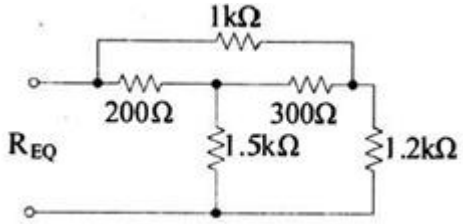
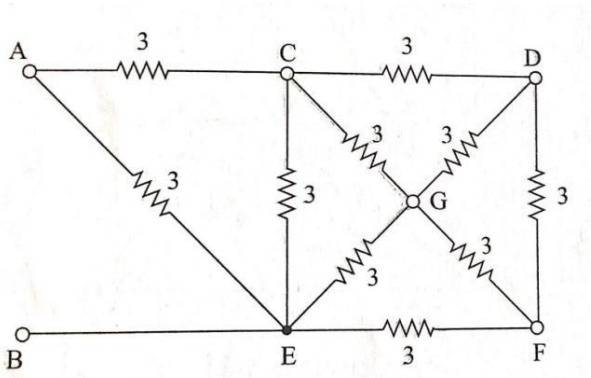
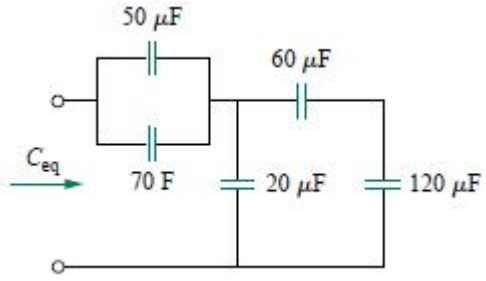
QUESTION BANK

SEMESTER 1- CIVIL ENGINEERING

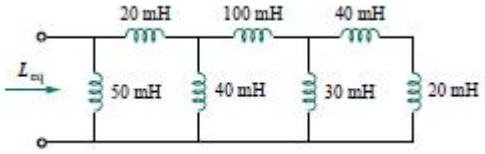
PART 1 : BASICS OF ELECTRICAL ENGINEERING

MODULE 1

1	Explain Kirchhoff's voltage and current law with an example	*4*	*KTU'19*
2	Draw and explain the characteristics of ideal and practical voltage and current source	*4*	*KTU'17*
3	Using Star-Delta transformations find the total resistance REQ for the circuit shown 	*4*	*KTU'17*
4	Write the relationship of star – delta transformation of three resistors	*4*	*KTU'17*
5	Calculate equivalent resistance across B and A 	*4*	*KTU'16*
6	A resistor of 5Ωis connected in parallel with a resistor of R1Ω. This combination is connected in series with an unknown resistor of R2Ω and the complete circuit is then connected to 50 V dc supply. Calculate the values of R1 and R2, if the power dissipated by the unknown resistor R1 is 150W with 5A passing through it.	*4*	*KTU'17*
7	Three resistors R1=20 ohm, R2=90 ohm and R3=10 ohm are connected in star .Obtain the equivalent delta circuit.	*4*	*KTU'16*
8	Find the equivalent capacitance seen at the terminals of the circuit	*4*	

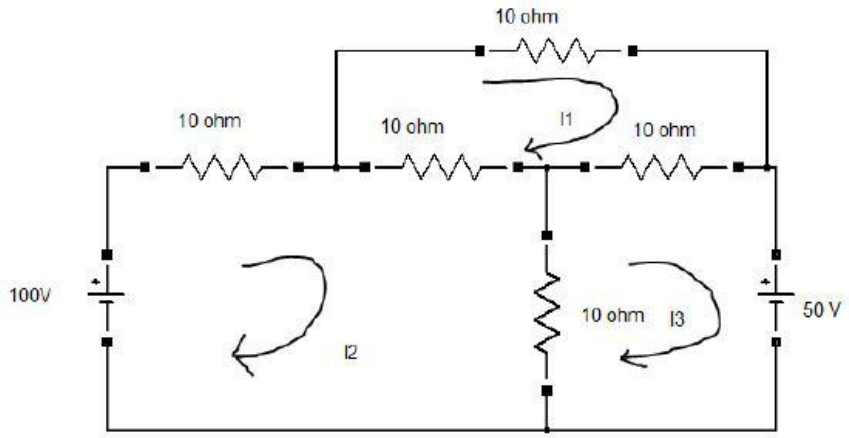


9 Calculate the equivalent inductance for the inductive ladder network *4*

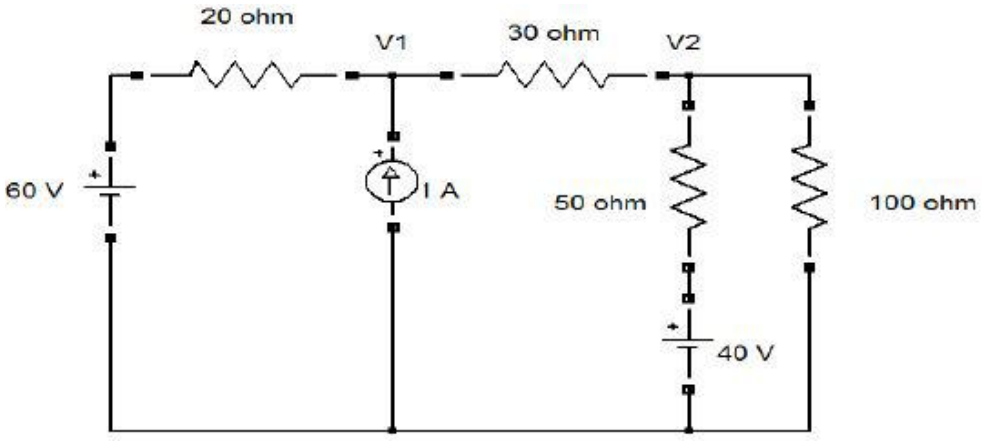


10 Plot the V-I characteristics of Capacitance and Inductance *4*

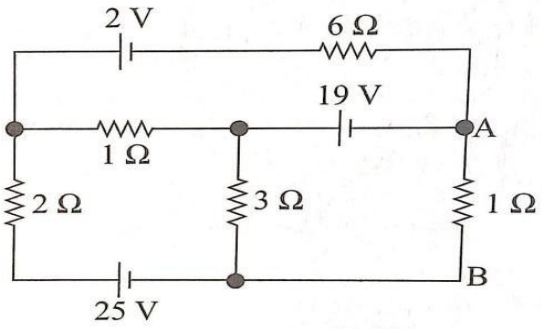
11 Find mesh currents in the figure shown by mesh analysis *14* *KTU'19*



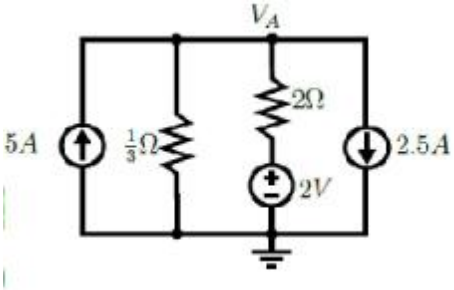
12 Find current in 100 ohm resistor using node analysis *14* *KTU'18*



13 By applying Kirchhoff's laws calculate current flowing through the 6Ω resistor in the network shown. *14* *KTU'16*

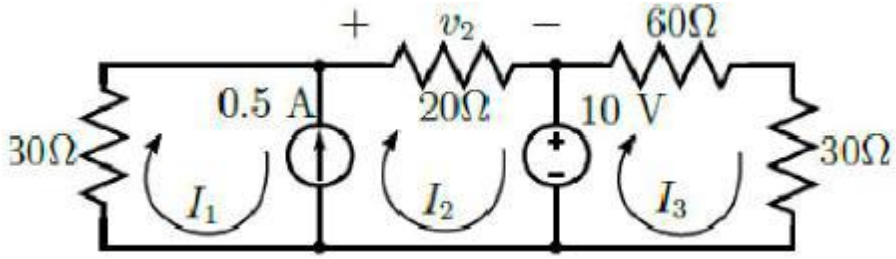


14 From the figure use node voltage analysis to find voltage V_A *14* *KTU'16*

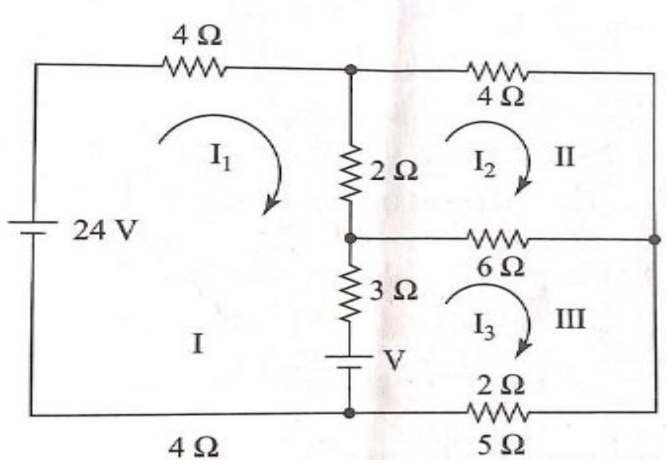


15 a. From the fig find V_2, I_1,$I_2$and I_3 using mesh analysis. Also evaluate the power delivered by the current source *14* *KTU'16*

b. Derive the expression for delta equivalent resistors from a star network

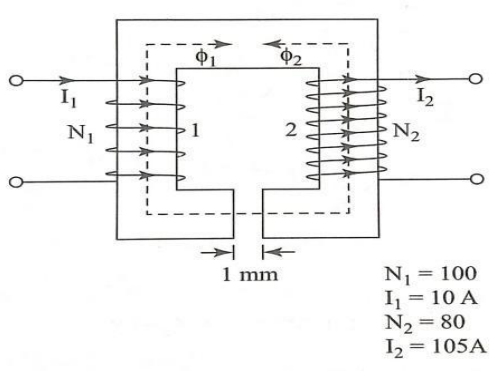


16 A network with three meshes are shown. Apply mesh current method to determine the value of unknown voltage V, for which mesh current I_1=0. *14* *KTU'16*



MODULE II

1	Define a) Magnetic Field intensity b) Flux c) Reluctance d) Flux Density. Give equations and units.	4	KTU'19
2	Define a) RMS Value b) Average Value c) Frequency d) Time Period	4	KTU'19
3	Calculate the RMS and average values of a purely sinusoidal current having peak value 15A.	4	KTU'18
4	Compare electric and magnetic circuits	4	KTU'18
5	What is fringing effect and leakage flux in magnetic circuits? What are its disadvantages	4	KTU'17
6	Calculate the flux produced in the air gap in the magnetic circuit shown infigure which is excited by the MMF of two windings. The mean length of theflux path is 40 cm. The permeability of iron is 2000. The uniform cross sectional area is 10 cm²	4	KTU'16
7	Differentiate between statically induced and dynamically induced EMF.		
8	Derivetheformfactorofapuresinusoidalwaveform	4	KTU'17
9	What do you mean by Coefficient of coupling?	4	
10	Draw the circuit of a series parallel magnetic circuit. Show its electrical equivalent	4	KTU'16
11	a) A ring shaped electromagnet has an air gap of 6mm and cross sectional area of 12 cm². The mean length of the core (excluding air gap) is 60cm. Calculate the mmf required to produce a flux density of 0.4 Wb/m²in the gap. Take the relative permeability of	10	KTU'18



the material as 400.

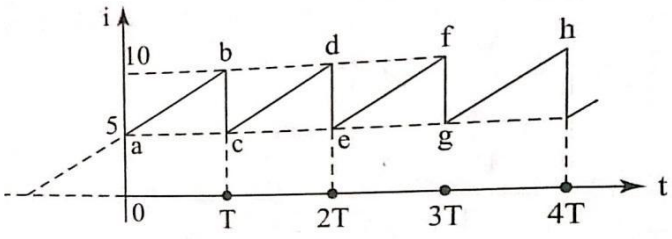
b) Derive the expression for energy stored in a magnetic field.

12 A steel ring of 25 cm diameter and of circular section 3 cm in diameter has an air gap of 1.5mm length. It is uniformly wound with 1000 turns of wire carrying a current of 2A. Calculate — 10 — KTU'19

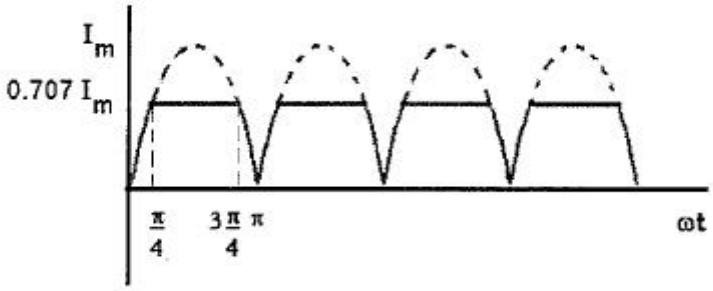
i) magnetomotive force
ii) magnetic flux density in air gap
iii) magneticflux
iv) relative permeability of steel ring. Assume that iron path takes about 40% of the total mmf.

13 a) Show that for a sinusoidal voltage, RMS value is 0.707 times its maximum value — 10 — KTU'16

b) Calculate the RMS value and average value of current shown



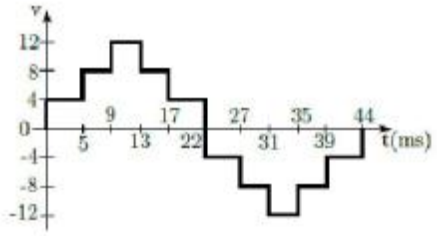
14 Determine the RMS, Average and Form Factor of the waveform shown below — *10* — *KTU'18*



15 Two coils of N1 = 50 and N2 = 500 turns respectively are wound side by side on aniron ring of cross sectional area of 50 cm2 and mean length of 120 cm. Calculatemutual inductance between the coils, self-inductance of the coils and the coefficient ofcoupling assuming permeability of iron as 1000. — *10* — *KTU'16*

16 Derive an expression for dynamically induced emf in terms of magnetic flux density (B), length of the conductor (l), velocity(v) and angle between B and v — *10* — *KTU'18*

MODULE III

1	In a single phase ac circuit consisting of an impedance of 10Ω, the RMS value of applied voltage is 230V. i. Write down the expression for instantaneousvoltage ii. If the current lags the applied voltage by 30° write down the expression for instantaneouscurrent Calculate the power consumed in thecircuit	*4*	*KTU'19*
2	What is the phase angle relationship between applied ac voltage and circuit current in a purely inductive circuit? Prove your answer	*4*	*KTU'18*
3	An RL series circuit is supplied from an ac voltage vourcev(t) = 12cos4t V. thecomplex power delivered by the source is S = 3.6 +7.2j VA. Calculate the values ofthe resistance, inductance and power factor.	*4*	*KTU'17*
4	When an AC supply with a supply voltage of 250V is applied across the circuit, the current in the circuit is found to be 25A. If the current is 0.8pf lagging, find the impedance of the circuit in j form and its magnitude	*4*	
5	Find the rms value of the stepped waveform  	*4*	*KTU'16*
6	Prove that power in a purely inductive and capacitive circuit is zero	*4*	*KTU'17*
7	An alternating voltage is defined as v=100 sin α 0<α<π v=0V π<α<2π What is the RMS value of this voltage	*4*	*KTU'17*
8	Three 100 Ω resistors are connected first in star and then in delta across 415 V, 3-phase supply. Calculate the line and phase currents in each case and also the power taken from the source	*4*	
9	A series circuit having pure resistance of 40 Ω, pure inductance of 50mH and a capacitor is connected across a 400V, 50 Hz ac supply. This RLC circuit draws a current of 10A. Calculate 1) Power factor of the circuit, 2) Capacitor value	*4*	
10	A 400V is applied to three star connected identical impedances each consisting of a 40 Ω resistance inseries with 3Ω inductance reactance. Find (i) line current (ii) Total power supplied	*4*	
11	a) With the help of diagrams explain how an alternating voltage is generated using a single turn coil. b) A resistance of 5 Ω and an inductor of 15mH are connected in	*10*	*KTU'19*

	series across a 230V 50Hz single phase ac supply. Calculate the (i) current (ii) power factor (iii) power consumed (iv) What value of capacitor must be connected in series with thiscombination so as to improve the power factor to 0.9		
12	.A balanced three phase load consists of three coils each having resistance of 4Ω and inductance 0.02H. It is connected to a 415V, 50Hz, 3-phase ac supply. Determine the phase voltage, phase current, power factor and active power when the loads areconnected in (i) star (ii) delta	*10*	*KTU'19*
13	a) A 220V, 50Hz single phase sinusoidal voltage produces a current of 2.2A in a purely inductive coil. Determine (i) inductive reactance of the coil (ii) inductance (iii) power absorbed (iv) derive expression for applied voltage and current b) With the help of circuit diagram and phasor diagram derive the relation between line and phase voltages, and line and phase currents in a balanced delta connected system.		*KTU'18*
14	A coil of resistance 10 Ω and inductance 0.1 H is connected in series with a 150 μF capacitor across 200V, 50 Hz supply. Calculate (i) Inductive reactance, Capacitance reactance, impedance, current and power factor. (ii) The voltage across the coil and capacitor respectively.	*10*	*KTU'17*
15	i) Two impedences, 10|_-30 and 20 |_60 are connected in parallel. Evaluate the equivalent impedance. What is the nature (capacitive or inductive) of the equivalent impedence? If a current of 10|_45 is passing through the parallel combination, calculate the voltage across the combination and express it in rectangular form. Evaluate the currents in each of the impedences. Draw the phasor diagram showing this voltage and all three currents i) Define peak factor and form factor. Consider v(t) = 500cos(100t), a sinusoidal voltage. Evaluate the rms value and peak factor of the voltage form.	*10*	*KTU'16*
16	i) An alternating voltage of(80 + j60) V is applied to a circuit and the current flowing is (-4 + j10) A. Find (i) the impedance of the circuit, (b) the power consumed and (c) thephaseangle. ii) Each phase of a delta connected load has a resistance of 25Ωand an inductanceof0.15 H. The load is connected across a 400 V, 50 Hz, three phase supply. Determine the line current, power factor andpower consumed.	*10*	*KTU'17*

PART II

BASICS OF ELECTRONICS ENGINEERING

MODULE 4

1.	Differentiate fixed and variable resistors. Briefly explain the fabrication steps of each type.	10
2.	Give the specifications of a resistor. The color bands marked on a resistor are Blue, Grey, Yellow and Gold. What is the minimum and maximum resistance values expected from that resistance?	4
3.	Write the expression for capacitive reactance. Explain how reactance varies with frequency?	2
4.	How an electrolytic capacitor is formed?	5
5.	Find out the max current rating for a 10k ohm,0.5W resistor	2
6.	Compare CB, CC, CE configurations of transistor.	10
7.	Differentiate Zener and Avalanche breakdowns.	5
8.	Discuss the formation of barrier potential in PN junction	5
9.	Explain the different types of inductors.	7
10.	List any four circuits where you can find inductors and capacitors	8

MODULE-5

1.	Explain in detail the voltage divider biasing with a neat diagram.	5
2.	Explain with block diagram the PA addressing system.	10
3.	Draw the circuit diagram and explain the working of zener voltage regulator.	5
4.	With circuit diagram and necessary waveform. Explain the working of a bridge rectifier.	7
5.	Explain how filtering is done with capacitor filter.	5
6.	What is a multimeter? With a neat block diagram explain the working of a digital multimeter. Give two differences between digital and analog multimeter.	10
7.	Draw the frequency response characteristics of an RC coupled amplifier and state the reasons for the reduction of gain at lower and higher frequencies	4
8.	With a neat circuit diagram, explain the working of an RC coupled amplifier.	6
9.	Calculate α_{dc} and β_{dc} for a transistor if I_C is measured as 1mAand I_B is 25μA.Also determine the new base current to give I_C=5mA.	4
10.	Explain he block diagram of an electronic instrumentation system.	10

MODULE-6

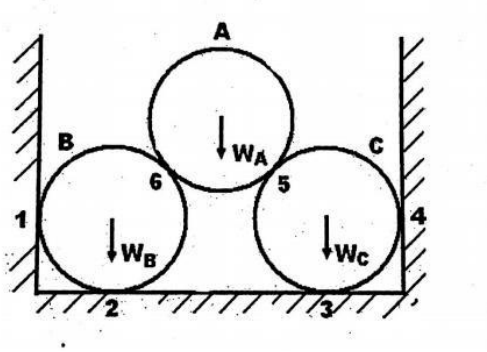
1.	Explain basic principle of cellular communication systems	5
2.	With neat diagram explain the working of AM super heterodyne receiver?	10

3.	Explain the importance of antenna in communication?	4
4.	What is the principle of operation of GSM? What are the services offered by GSM?	5
5.	Explain the working of parabolic reflector with neat diagram	5
6.	Brief the evolution of communication system	5
7.	Explain the basic principle of antenna	4
8.	Explain the frequency bands used for communication?	4
9.	What is modulation? Differentiate AM and FM.	7.
10.	Explain parameters of antenna?	4

ENGINEERING MECHANICS

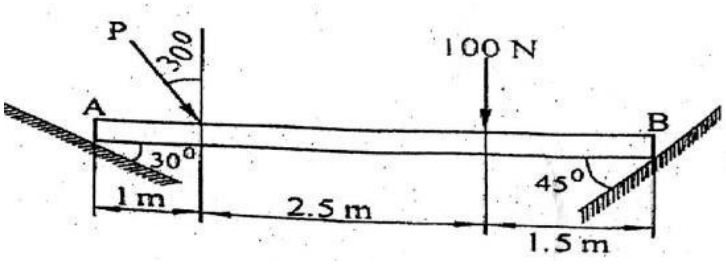
MODULE 1

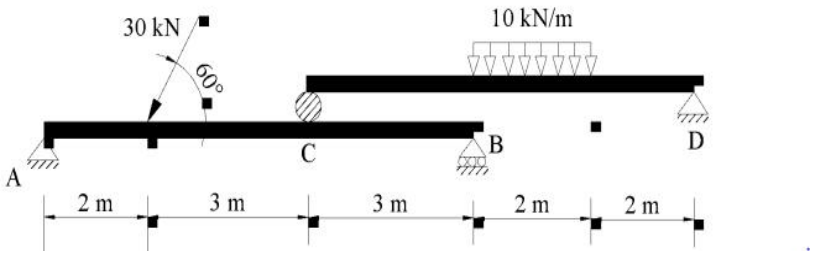
1	Explain the laws of mechanics	3 marks	KTU 2017
2	State and prove Varignon's theorem of moments.	3 marks	KTU 2018
3	Calculate the amount of work done when the point of application is shifted from the point P, 2i- 6j- 3k to the point Q, 4i+3j-k by the application of a force F = 5i +2j +7k. (5) 3 With the help of sketches, explain how forces involved in the lifting of a load by a wedge are analysed	14 marks	KTU 2018
4	Explain the concept of free body diagram with figures	3 marks	KTU 2018
5	State Pappus Guldinus theorem.	3 marks	
6	Determine the volume of a body generated by rotation of a semi-circular area about a non- intersecting axis using this theorem	14 marks	
7	The greatest and least resultants of two forces F1 and F2 are 17N and 3N respectively. Determine the angle between them when their resultant is 149 N?	14 marks	KTU 2018
8	ABCD is a square , each side being 20cm and E is the middle point of AB. Forces of magnitude 7,8,12,5,9 and 6 kN act on lines of directions AB, EC, BC, BD, CA and DE respectively. Find the magnitude and direction of resultant force.	14 marks	KTU 2018
9	State and explain the principle of transmissibility of forces with figure?	14 marks	KTU 2018
10	3 cylinders of weight 300N (A), 200N (for B and C)are placed on a rectangular channel as shown in fig. Determine the reactions at 1, 2 and 4?	14 marks	KTU 2018



MODULE II

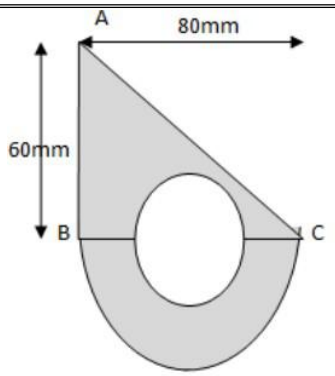
MODULE II

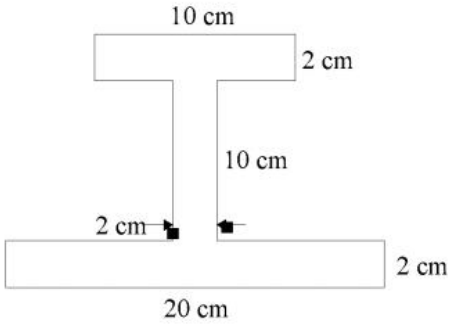
1	Define angle of friction and angle of repose. Establish the relationship between angle of friction and coefficient of friction?	3 marks	KTU DEC 2018
2	Distinguish between (i) Static and kinetic frictions,(ii) Sliding friction and rolling friction	3 marks	KTU DEC 2018
3	Distinguish static and dynamic friction	3 marks	KTU DEC 2018
4	A simply supported beam AB of span 5 m is carrying point loads 5kN, 3kN and 2kN at 1m, 3m and 4m respectively from support A. Calculate the support reaction at B.	3 marks	KTU DEC 2018
5	A lift has an upward acceleration of 1.2 m/s2 . What force will a man weighing 750 N exert on the floor of the lift? What force would he exert if the lift had an acceleration of 1.2 m/s2 downwards?	14 marks	KTU MAY 2018
6	write short notes on Types of beams Types of loads Types of supports	14 marks	KTU 2018
7	 Determine the load P and support reactions?	14 marks	KTU 2018
8	Determine the support reactions at A and B?	14 marks	KTU 2018

9	Determine the support reactions?	14 marks	KTU 2018
			
10	A ladder 5 m long and weighing 260 N is placed against a vertical wall at an inclination of $30^0$with wall. A man weighing 780 N climbs the ladder. When he is at a distance of 1.64 m along the ladder from lower end, the ladder slips, What is the coefficient of friction assuming it to be same for all contact surfaces?	14 marks)	KTU DEC 2017

MODULE III

1	State and prove pappus guldinus theorem?	3 marks	KTU 2018
2	Write a note on moment of inertia	3 marks	KTU 2018
3	Write a note on parallel axis theorom	3 marks	KTU 2018
4	Write a note on perpendicular axis theorem	3 marks	KTU 2018
5	Calculate the centroid of given areas?	14 marks	KTU 2018





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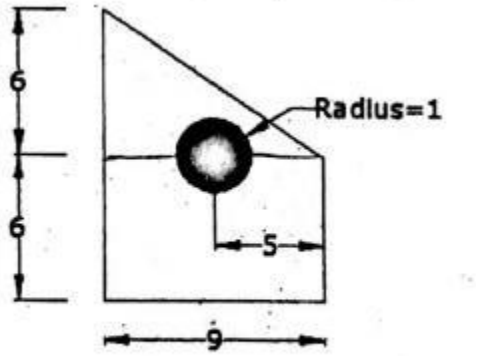
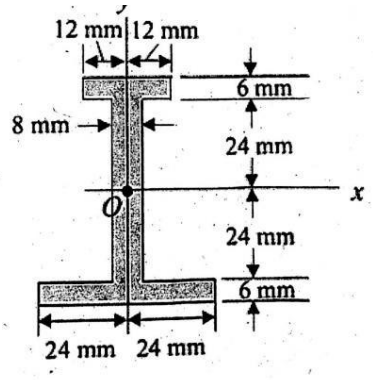


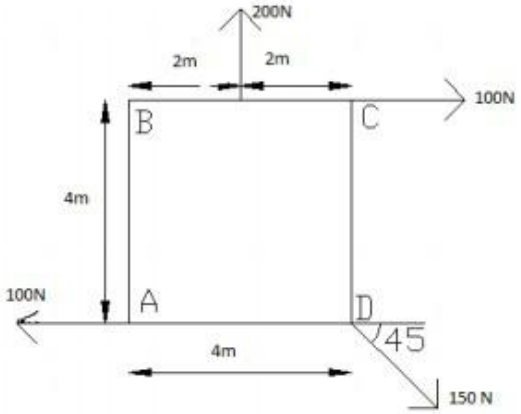
All dimensions in mm

6 Determine the moment of inertia of given section 14 marks KTU 2018

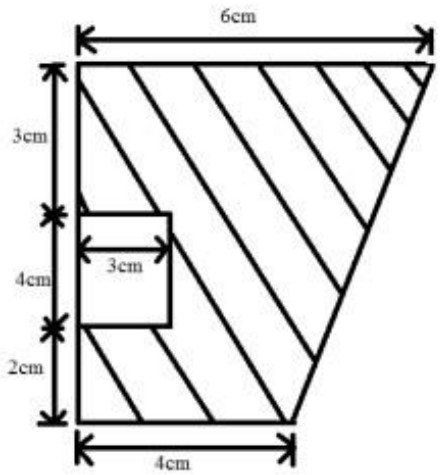


7 A solid cylinder 30mm diameter and weighing 30N is placed in a triangular channel, as shown in fig. Neglecting friction between the contact surfaces, calculate the normal reactions on the sides of the channel

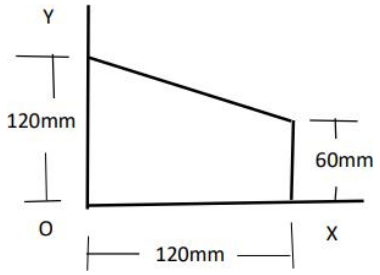
8	Explain principal moment of inertia, principal axis?	3 marks	KTU 2018
9	State and prove parallel axis theorem?	3 marks	KTU 2018
10	For the system of forces, determine the magnitude,direction and position of the resultant force about A.	14 marks	KTU 2019 KTU 2019



11	a) Define principal axes and principal moment of inertia. b) Determine the centroid of the shaded area. Also find moment of inertia of the shaded area about an horizontal axis passing through the centroid.	14 marks	KTU 2019

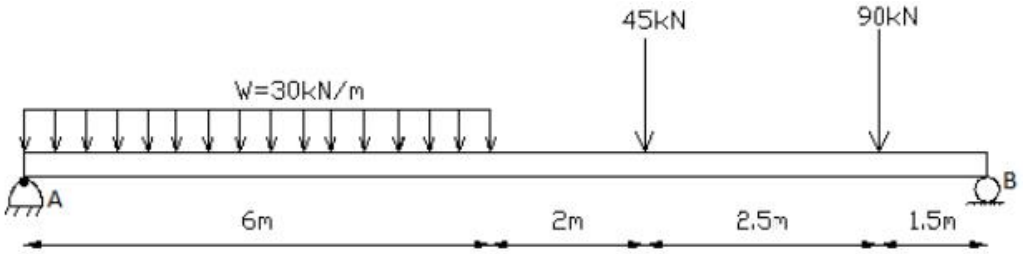


12	Determine the product of inertia about OX and OY of the trapezium.	14 marks	KTU 2019



MODULE IV

1. Highlight the principles of mechanics applied in the evaluation of elastic collusion of rigid bodies. 3 marks
2. Explain D'Alembert's principle 3 marks
3. Briefly explain equations of kinematics 3 marks
4. An effort of 200N is required just to move a certain body up an inclined plane of angle 15, the force acting parallel to the plane. If the angle of inclination of the plane is made $20^0$the effort required, again parallel to the plane is found to be 230N. Find the weight of the body and the coefficient of friction. (14 marks) KTU MAY 2017
5. Explain with sketches how the forces involved in the lifting of a load by a wedge are analysed. (14 marks) KTU DEC 2
6. State D'Alemberts principle giving equations expressing the above Principle on the motion of a lift moving upwards with an acceleration 'a' m/sec^{2}carrying a weight of 'W' N (3 marks)
7. Find the reactions at the supports A(hinged) and B (roller). 14 marks KTU



MODULE V

1. What do you mean by instantaneous centre of rotation? How can it be located for a body moving with combined motion of rotation and translation? (3 marks) KTU MAY 2018
1. Compare damped and undamped free vibrations. 3 marks
2. State the equation of motion of a rotating rigid body, rotating about its fixed axis 3 marks
3. Illustrate the significance of instantaneous centre in the analysis of rigid body undergoing rotational motion. 3 marks KTU MAY 2018

4. An elevator weigh 500N is ascending with an acceleration of 3 m/s2.During this ascend its operator whose weight is 700N is standing on the floor. What will be the reaction produced by the floor on the operator, what will be the total tension in the cable on the elevator (14 marks) KTU DEC 2017

5. Define simple harmonic motion? Derive an expression for the acceleration of particle executing simple harmonic motion. 14 marks KTU MAY 2018
6. Distinguish between SHM and periodic motion? (3 marks) KTU DEC 2018
7. Explain the types of vibrations (3 marks) KTU DEC 2018
8. Discuss – (a) amplitude (b) frequency (c) time period (3 marks) KTU MAY 2018
9. A body performing simple harmonic motion completes 8 oscillations in one minute. The velocity of the body is half the maximum velocity at a distance of 12 cm from the centre. Determine the amplitude and maximum acceleration. (14 marks) KTU MAY 2017

10. A particle has simple harmonic motion. Its maximum velocity was 6 m/s and the maximum acceleration was found to be 12 m/s^2. Determine the angular velocity and amplitude. Also determine its velocity and acceleration when displacement is half of the amplitude.

    (14 marks) KTU MAY 2017

11. The strength of a spring is such that a load of 50 N is required to elongate it by 10mm. When a certain load W is suspended from one end and caused to perform SHM, the complete oscillations per minute is 100. Calculate the stiffness of the spring and the value of load W (14 marks) KTU MAY 2017

12. A clock provided with a seconds pendulum is gaining 160 seconds a day. Find by how much the length of the pendulum should be increased so as to correct the clock. If it is running at correct time at a place where acceleration due to gravity is 9.81 m/s2 , find by how much the clock will lose or gain if it is taken to a place where the acceleration due to gravity is 9.79m/s2 . 14 marks KTU MAY 2019

LINEAR ALGEBRA AND CALCULUS

MODULE I

1. Solve the following system of equations?
   Y+z-2w=0
   2x-3y-3z+6w=2
   (7)
   4x+y+z-2w=4
2. Determine the rank of the matrix A=$\begin{bmatrix} 1 & 2 & -1 \\ -2 & -4 & 2 \\ 3 & 6 & -3 \end{bmatrix}$ (3)
3. Solve the following by Gauss elimination

   Y+Z-2w=0, 2x-3y-3z+6w=2, 4x+y+z-2w=4 (7)
4. Diagonalize the matrix $\begin{bmatrix} -1 & 2 & -2 \\ 2 & 4 & 1 \\ 2 & 1 & 4 \end{bmatrix}$ (7)
5. Write down the Eigen values $\begin{bmatrix} 2 & 0 \\ 0 & -1 \end{bmatrix}$ (3)
6. What kind of conic section the quadratic from $3x_1^2+22x_1x_2+ 3x_2^2 =0$ represents and transform it to principal axes (7)
7. Find the Eigen values and Eigen vectors of the matrix

   $\begin{bmatrix} -2 & 2 & -3 \\ 2 & 1 & -6 \\ -1 & -2 & 0 \end{bmatrix}$ (7)
8. Determine whether the matrix $\begin{bmatrix} 1 & 0 & -0 \\ 1 & 1/\sqrt{2} & -1/\sqrt{2} \\ 0 & 1/\sqrt{2} & 1/\sqrt{2} \end{bmatrix}$ is orthogonal (3)

9. Reduce the matrix A= $\begin{bmatrix} 2 & 3 & -1 & -1 \\ 1 & -1 & -2 & -4 \\ 3 & 1 & 3 & -2 \end{bmatrix}$ to row echelon form and hence find its rank (7)

10. Find out what type of conic section the quadratic form $17x_1^2-30x_1x_2+17x_2^2=128$ and transform it to principal axes (7)

11. 11.Solve the system of equation by Gauss elimination method 3x+3y+2z=1, x+2y=4, 10y+3z=-2,2x-3y-z=5 (7)

12. A= $\begin{bmatrix} 3 & 0 & 2 \\ 0 & 2 & 0 \\ -2 & 0 & 0 \end{bmatrix}$ find an orthogonal matrix p that diagonalizes A (3)

MODULE II

1. Let Z=f(x,y) where x= rcosθ , y= rsinθ prove that $\left(\frac{\partial z}{\partial x}\right)^2+\left(\frac{\partial z}{\partial y}\right)^2=\left(\frac{\partial z}{\partial r}\right)^2+1/r^2\left(\frac{\partial z}{\partial \theta}\right)^2$ (7)

2. show that the function u(x,t) = sin (x-ct) is a solution of the equation (3)

3. Use Lagrange multiplier to determine the dimensions of a rectangular box open at the top having a volume $32ft^3$ and requiring the least amount of material for its costruction. (7)

4. Find $f_x(1,3)$and fy(1,3) for the function $f(x,y) = 2x^3y^2+2y+4x$ (3)

5. Find the slope of the surface Z= x^2y+5y^3in the X direction at the point(1,-2) (3)

6.Let W=$\sqrt{x2+y2+z2}$,x = $\cos\theta, y=\sin\theta, z=\tan\theta$. Use chain rule to find $\frac{dw}{d\theta}$ when θ= $\pi/4$(7)

7. Locate all relative maxima ,relative minima and saddle points of f(x,y)=xy+ a^3/x +b^3\y (a≠ 0 , b ≠ 0 (7)

8.Find the points on the sphere $x^2 + y^2 + z^2 = 4$ that are closest to and farthest from the point (3,1,-1) (3)

9. Given the function W=xy+z use chain rule to find the instantaneous rate of change of wat each point along the curve x=$\cos t, y=\sin t, z=t$ (3)

10. Use the chain rule to find d $\frac{dw}{ds}$ at s=$\frac{1}{2}$ if $w=r^2-r\tan\theta$,r=$\sqrt{s}$,$\theta=\pi s$ (3)

11.Find the slope of sphere $x^2 + y^2 + z^2 = 1$ in the y-direction at $(\frac{2}{3}\frac{1}{3}\frac{-2}{3})$ (3)

12. Locate all relative maxima , relative minima and saddle point if any for $f(x,y)=y^2+xy+4y+2x+3$ (7)

MODULE III

1. use double integral to find the area of the region enclosed between the parabolas $y=\frac{1}{2}X^2$ and the line y=2x (3)

2.Use polar coordinates to evaluate the area of the circle $X^2+Y^2=4$ (3)

3.Evaluate the integral $\int_0^4 \int_{\sqrt{y}}^2 e^{x3}dxdy$

by changing the order of integration (7)

4. Find the volume of the solid bounded by the cylinder $x^2+y^2=4$ and the planes y+z=4 and z=0 (7)

5.Use spherical coordinates to find the volume of the solid bounded above by the sphere $x^2+y^2+z^2=16$ and below by the cone $Z=\sqrt{x2+y2}$ (7)

6. Evaluate $\iiint xdxdydz$ where v is the volume of the tetrahedron bounded by the plane x=0,y=0,z=0,x+y+z=a (7)

7. Evaluate $\iiint \sqrt{1-x^2-y^2-z^2}\, dxdydz$ taken throughout the volume of the sphere$x^2 + y^2 + z^2 = 1$ by transforming to spherical polar coordinates (3)

8.Find the area of the region R enclosed between the parabola $y=\frac{x2}{2}$ and the line y=2x (7)

9.Use triple integral to find the volume of the solid within the cylinder $x^2 + y^2 = 9$ and between the planes z=1 and x+z=5 (7)

10.Evaluate $\int_0^1 \int_0^1 \frac{dydx}{\sqrt{1-x^2}\sqrt{1-y^2}}$ (3)

11.Use the integral to find the area enclosed by the given curves y=sin x and y=cos x in $0 \leq x \leq \frac{\pi}{4}$ (7)

12.Evaluate $\int_0^1 \int_0^{y^2} \int_{-1}^{z} zdxdydz$ (7)

MODULE IV

1.Test the convergence of the series $\sum_{K=1}^{\infty} \frac{K}{K+1}$ (3)

2.Test the convergence of the alternating series $\sum_{k=1}^{\infty} (-1)^{K+1} \frac{1}{K}$ using Leibnitz test (3)

3.Check whether the series $\sum_{K=1}^{\infty} (-1)^{K+1} \frac{(2K)!}{(3K-2)!}$ is absolutely convergent ,conditionally convergent or divergent (7)

4.Check the convergence of the series $\frac{3}{4}+\frac{3.4}{4.6}+\frac{3.4.5}{4.6.8}+\ldots$ (3)

5.Determine whether the alternating series $\sum_{K=1}^{\infty} (-1)^{K+1} \frac{3^{2K-1}}{K^2+1}$ is absolutely convergent (7)

6.Test the convergence of the series $1+\frac{1.2}{1.3}+\frac{1.2.3}{1.3.5}+\ldots$ (3)

7. Check whether the series $\sum_{k=1}^{\infty} \frac{1}{2k-1}$ converges or not (3)

8. Test the convergence of $\frac{x}{1^2}+\frac{x^2}{2^3}+\frac{x^3}{3^4}+\ldots$ (3)

9. Determine whether the series $\sum_{n=1}^{\infty} \frac{5}{2n^2+4n+3}$ converges or diverges (7)

10. check whether the series $\sum_{n=1}^{\infty} \frac{(-1)^{n-1}}{n}$ convergent ,absolutely convergent or conditionally convergent (7)

11.check the convergence of the series $\sum_{k=1}^{\infty} \frac{k(k+3)}{(k+1)(k+2)(k+5)}$ (7)

12.Test the convergence of series $\sum_{n=1}^{\infty} (\frac{n}{n+1})^{n^2}$ (3)

MODULE V

1. Find the values to which the Fourier series of f(x) =x for- $\pi < x < \pi$ with f(x+2π) =f(x) converges (3)

2. Find the Taylor series expansion of $\sin \pi$about x =$\frac{1}{2}$ (3)

3.Find the Fourier series for f(x)=X^2 in the interval $-\pi < x < \pi$ with f(x+2π) =f(x) (7)

4. Expand $(1+x)^{-2}$ as a Taylor series about x=0 and state the region of convergence of the series (7)

5.Find the half range sine series of f(x)=$\begin{cases} \frac{2kl}{x} & if\ 0 < x < 1/2 \\ \frac{2k(l-x)}{l} & if \frac{1}{2} < x < l \end{cases}$ (7)

6.obtain the fourier series for f(x)=e^{-x} in the interval 0<x<2π with f(x+2π) = f(x). Hence deduce the value of $\sum_{n=2}^{\infty} (-1)^n/1+n^2$ (7)

.7. Find the fourier series of the function f(x)=x^2 -2$\leq x < 2$ f(x+4)=f(x) (7)

8.Find the Maciaurian series expansion of f(x)=$(1+x)^k$ for IxI <1 where k is any real number (7)

9.Find the Taylors series of $\frac{1}{x+2}$ about x=1 (3)

10.Find the Taylor series of f(z)=$\frac{-2z+3}{z2-3z+2}$ with centre o in IzI<1 (7)

11. Expand the function f(x)= x 0<x<1/2 into a fourier sine series (3)

12.Find the Taylor series of $\frac{1}{x}$ about x=1 (3)

ENGINEERING PHYSICS

MODULE 1
HARMONIC OSCILLATIONS & WAVES

		Marks	Year
1	What is the effect of damping on the frequency and time period of an oscillator?	2	May 19, July '16 KTU
2	Explain the phenomenon of amplitude resonance and obtain the value of resonant frequency.	4	May 19 KTU
3	A wave is represented by $\Psi = 3*10^{-3}\cos(8.4*10^{13}t + 2.8*10^{5} Z)\ Vm^{-1}$. Find the amplitude, frequency, wavelength and wave velocity. Where z in meter and t in second.	4	May;19 KTU
4	Solve the differential equation of a damped harmonic oscillator. Explain the time displacement curve of over damped, critically damped and under damped cases.	6	May;19 KTU
5	What is the condition for critical damping in the case of a damped harmonic oscillator? With the help of the expression for displacement write how this condition affects the amplitude of the oscillator	4	Dec '18 KTU
6	Distinguish between transverse and longitudinal waves.	2	May'19 KTU
7	What do you mean by Quality factor of an oscillator	2	Jan '16 KTU
8	What is resonance in forced oscillation? Give one example	2	Dec '16KTU
9	Frame and solve the differential equation of a forced harmonic oscillator	6	July '16 KTU
10	Distinguish between longitudinal waves and transverse waves	2	April '18KTU
11	What is meant by sharpness of resonance	4	June '16KTU
12	Frame the differential equation of a forced harmonic oscillator and obtain its solution.	6	Dec'18 KTU
13	Considering transverse vibration of stretched string derive one dimensional wave equation.	4	Jan'16,Dec '17
14	Derive an expression for fundamental frequency of transverse vibration of a stretched string.	6	Dec '16KTU

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MODULE 2
WAVE OPTICS

1	What are coherent sources?	2	May'19 KTU
2	What is grating element? Write the grating equation in terms of grating element.	2	May'19 KTU
3	How an interference filter is constructed?	4	May'19 KTU
4	In fraunhofer's diffraction due to a single slit a screen is placed 2m away from the lens to obtain a pattern. If the slit width is 0.2mm and the first minima lies 5mm on either side of central maxima, find the wavelength of light.	4	May'19 KTU
5	Explain the formation of interference fringes using air wedge. How is it used to determine the thickness of a thin wire?	6	May'19 KTU
6	Two independent sources of light cannot produce interference fringes. why	2	Jan '16 KTU
7	Write the expression for the radius of the nth dark ring in Newton's rings interference pattern. What happens to this radius when air is replaced by a liquid of refractive index	4	July '16 KTU
8	In a Newton's ring arrangement, if a drop of water **(μ=4/3)** is placed in between lens and plate, the diameter of the **10^{th}** dark ring is found to be **0.6cm**. Obtain the radius of curvature of the face of the lens in contact with the plate. The wavelength of the plate is **6000Å**	4	Dec '18 KTU
9	With necessary theory write the formation of interference pattern in an air wedge and derive an expression for the bandwidth	6	July '16 KTU
10	Show that the radi of different dark rings in Newton's Rings are proportional to square root of integers. Explain with necessary theory, how the refractive index of the given liquid is determined using Newton's rings arrangement.	6	April '18KTU
11	Write Rayleigh's criteria for resolution. State Rayleigh's criteria for geometrical and spectral resolution	6	Jan '16KTU
12	Define resolving power of a grating	2	July'16K TU
13	Distinguish between Fresnel's and Fraunhofer Diffraction	2	May '17KTU

14	What is plane transmission grating? Describe how is it used to determine the wavelength of light	6	Dec '17KTU
15	With the help of a neat diagram, explain the formation of diffraction pattern with a single slit .Deduce the equation for the bright and dark fringes and the width of central maxima.	6	May '17KTU

MODULE 3
QUANTUM MECHANICS & NANOTECHNOLOGY

1	What is tunnel effect?	2	May'19 KTU
2	Estimate the de Broglie wavelength of an electron moving with a kinetic energy of 100 eV.	4	May'19 KTU
3	What is Fermi level? Give its physical significance.	4	May'19 KTU
4	Write the Schrodinger equation for a particle trapped in a one dimensional box of width L and solve it to obtain the energy eigen values.	6	May'19 KTU
5	Write the normalization condition of a wave function and its significance	2	Aug '16 KTU
6	Calculate the de Broglie wavelength of electron whose Kinetic energy is **10keV**	4	Jan '16 KTU
7	State Uncertainty principle. With help of it, explain the absence of electrons inside the nucleus. .	4	July '16 KTU
8	Solve Schrodinger's equation for a particle in a one dimensional box and obtain the following (i) energy values (ii) normalized wave function.	6	July '17KTU
9	Explain the Quantum Mechanical Tunneling .	4	July '16 KTU
10	Obtain energy and momentum operators	4	Dec '18KTU
11	What do you mean by Fermi energy level and Fermi energy?	2	May'16 KTU
12	Derive Schrodinger's time independent equation from time dependent one	6	Dec '17KTU

MODULE 4
ACCOUSTICS & NANOTECHNOLOGY

1	What is the difference between echo and reverberation?	2	May'19 KTU
2	What is magnetostriction effect? Write one application.	2	May'19 KTU
3	A hall has dimensions of 25m X 20m X 8m. The reverberation time is 4s.	4	May'19 KTU

	Determine the average absorption coefficient of the surfaces.		
4	Calculate the capacitance required to produce ultrasonic waves of frequency 1 MHz with an inductance of 1H.	4	May'19 KTU
5	What is inverse piezoelectric effect? With the help of a circuit diagram explain the production of ultrasonic waves using a piezoelectric oscillator.	6	May'19 KTU
6	Define absorption co-efficient of sound .	2	July '16 Dec '18 KTU
7	The volume of a hall is **3000 m^3**. It has a total absorption of **100 m^2 Sabine**. If the hall is filled with audience who add another **80 m^2 Sabine**. Find the difference in reverberation time.	4	Dec '18 KTU
8	What is reverberation and reverberation time? What is its significance? 6Write the factors on which the reverberation time depends. Write Sabine's formula.	6	July '16 KTU
9	What is piezo electric effect? With a neat circuit diagram explain the working of a Piezoelectric oscillator to produce ultrasonic waves	6	Jan '16 KTU
10	What are the factors affecting acoustics of a building? Give remedies	6	Jan '16 \July'17 KTU
11	Define intensity of sound wave. Write the expression for the SIL in dB scale. Distinguish between threshold minimum intensity and threshold pain intensity	6	May'19, May'16 KTU
12	What are NDT and SONAR? How ultrasonic waves is used in it?	6	Dec '16 KTU
13	What is Magnetostriction effect? What are ultrasonic waves? Write the principal of production of ultrasonic waves by Magnetostriction effect. Draw the circuit diagram of the Magnetostriction oscillator. Write any two application of ultrasonic waves	4	May'16 KTU
14	Name and explain two methods for the detection of ultrasonic waves. Name any four medical applications of ultrasonic waves	6	July '16KTU
15	Calculate the frequency of ultrasonic waves that can be generated by a nickel rod of length 4cm. (Young's modulus of nickel = 207 GPa and density of nickel 8900 kg/m3). .	4	July '16KTU

MODULE 5
LASER & FIBRE OPTICS

1	What are the advantages of semiconductor laser?	2	May'19 KTU
2	What is photovoltaic effect?	2	May'19 KTU
3	Compare photographs and holograms.	4	May'19 KTU
4	With a block diagram, explain the working of an optical communication system.	4	May'19 KTU
5	Explain construction and working of Ruby laser.	6	May'19 KTU
6	Explain the principle of OFC. Distinguish between step index and graded index fibers. Give any two advantages of optical fibres.	6	May'19 KTU
7	What is popul**ation** inversion? How can be achieved? Hint: Explanation of optical pumping using Xenon flash lamp in Ruby laser	2	Aug '16 KTU
8	What is the difference between spontaneous emission and stimulated emission?	2	Jan '16 Dec '18 KTU
9	What is a laser? What are the three requisites for laser action to take place? Hint: Laser expansion or explanation. Name three requisites-metastable state ,population inversion, stimulated emission, optical amplification Or three components—pumping system, lasing medium, optical resonator	2	Jan'17 KTU
10	What is holograpy? How is it different from that of photography? Draw the diagrams illustrating the recording and reconstruction of a hologram.	6	Jan '17 KTU
11	Outline the principle and working of Ruby laser	6	Jan '16 KTU
12	With a neat figure and energy level diagrams, explain the construction and working of He-Ne laser .	6	Dec '18 KTU
13	What is an LED? Give its working principle. Hint: Fig, Explanation, Working with the concept of direct bang gap semiconductor.	2	Jan '16 Dec'18 KTU
14	Name the principle behind the propagation of light through an optic fibre. How the essential conditions for this phenomenon is satisfied in optic fibres. List three advantages of fibre optic communication.	4	Aug '16 KTU
15	What are fibre optic sensors? Name two different types.	2	July '16 KTU

16	Define numerical aperture of an optical fibre and derive an expression for NA of a step index fibre. Any four applications of optical fibre	6	Jan '16 Dec '18 KTU

LIFE SKILLS

Module 1

Sl. No	Questions	Marks	KTU (Month/Year)
1	What do you mean by communication? What are the different types of Barriers to communication?	6	DEC,2016
2	Briefly mention different Levels of communication?	5	January,2017
3	Explain the Flow of communication and represent it diagrammatically?	5	KTU,july,2017
4	What are the different types of Communication Networks?	6	KTU,Dec,2019
5	Differences between Group Discussion & Debate	5	KTU,April,2019
6	Compose an e-mail to your friend	6	KTU,May,2018
7	Prepare your Resume	6	KTU,May,2018
8	Letter Writing- Formal & Informal	6	KTU,May,2016
9	Differences between Literary writing & Technical writing	5	KTU,DEC,2016
10	Methods to ensure success in GD	5	KTU,DEC 2018
11	Types of Report	4	KTU,April,2019
12	Multiple Intelligence	2	KTU,April,2019

Module 2

1	Different types of Thinking Hats	5	KTU,DEC2019
2	Differences between Lateral Thinking & Vertical Thinking	5	KTU,DEC,2019
3	Differences between Creative Thinking & Critical Thinking	4	KTU,April 2019
4	Differences between Creativity & Innovation	3	KTU, May 2016

5	Define : Kinesics, Proxemics, Chronemics	3	KTU, Jan 2017
6	Interpreting body language cues	3	KTU,july 2017
7	Discuss the steps in Problem Solving	5	KTU, April 2019
8	Differences between Convergent thinking & Divergent Thinking	3	KTU, July 2017
9	Myths of Creativity	5	KTU, July 2017
10	What are the different functions of Left Brain & Right Brain?	4	KTU, Dec,2016

Module 3

1	Differences between Group & Team	5	KTU, May 2018
2	Techniques of Group Dynamics	6	KTU, July 2017
3	Different types of Group	3	KTU, May 2018
4	Piaget's Theory of Moral Development	6	KTU, Jan 2017
5	Different steps in Group Problem Solving	6	KTU, April 2019
6	Different types of Team	3	KTU May,2018
7	What do you mean by Brain Storming?	4	KTU,Dec,2016
8	What is Mind Mapping & diagrammatically represent it	6	KTU, Jan 2017
9	What are the means to enhance productivity?	5	KTU, Dec 2016
10	Kohlberg's Theory	6	KTU, May 2018
11	Gilligan's Theory	4	KTU April 2019

Module 4

1	What do you mean by Moral Realism?	3	KTU, May,2016
2	What is Moral Absolutism?	3	KTU, Dec 2019
3	What is the importance of Professional Ehics?	5	KTU, Jan 2017
4	Explain Engineering as Experimentation	3	KTU, Dec 2019

5	Briefly mention Code of ethics	6	KTU, Dec 2019
6	What is the relevance of Environmental ethics with regard to Engineering?	6	KTU, Dec 2018
7	What is computer code of ethics	4	KTU, DEC2016
8	Mention IEEE and ME code of ethics	3	KTU,May 2016
9	What do you mean by Empathy, Integrity & sharing?	4	KTU, Dec 2018
10	Case Study	20	KTU(All Sem)

Module 5

1	What do you mean by Leadership & what are its different traits?	5	KTU july 2017
2	Explain VUCA Leadership	3	KTU April,2019
3	What are the different Levels of Leaderships?	6	KTU Dec 2019
4	Explain the term making of a leader	3	KTU Dec 2018
5	Differences between Transactional leader & Transformational leader?	5	KTU May 2018
6	What are the different types of Leadership?	6	KTU May,2018
7	Differences between Manager & Leader	4	KTU May,2016
8	Differences between Coaching & Teaching	3	KTU Dec 2016
9	What do you mean by DART Leadership?	3	KTU May 2016
10	What are the different levels of Leadership?	6	KTU Dec 2018
11	Leadership Grid	2	KTU April 2019
12	VUCA Leadership	2	KTU, Dec 2019