018	
8	Technology may affect sustainability in positive and negative ways. Give one example each for both cases.	5	KTU APRIL 2018	
9	Illustrate the three-pillar model of sustainability.	2	KTU MAY 2019, 2020, 2021	
10	Justify, giving one reason, why sustainability is an essential component in any developmental	2	KTU DEC 2018	

	programmes and projects.			

Module 2

Sl. No	Questions	Marks	KU/KTU (Month/Year)	Instructional Objectives
1	Describe carbon credit.	5	KTU APRIL 2018, 2020, 2021	
2	Give an account of climate change and its effect on environment.	5	KTU APRIL 2018	
3	Explain the common sources of water pollution and its harmful effects.	5	KTU APRIL 2018, 2020	
4	Give an account of solid waste management in cities	10	KTU DEC 2019, 2021	
5	Explain the 3R concept in solid waste management?	10	KTU DEC 2017, 2020	
6	Write a note on any one environmental pollution problem and suggest a sustainable solution.	5	KTU DEC 2018	
7	In the absence of green house effect the surface temperature of earth would not have been suitable for survival of life on earth. Comment on this statement.	10	KTU DEC 2018	
8	Write short note on the need of environmental sustainability? Also explain the concept of zero waste?	5	KTU DEC 2018, 2020	
9	Briefly describe zero waste concept with a suitable example.	2	KTU MAY 2019, 2021	

10	What is the concept of industrial ecology? Give an example of a recent product.	3	KTU JAN 2017	

Module 3

Sl. No	Questions	Marks	KU/KTU (Month/Year)	Instructional Objectives
1	Describe biomimicry? Give two examples.	5	KTU APRIL 2018	
2	Explain the basic concept of Life Cycle Assessment.	10	KTU APRIL 2018, 2021	
3	Explain the different steps involved in the conduct of Environmental Impact Assessment	5	KTU APRIL 2018	
4	Suggest some methods to create public awareness on environmental issues.	5	KTU DEC 2017	
5	“Nature is the most successful designer and the most brilliant engineer that has ever evolved”. Discuss.	10	KTU DEC 2017	
6	Match the items in the following sets: SetA: {ISO 14006; ISO 14041; ISO 14048;ISO 14012} Set B: {LCA Data Documentation Format; Environmental Auditing qualifying criteria; Eco design guidelines; LCA inventory analysis}	10	KTU DEC 2017	
7	Write short notes on ISO 14001 series	5	KTU DEC 2020	
8	Suppose you are required to do the Life Cycle Assessment of an Electric Vehicle. In the utilisation stage, the assessment must be made for the energy used to drive the vehicle. List any three possible impacts of the Electric Vehicle during the usage stage? Suggest a possible way to reduce the impact during utilisation of the vehicle?	5	KTU DEC 2018	

9	A) What is Environment Management System (EMS)? B) List out functions of EMS.	2 3	KTU DEC 2018, 2021	
10	What is LCA? Illustrate how LCA can be effectively used in the environmental management of industrial production systems.	5	KTU DEC 2018, 2020	
11	What is the concept of industrial ecology? Give an example of a recent product.	5	KTU DEC 2019	

Module 4

Sl. No	Questions	Marks	KU/KTU (Month/Year)	Instructional Objectives
1	Name three renewable energy sources.	5	KTU APRIL 2018	
2	Mention some of the disadvantages of wind energy.	5	KTU APRIL 2018	
3	Comment on the statement, “Almost all energy that man uses comes from the Sun”.	10	KTU APRIL 2018	
4	Write notes on: a. Land degradation due to water logging. b. Over exploitation of water.	5	KTU DEC 2017	
5	Enumerate the impacts of biomass energy on the environment	10	KTU DEC 2017, 2021	
6	Explain the working of a photovoltaic cell with a neat sketch? What are the steps involved in bio fuel production?	5	KTU DEC 2018	
7	How can energy be derived from oceans?	5	KTU DEC 2018	
8	Explain in detail any one methodogy to extract geothermal energy	5	KTU DEC 2018	

9	Compare and contrast conventional and nonconventional energy with reference to sustainability	5	KTU DEC 2018	
10	What are the methods for increasing energy efficiency of buildings?	5	KTU DEC 2019, 2020	

Module 5

Sl. No	Questions	Marks	KU/KTU (Month/Year)	Instructional Objectives
1	Enlist some of the features of sustainable habitat	5	KTU APRIL 2018, 2021	
2	Explain green engineering.	5	KTU APRIL 2018, 2020	
3	Discuss the elements related to sustainable urbanisation.	$^{5}4$	KTU APRIL 2018, 2021	
4	Discuss any three methods by which you can increase energy efficiency in buildings	5	KTU DEC 2017	
5	How a green building differs from a conventional building? Compare any five aspects?	5	KTU DEC 2017, 2019	
6	Explain the criteria for the material selection of sustainable builings?	10	KTU DEC 2017	
7	Write short note on the green building certification in india	5	KTU DEC 2018	
8	Write short note on sustainable transportation? What are all the characterestics?	10	KTU DEC 2019, 2021	
9	How can sustainable urbanization and poverty reduction be related?	5	KTU DEC 2018, 2020	