# QUESTION BANK

## SUBJECT: MAT102 VECTOR CALCULUS, DIFFERENTIAL EQUATIONS AND TRANSFORMS

| MODULE 1 | | | |
|---|---|---|---|
| Sl. No | Questions | Marks | KU/KTU |
| 1 | A particle moves along a circular helix in 3-space so that its position vector at any time 't' is $r(t) = (4cos\pi t)\vec{i} + (4sin\pi t)\vec{j} + t\vec{k}$. Find the displacement of the particle during the interval $1 \leq t \leq 5$. | 7 | KTU Feb-2017 |
| 2 | If $f(x,y,z) = x^2 i - 3j + yz^2 k$ find div $F$ | 2 | KTU Apr-2018 |
| 3 | Find the work done by the force field $F = xy\, i + yz\, j + zx\, k$ on a particle that moves along the curve C: $x = t, y = t^2, z = t^3, 0 \leq t \leq 1$ | 3 | KTU Apr-2018 & Dec-2017 |
| 4 | Find the divergence and curl of the vector field $f(x,y,z) = yz\vec{i} + xy^2\vec{j} + yz^2\vec{k}$ | 3 | KTU Dec-2017 |
| 5 | Evaluate $\int_c (3x^2 + y^2)\, dx + 2xydy$ along the circular arc C given by $x = cost,\ y = sint$ for $0 \leq t \leq \frac{\pi}{2}$ | 3 | KTU Dec-2017 |
| 6 | Show that the integral $\int_{(1,1)}^{(3,3)} (e^x logy - \frac{e^y}{x})dx + \left(\frac{e^x}{y} - e^y logx\right) dy$<br><br>Where $x$ and $y$ are positive, is independent of path and find its value. | 5 | KTU Dec-20117 |
| 7 | If $\vec{r} = x\vec{i} + y\vec{j} + z\vec{k}$ and $r = \lvert\vec{r}\rvert$, then show that $\nabla f(r) = \frac{f'(r)}{r}\vec{r}$. | 5 | KTU Dec-2017 |
| 8 | Prove that the force field F= $e^y$i+ x $e^y j$ is conservative in the entire xy- plane | 7 | KTU Model question |
| 9 | Find the work done by the Force field $F(x,y,z) = xyi + yzj + xzk$<br><br>along C where C is the curve $r(t) = ti + t^2 j + t^3 k$ | 7 | KTU Model Question |
| 10 | Show that $f(x,y) = (cosy + ycosx)\vec{i} + (sinx - xsiny)\vec{j}$ is a conservative vector field. Hence find the scalar potential for it. | 5 | KTU Dec-2017 |

| | | | |
|---|---|---|---|
| 11. | Find the velocity and acceleration of a particle whose position vector is given by $\vec{r}(t) = e^t i + e^{-t} j$ at $t = 0$ | 3 | KTU JULY 2021 |
| 12. | If C is the unit circle $x^2+y^2 = 1$ oriented counter clockwise ,Find<br><br>$\int_c x\,dx + y\,dy$ | 3 | KTU JULY 2021 |
| 13. | Find the directional derivative of $\varphi(x,y,z) = x^3z - yx^2 + z^2$ at (1,1,1) in the direction of $a^{\rightarrow} = 2i^{\rightarrow} - j^{\rightarrow} + 2k^{\rightarrow}$. Also find maximum directional derivative. | 7 | KTU JULY 2021 |
| 14. | Show that the vector field $\vec{f}(x,y) = xy^2 i + x^2 yj$ is conservative and find $\varphi$ such that $\vec{f} = \nabla\varphi$ Hence evaluate $\int_{(1,2)}^{(2,4)} xy^2 dx + x^2 y\,dy$ . | 7 | KTU JULY 2021 |
| 15. | Find the parametric equation of the tangent line to the graph $r^{\rightarrow}(t) = t^2 i^{\rightarrow} - \frac{1}{t+3} j^{\rightarrow} + (4 - t^2)\, k^{\rightarrow}$ at (-4,-1,0) | 7 | KTU JULY 2021 |
| 16. | Using line integral evaluate $\int_c x^2 y\,dx + x\,dy$ where C is a triangular path connecting (0,0),(1,0) and(1,2) in the positive direction . | 7 | KTU JULY 2021 |
| | **Module 2** | | |
| 1 | Using Greens theorem, find the work done by the force field $\vec{f}(x,y) = (e^x - y^3)\vec{\imath} + (cosy + x^3)\vec{\jmath}$ on a particle that travels once around the unit circle $x^2 + y^2 = 1$ in the counter clockwise direction | 5 | KTU Apr-2018 |
| 2 | If $\sigma$ is any closed surface enclosing a volume V and $F = x\vec{\imath} + 2y\vec{\jmath} + 3z\vec{k}$, using divergence theorem show that $\iint_\sigma F.nds = 6\,V$. | 3 | KTU Apr-2018 |
| 3 | Evaluate $\int_c (x^2 - 3y)dx + 3xdy$ , where C is the circle $x^2 + y^2 = 4$ | 3 | KTU Dec-2017 |

| | | | |
|---|---|---|---|
| 4 | Using line integral evaluate the area enclosed by the ellipse $\frac{x^2}{a^2}+\frac{y^2}{b^2}=1$ | 2 | KTU Dec-2017 |
| 5 | Using Greens theorem evaluate $\int_C (xy+y^2)dx+x^2dy$, where C is the boundary of the common to the curve $y=x^2$ and $=x$ . | 5 | KTU Apr-2018 |
| 6 | Using stokes theorem evaluate $\int_c f.dr$ where $F=xz\,i+4x^2y^2j+xy\,k$ , C is the rectangle $0\le x\le 1, 0\le y\le 3$ in the plane $z=y$. | 5 | KTU DEC-2017 |
| 7 | Determine whether the vector fields are free of sources and sinks, If it is not locate them. (i)$(y+z)i-\ xz^3j+x^2siny\,k$ (ii)$xy\,i-2xyj+y^2\,k$ | 5 | KTU Dec-2017 |
| 8 | Evaluate the surface integral $\iint_\sigma xzds$ , where $\sigma$ is the part of the plane $x+y+z=1$ that lies in the first octant. | 5 | KTU Dec-2017 |
| 9 | Using divergence theorem evaluate $\iint_S F.nds$ where $F=(x^2+y)i+z^2j+(e^y-z)k$ and S is the surface of the rectangular solid bounded by the co-ordinate planes $x=3$, $y=1,\ z=3$ | 5 | KTU Apr-2018 |
| 10 | Use stokes theorem to evaluate the integral $\int_C F.dr$ where $\vec{F}=(x^2-y^2)\vec{\imath}+2xy\vec{j}$ and C is the rectangle in the $xy$-plane bounded by the lines $x=0$ , $y=0$ , $x=a$ and $y=b$ . | 5 | KTU Apr-2018 |
| 11 | Find the circulation of $F=(x-z)i+(y-x)j+(z-xy)k$ using Stokes theorem around the triangle with the vertices A(1,0,0),B(0,1,0) and C(0,0,1). | 7 | KTU MODEL QUESTION |
| 12 | Use divergence theorem to find the out ward flux of the vector field $F=2xi+3yj+z^3$k across the unit cube bounded by $x=0, y=0, z=0, x=1, y=1, z=1$ | 7 | KTU MODEL question |

| | | | |
|---|---|---|---|
| 13. | Determine the source and sink of the vector field $\vec{f}(x,y,z) = 2(x^3 - 2x)\, i^{\rightarrow} + 2(y^3 - 2y) j^{\rightarrow} + 2(z^3 - 2z)\, k^{\rightarrow}$ | 3 | KTU JULY 2021 |
| 14. | Evaluvate $\iint\ xz\, dS$ $W$here $\sigma$ is the part of the plane $x + y + z = 1$ that lies in the first octant | 3 | KTU JULY 2021 |
| 15. | Use greens theorem to evaluate $\int_c\ log(1+y)dx - \frac{xy}{1+y}dy$ where C is the triangle with vertices (0,0),(2,0),(0,4) | 7 | KTU JULY 2021 |
| 16. | Use divergence theorem to find the outward flux of the vector field $F^{\rightarrow}(2x + y^2)\, i^{\rightarrow} + xy\, j^{\rightarrow} + (xy - 2z)\, k^{\rightarrow}$ across the surface of the tetrahedran bounded by $x + y + z = 2$ and the co ordinate plane | 7 | KTU JULY 2021 |
| 17. | Find the flux of the vector field $\vec{F} = (x,y,z) = xk^{\rightarrow}$ across the surface, portion of the paraboloid $z = x^2 + y^2$ below the plane $z = 2y$ oriented by downward unit normal | 7 | KTU JULY 2021 |
| 18 | Use stoke theorem evaluate $\int_c\ \vec{f}\, dr$ ,where $f(x,y,z) = (z - y)\, i^{\rightarrow} + (z + x)\, j^{\rightarrow} + (x + y)k^{\rightarrow}$ and C is the boundary of the paraboloid $z = 9 - x^2 - y^2$ above the XY plane with upward orientation | 7 | KTU JULY 2021 |
| | **Module 3** | | |
| 1 | Consider the initial value problem $y'' - x^3y' + 6x = sinx$ , $y(0) = 3, y'(0)$ =-1. Can this problem have unique solution in an interval containing zero? Explain | 3 | KTU JULY-2018 |
| 2 | Find any three independent solutions of the differential equation $y''' - y' = 0$ | 3 | KTU JULY-2018 |
| 3 | Discuss the existence and uniqueness of solution of initial value problem $\frac{dy}{dx} = \frac{y}{\sqrt{x}}$ , $y(1) = 3$ | 3 | KTU JULY-2018 |
| 4 | Prove that $y_1(x) = e^x$ and $y_2(x) = e^{4x}$ form a fundamental system (basis) for the differential equation $y'' - 5y' + 4y = 0$.Can $5e^x - 2e^{4x}$ be a solution (do not use verification code)of the differential equation ?Explain. | 5 | KTU JULY-2018 |
| 5 | Discuss the existence and uniqueness of solution of the initial value problem $\frac{dy}{dx} = x^2 + y^2$ , $y(0) = 1$ in the rectangle $\lvert x\rvert \leq 1, \lvert y - 1\rvert \leq 1$. | 6 | KTU JULY-2018 |

| | | | |
|---|---|---|---|
| 6 | If $y_1(x) = x$ is a solution of $x^2y''+2xy' - 2y = 0$, fInd the general solution. | 5 | KTU JULY-2018 |
| 7 | Examine whether $e^{2x}, e^{3x}$ are linearly independent solutions of the differential equation $\frac{d^2y}{dx^2} - 5\frac{dy}{dx} + 6y = 0$ in $-\infty < x < \infty$,What is its general solution? | 3 | KTU MAY-2017 |
| 8 | Find the particular integral of $(D^2+4D+10)y = e^x \sin 3x$ | 3 | KTU MAY-2017 |
| 9 | Solve $(D^3 + 8)y = \sin x \cos x + e^{-2x}$ | 6 | KTU MAY-2017 |
| 10 | Solve y"+y= *sec x* by the method of variation of parameters | 7 | KTU MODEL QUESTION |
| 11 | Solve $y''+4y'+4y= x^2 + e^{-x}\cos x$ | 7 | KTU MODEL QUESTION |
| 12 | Solve $y^{"'} + 10y^{"} + 9y = 0$ | 3 | KTU JULY 2021 |
| 13 | Solve the initial value problem $y^{"} + y = 0; y(0) = 3, y'(0) = 1$ | 3 | KTU JULY 2021 |
| 14 | Find the Wronskian corresponding to the solution of $y'' - 3y' + 2y = 0$ | 3 | KTU JULY 2021 |
| 15 | Solve using the method of undetermined coefficients $y'' - 4y'+4y =4\ sin^2 x$ | 7 | KTU JULY 2021 |
| 16 | Solve using the method of variation of parameters : $y'' + 4y =$ Sec $2x$ | 7 | KTU JULY 2021 |
| 17 | Solve using the method of undetermined coefficients:$y'''' + 2y''-y' - 2y = e^x$ | 7 | KTU JULY 2021 |
| 18 | Solve the initial value problem $x^2y'' - 3xy' + 3y = 0, y(1) = 0, y'(1) = 1$ | 7 | KTU JULY 2021 |
| | **Module 4** | | |
| 1 | Find the inverse Laplace transform of $\frac{5}{(s^2+1)(s^2+25)}$ , using convolution theorem. | 7 | KTU-Dec 2018 |
| 2 | Find the Laplace transform of<br>i) $\cos(\omega t + \theta)$ | 7 | KTU-Dec 2018 |
| 3 | Solve the initial value problem $y'' - y' - 6y = 0, y(0) = 6,$ $y'(0) = 13$ using Laplace transforms. | 7 | KTU-March 2017 |
| 4 | Solve, by using Laplace Transform: $y"+y=3cos\ 2t$; (0)=0, $y'(0)=0$. | 8 | KTU- Apr 2018 |

| | | | |
|---|---|---|---|
| 5 | Find the Inverse Laplace Transform of:<br>$(i)\ \frac{S-4}{S^2-4}$ $(ii)\ \frac{4}{S^2-2s-3}$ | 8 | KTU- April 2018 |
| 6 | Find the Laplace Transform of :<br>$(i)\ sin3t\cos2t\ (ii)\ e^{-2t}cos^2t$ | 8 | KTU-April 2018 |
| 7 | Find the inverse Laplace transform of $\frac{1}{(s+\sqrt{2})(s-\sqrt{3})}$ | 7 | KTU- July 2017 |
| 8 | Solve the initial value problem, using Laplace transforms. y" + y' + 9y = 0, y(0) = 0.16, y'(0) = 0 | 8 | KTU-July 2017 |
| 9 | Find the Laplace transform of<br>(i) sinh$t\cos t$ (ii) $(t-1)^3$ | 8 | KTU-July 2017 |
| 10 | Find the Laplace transform of<br>i) $cost - tsint$ ii) $4te^{-2t}$ | 8 | Ktu- May 2017 |
| 11. | Find the inverse laplace transform of $F(s) = \frac{2(e^{-s}-e^{-3s})}{s^2-4}$ | 7 | Model Question KTU |
| 12. | Using laplace transforms solve $y'' + 4y' + 3y = e^{-t}, y(0) = 1, y'(0) = 1$ | 7 | KTU JULY2021 |
| 13 | Using convolution theorem, find the inverse laplace transform of $\frac{18s}{(s^2+36)^2}$ | 7 | KTU JULY2021 |
| 14 | Use laplace transform to solve $y" + 3y' + 2y = u(1-t), y(0) = 0, y'(0) = 0$ | 7 | KTU JULY2021 |
| 15 | Evaluvate $L^{-1}\left[\frac{2s+1}{s^2+2s+5}\right]$ | 7 | KTU JULY2021 |
| 16 | Find the laplace transform of $sin3tcos2t$ | 3 | KTU JULY2021 |
| 17 | Evaluvate $L^{-1}\left[\frac{2}{(S+4)^3}\right]$ | 3 | KTU JULY2021 |
| **Module 5** | | | |
| 1 | Using Fourier cosine integral, show that $\int_0^\infty \frac{cos\omega x}{1+\omega^2} d\omega = \frac{\pi}{2}e^{-x}, if x > 0$ | 7 | KTU-Dec 2018 |

| | | | |
|---|---|---|---|
| 2 | Find the Fourier sine transform of $f(x) = \begin{cases} sinx, 0 < x < \pi \\ 0, \quad x > \pi \end{cases}$ | 8 | KTU-Dec 2018 |
| 3 | Find the Fourier transform of $f(x) = \begin{cases} e^{kx}, x < 0 \\ 0, \quad x > 0 \end{cases}$ | 7 | KTU-Dec 2018 |
| 4 | Use Fourier integral to show that $\int_0^\infty \frac{cosx\omega + \omega sinx\omega}{1+\omega^2}\, d\omega = \begin{cases} 0 \; if \; x < 0 \\ \frac{\pi}{2} if \; x = 0 \\ \pi e^{-x} \; if x > 0 \end{cases}$ | 7 | KTU-May 2017 |
| 5 | Represent $f(x) = \begin{cases} x^2, \; 0 < x < 1 \\ 0 \; , \quad x > 1 \end{cases}$ as a Fourier cosine integral | 8 | KTU-May 2017 |
| 6 | Find the Fourier transform of $f(x) = \begin{cases} 1, \quad \lvert x \rvert < 1 \\ 0, \; otherwise \end{cases}$ | 7 | KTU-May 2017 |
| 7 | Express f(x) = 1, $0 < x < \pi$<br>0, $x > \pi$,<br>a Fourier sine integral and evaluate $\int_0^\infty \frac{1-cos\pi\omega}{\omega}\, sinx\omega \, d\omega$ | 7 | KTU-July 2017 |
| 8 | Find the Fourier Sine Transform of $(x)=e^{-\lvert x \rvert}$. Hence evaluate $\int_0^\infty \frac{\omega sin\omega x}{1+w^2}\, d\omega$ . | 8 | KTU-April 2018 |
| 9 | Find the Fourier Cosine Transform of $(x)$=sin$x$ ; $0<x<\pi$. | 7 | KTU-April 2018 |
| 10 | Using Fourier integral representation show that<br>$\int_0^\infty \frac{sin\omega - \omega cos\omega}{\omega^2} = \begin{cases} \frac{\pi x}{2}, \quad if \; 0 < x < 1 \\ \frac{\pi}{4}, \quad if \; x = 1 \\ 0, \quad if \; x > 1 \end{cases}$ | 8 | KTU-July 2017 |
| 11 | Does the Fourier sine transform $f(x) = x^{-1}sinx$ for o<x<∞ exist? Justify your answer. | 4 | Ktu model question |
| 12 | Find the fourier cosine transform of the function $f(x) = \begin{cases} k, 0<x<a \\ 0, x>a \end{cases}$ | 3 | KTU JULY 2021 |
| 13 | Express $f(x) = \begin{cases} \frac{1}{2}, 0<x<\pi \\ 0, x>\pi \end{cases}$ as a fourier sine integral | 3 | KTU JULY 2021 |
| 14 | Find the fourier sine transform of $f(x) = \begin{cases} x \;\; if \;\; 0<x<1 \\ 3-x \;\; if \; 1<x<3 \; , \quad 0 \;\; if \; x>3 \end{cases}$ | 7 | KTU JULY 2021 |
| 15 | Represent $f(x) = e^{-kx}, x > 0, k > 0$ as a Fourier cosine integral | 7 | KTU JULY 2021 |
| 16 | Find the Fourier transform of $f(x) = \begin{cases} \lvert x \rvert \;\; if \;\; -1 < x < 1 \\ 0 \qquad otherwise \end{cases}$ | 7 | KTU JULY 2021 |

| | | | |
|---|---|---|---|
| 17 | Find the fourier integral of $f(x) = \begin{cases} \pi - x & if\ 0 < x < \pi \\ 0 & otherwise \end{cases}$ | 7 | KTU JULY 2021 |
| | | | |

# EST102
# PROGRAMMING IN C
# (EEE)

*Faculty- Ms.Ansha Shakkeer*

| MODULE 1 | | | | |
|---|---|---|---|---|
| **Sl. No** | **Questions** | **Marks** | **Year** | |
| 1. | Explain the architecture of computer | **3** | | |
| 2. | Write short note on processor and memory in a computer | **3** | | |
| 3. | Explain the Input and output devices | **3** | | |
| 4. | Explain the difference between Application Software and System Software? | **3** | July 2021 | |
| 5. | Write short note on low level language and high level language | **3** | | |
| 6. | Bring out the difference between top-down approach and bottom-up approach of program design | **3** | | |
| 7. | Write a flow chart for finding the maximum out of three numbers | **3** | | |
| 8. | Differentiate between compiler and interpreter | **3** | July 2021 | |
| 9. | Draw a flow chart to find the position of an element in a given sequence, using linear searching technique. With an example explain how the flowchart finds the position of a given element. | **10** | | |
| 10. | Write an algorithm to find sum of digits of a number. | **7** | July 2021 | |
| 11. | Explain bubble sort with an example. Draw a flowchart and write pseudo code to perform bubble sort on an array of numbers. | **14** | July 2021 | |
| 12. | Explain different types of memory used in a computer. | **7** | July 2021 | |

| | | | | |
|---|---|---|---|---|
| **MODULE 2** | | | | |
| **1.** | Is it advisable to use goto statements in a C program? Justify your answer. | **3** | | |
| **2.** | With suitable examples, explain various operators in C. | **10** | | |
| **3.** | Explain how characters are stored and processed in C. | **4** | | |
| **4.** | Explain how one can use the built in function in C, scanf to read values of different data types. Also explain using examples how one can use the built in function in C, printf for text formatting. | **8** | | |
| **5.** | Write a program to find the sum of n natural numbers? | **7** | July **2021** | |
| **6.** | What is a variable? How are the variables declared in C? | **3** | | |
| **7.** | What is the purpose of a switch statement with an example? | **4** | | |
| **8.** | Give the differences between while and do-while statement | **3** | | |
| **9.** | Discuss the differences between break and continue statements in C. | **3** | July **2021** | |
| **10.** | What are identifiers? Give the rules for forming identifiers in c? | **3** | | |
| **11.** | Write a C program to find the sum of first and last digit of a number | **7** | July **2021** | |
| **12.** | Write a C program to check if a number is present in a given list of numbers. If present, give location of the number otherwise insert the number in the list at the end. | **7** | July **2021** | |
| **13.** | What is the importance of precedence and associativity? Write the table for operator precedence | **3** | July 2021 | |
| 14. | Explain different data types supported by C language with their memory requirements. | **7** | July **2021** | |
| **MODULE 3** | | | | |
| **1.** | Explain the different ways in which you can declare & initialize a single dimensional array. | **3** | | |

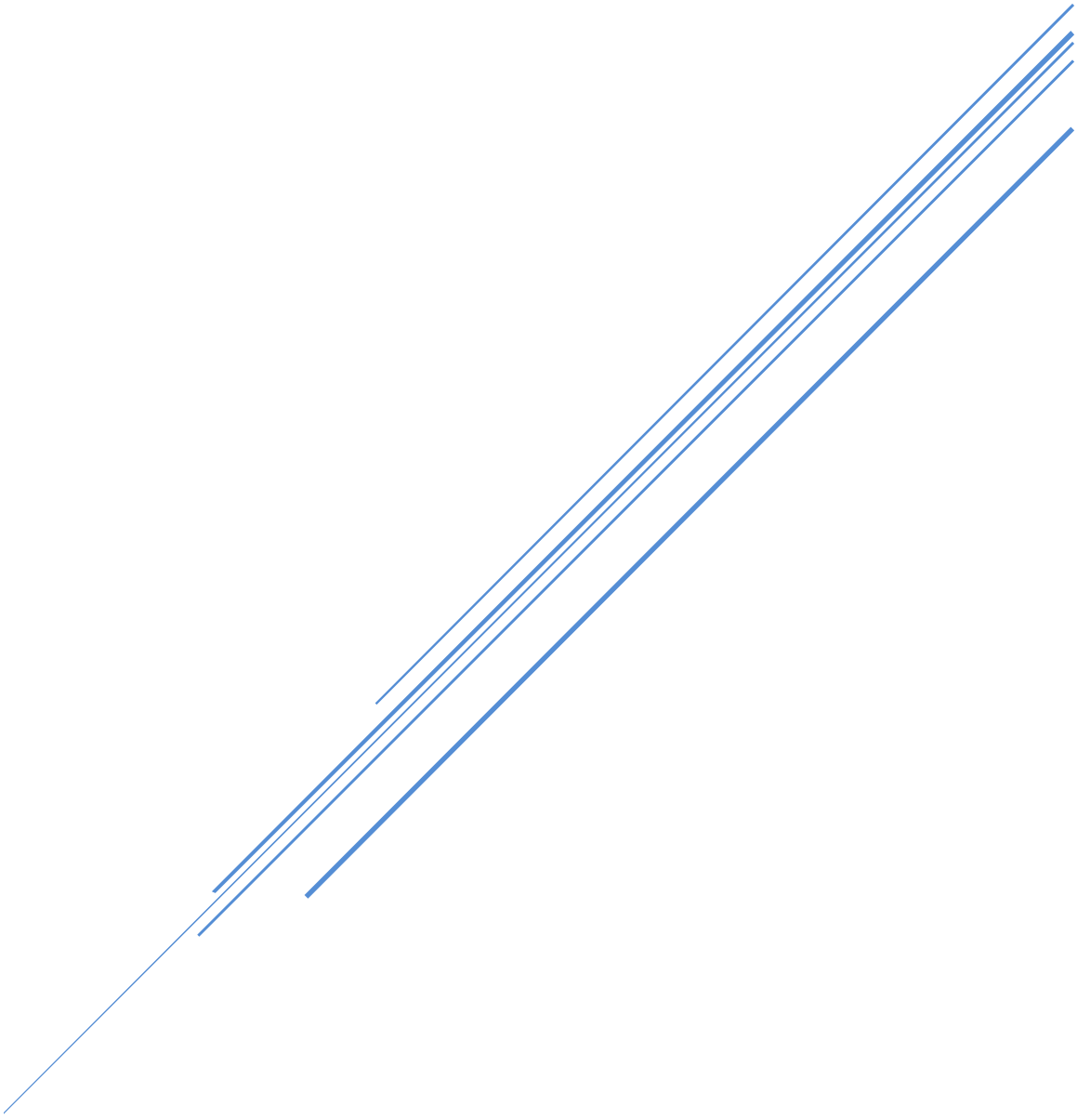
| | | | | |
|---|---|---|---|---|
| | | | | |
| **2.** | Without using any builtin string processing function like strlen, strcat etc., write a program to concatenate two strings. | **8** | | |
| **3.** | Write a C program to perform bubble sort. | **6** | | |
| **4.** | Write a C program to perform linear search on an array of numbers. | **7** | July **2021** | |
| **5.** | Write a C program to print number of vowels and consonants in a string. | **7** | July **2021** | |
| **6.** | Write a C program to check whether a given matrix is a diagonal matrix. | **8** | | |
| **7.** | Write a C program to concatenate two strings without using built in function. | | | |
| | Explain any 3 string handling functions using examples | **3** | July **2021** | |
| **9** | Write a C program to find the transpose of a matrix. | **7** | July **2021** | |
| **10** | How do you initialize a two dimensional array during declaration? | **3** | | |
| | Write a C program to find the occurrence of each element in an array. | **3** | July **2021** | |
| **12** | Explain gets and puts functions using suitable program. | **5** | | |
| **13** | Write a program to search for a substring in a given string. | **5** | | |
| **MODULE 4** | | | | |
| **1.** | With a suitable example, explain the differences between a structure and a union in C. | **6** | | |

| | | | | |
|---|---|---|---|---|
| **2.** | Declare a structure namely Student to store the details (roll number, name, mark_for_C) of a student. Then, write a program in C to find the average mark obtained by the students in a class for the subject Programming in C (using the field mark_for_C). Use array of structures to store the required data. | **8** | | |
| **3.** | With a suitable example, explain the concept of pass by value | **6** | | |
| **4.** | Write a C program to find sum and average of an array of integers using user defined functions | **7** | July **2021** | |
| **5.** | Write a C program to : (i) Create a structure containing containing the fields: Name, Price, Quantity, Total Amount. (ii) Use separate functions to read and print the data | **7** | July **2021** | |
| **6.** | Discuss the difference between the call by value and call by reference parameter passing techniques with the help of suitable examples. | **6** | | |
| **7.** | Write a recursive program to perform binary search in sorted numbers | **5** | | |
| **8.** | What are different storage classes in C? Give examples for each | **7** | July **2021** | |
| **9.** | Define formal parameters and actual parameters. Illustrate with an example. | **3** | July **2021** | |
| **10.** | What is the purpose of function declaration and function definition and function call? With examples illustrate their syntax | **7** | July **2021** | |
| **11.** | With examples show how: (i) an array is passed as argument of a function. (ii) individual elements of an array is passed as argument of a function. | **3** | July **2021** | |
| **12.** | What is recursion? Give an example | **4** | | |
| **13.** | What is the use of typedef construct in C? | **3** | | |
| **14.** | Write a short note on scope and life time of a variable in C | **3** | | |
| **MODULE 5** | | | | |
| **1.** | Explain the different modes of operations performed on a file in C language. | **7** | July **2021** | |

| | | | | |
|---|---|---|---|---|
| **2.** | Explain how pointers can be passed to functions in C | **7** | July **2021** | |
| **3.** | Write any three file handling functions in C. | **3** | July **2021** | |
| **4.** | Using the prototypes explain the functionality provided by the following functions.<br><br>i. fseek() ii. ftell() iii. fread() iv. fwrite() v. rewind() | **10** | | |
| **5.** | Explain any 5 file handling functions in C? | **7** | July **2021** | |
| **6.** | What do you mean by opening of a file? How is this accomplished? | **3** | | |
| **7.** | What are array of pointers? How do you declare an array of pointers? | **4** | | |
| **8.** | Write a program in C to copy the contents of one file into another. | **7** | July **2021** | |
| **9.** | When a program is terminated, all the files used by it are automatically closed. Why is it then necessary to close a file during execution of the program? | **3** | | |
| **10.** | Write a C program to create a file and store information about a person, in terms of his name, age and salary. | **10** | | |
| **11.** | Write any two file handling functions used to write data into text files. | **4** | | |
| **12.** | What is a null pointer? | **3** | | |
| **13.** | Differentiate between address operator(&) and indirection(*) operator.. | **3** | July **2021** | |
| **14.** | Differentiate between the sequential access and random access to files | **3** | | |

# ENGINEERING PHYSICS

## PREVIOUS YEAR QUESTION BANK **(2019 & 2015 SCHEMES)**



VIDYA ACADEMY OF SCIENCE & TECHNOLOGY-TC 2022

| SUB CODE | PHT 100 | SUBJECT NAME | ENGINEERING PHYSICS - A (2019 SCHEME) |
|---|---|---|---|

| | | | |
|---|---|---|---|
| **ENGINEERING PHYSICS -A** | | | |
| **MODULE 1**<br>**HARMONIC OSCILLATIONS & WAVES** | | Marks | Year |
| **1** | List any six points to compare electrical oscillator with a mechanical oscillator. | 3 | Dec '19 KTU |
| **2** | Distinguish between transverse and longitudinal waves. Give one example for each. | 3 | Dec '19 KTU |
| **3** | What is amplitude resonance? Give two examples. | 3 | Dec '20 KTU |
| **4** | What is the relation between path difference and phase difference in wave motion? | 3 | Dec '20 KTU |
| **5 a)** | Set up the differential equation for a forced harmonic oscillator and solve it. | 10 | Dec '19 KTU |
| **b)** | A transverse wave on a stretched string is described by $y(x,t)=2\sin(20t+0.021x+\pi/6)$ where x and y are in cm and t is in second. Obtain (1) Amplitude (2) Initial phase (3) speed (4) frequency | 4 | Dec '19 KTU |
| **6 a)** | Derive an expression for the fundamental frequency of a transverse wave in a stretched string. | 10 | Dec '19 KTU |
| **b)** | A sitar wire is under tension of 40 N and length of the bridge is 80cm. A 10m sample of that wire has mass 1.2g. Find the speed and fundamental frequency of transverse wave on the wire. | 4 | Dec '19 KTU |
| **7 a)** | Frame the differential equation of a damped harmonic oscillator and deduce its solution. Compare the time-displacement curve in three cases. | 10 | Dec '20 KTU |
| **B** | The frequency of a tuning fork is 200Hz. If its quality factor is $8 \times 10^4$ , find the time after which its energy becomes 1/10th of its initial value. | 4 | Dec '20 KTU |
| **8 a)** | Derive the differential equation for transverse wave in a stretched string and hence obtain the expression for fundamental frequency. | 10 | Dec '20 KTU |
| **b)** | Calculate the fundamental frequency of a string of 1 m long & mass 2g when stretched by a weight of 4 kg. | 4 | Dec '20 KTU |
| **9 a)** | Write down the differential equation of a forced harmonic oscillator and obtain its solution. Derive the expressions for amplitude and phase difference. | 10 | Jan '21 KTU |

| | | | |
|---|---|---|---|
| | | | |
| **b)** | A transverse wave on a stretched string is described byy(x,t)=5 sin(25t+0.016x+n/2) where x and y are in cm and t is in second. Obtain (1) Speed (2) Amplitude (3)Frequency and (4) Initial phase of the wave | 4 | Jan '21 KTU |
| **10 a)** | Derive an expression for the velocity of transverse waves in a stretched string and state the laws of transverse vibrations | 10 | Jan '21 KTU |
| **b)** | A piece of wire 60 cm long and mass 1.2 g. is stretched by a load of 3 kg. Find the frequency of the second harmonic. | 4 | Jan '21 KTU |
| | **MODULE 2** | | |
| **1** | When a medium of $\mu \neq 1$ is introduced in the Newton's ring set up, what happens to the diameter of interference pattern? Explain it with the help of relevant equation. | 3 | Dec '19 KTU |
| **2** | Give 3 differences between interference and diffraction. | 3 | Dec '19 KTU |
| **3** | Newton's rings are circular but air wedge fringes are straight. Why? | 3 | Dec '20 KTU |
| **4** | Give 3 differences between Fresnel and Fraunhofer classes of diffraction | 3 | Dec '20 KTU |
| **5 a)** | With necessary diagram, write the formation of interference pattern in an air wedge and derive an expression for the diameter of a thin wire. | 10 | Dec '19 KTU |
| **b)** | A monochromatic light of wavelength 5893 Å is incident normally on a soap film of $\mu = 1.42$. What is the least thickness of the film that will appear dark by reflection? | 4 | Dec '19 KTU |
| **6 a)** | Derive the grating equation and describe an experiment to determine the wavelength of light. Define resolving power of a grating with expression. | 10 | Dec '19 KTU |
| **b)** | A grating has 6000 lines/cm. Find angular separation between two wavelengths 577nm and 579 nm in the second order. | 4 | Dec '19 KTU |
| **7 a)** | Derive Cosine law and obtain the conditions of brightness and darkness for a thin film in reflected system. | 10 | Dec '19 KTU |

| SUB CODE | PHT 100 | SUBJECT NAME | ENGINEERING PHYSICS - A (2019 SCHEME) |
|---|---|---|---|

| | | | |
|---|---|---|---|
| **b)** | In Newton's ring arrangement using a light of wavelength 546nm, the radius of the $n^{th}$ and $(n+20)^{th}$ dark rings are found to be 0.162cm and 0.368cm respectively.<br>Calculate the radius of curvature of the lens. | 4 | Dec '19 KTU |
| **8 a)** | State Rayleigh's criterion for spectral resolution. With necessary theory explain the diffraction due to a plane transmission grating. | 10 | Dec '20 KTU |
| **b)** | How many lines per meter are there in a plane diffraction grating which gives an angle of diffraction 30° in the second order for light of wavelength 520nm incident normally on it? | 4 | Dec '20 KTU |
| **9 a)** | Starting from the expression of radius of nth dark ring in Newton's rings pattern, describe an experiment to determine the refractive index of a transparent liquid. | 10 | Jan '21 KTU |
| **b)** | Two optically plane glass plates of length 0.1m are placed one over the other with a thin wire at one end, separating the two. The fringes formed with light of wavelength 589.3 nm are of width 3mm. Calculate radius of the wire | 4 | Jan '21 KTU |
| **10 a)** | Derive grating equation for a plane transmission grating. Explain resolving power and dispersive power of grating with expressions. | 10 | Jan '21 KTU |
| **b)** | When a diffraction grating is used at normal incidence, it is found that the image at $30^0$ consists of a yellow line of wavelength 5750 Å of the nth order spectrum is superimposed on a blue line of wavelength 4600 Å of order (n+l). Calculate the number of lines per unit length of grating. | 4 | Jan '21 KTU |
| | **MODULE 3** | | |
| **1** | State Heisenberg's Uncertainty principle and write the three uncertainty relations | 3 | Dec '19 KTU |
| **2** | Explain the optical properties of nanomaterials | 3 | Dec '19 KTU |
| **3** | What is meant by quantum mechanical tunnelling? Name two electronic devices based on this phenomenon. | 3 | Dec '20 KTU |
| **4** | Explain the concept of quantum confinement. | 3 | Dec '20 KTU |

| | | | |
|---|---|---|---|
| **5 a)** | Derive an expression for energy eigen values and normalized wave function for a particle in a box of width L. | 10 | July '16KTU |
| **b)** | Calculate the separation between the two lowest energy levels of an electron in a one-dimensional box of width 4Å in joules. Given me = 9.1 x 10-31 kg; h=6.625 x 10-34 Js | 4 | Dec '16KTU |
| **6 a)** | Write a note on quantum confinement and based on this explain nano sheets, nano wire and quantum dots. | 10 | Dec '19 KTU |
| **b)** | Mention any four applications of nanotechnology | 4 | Dec '19 KTU |
| **7 a)** | Starting from the wave equation derive Schrodinger's time dependent equation and hence deduce Schrodinger's time independent equation. | 10 | Dec '20 KTU |
| **b)** | Compute the de Broglie wavelength of an electron whose kinetic energy is 15eV. | 4 | Dec '20 KTU |
| **8 a)** | Explain the optical, electrical and mechanical properties of nanomaterials. Give two medical applications of nanotechnology. | 10 | Dec '20 KTU |
| **b)** | Explain surface to volume ratio of nanomaterials | 4 | Dec '20 KTU |
| **9 a)** | State and explain uncertainty principle. Write the three forms of uncertainty relations. How this principle is used to prove the absence of electron in the nucleus? Given me = 9.1 x $10^{31}$ kg; h=6.625 x $10^{34}$ Js | 10 | Jan '21 KTU |
| **b)** | For an electron in a one dimensional box of width IÅ, calculate the first three energy levels in electron volt. | 4 | Jan '21 KTU |
| **10 a)** | Why do nanomaterials exhibit properties different from those of their classical counter parts? Explain the electrical and mechanical properties of nanomaterials. | 10 | Jan '21 KTU |
| **b)** | Mention any four applications of nanotechnology. | 4 | Jan '21 KTU |

| SUB CODE | PHT 100 | SUBJECT NAME | ENGINEERING PHYSICS - A (2019 SCHEME) |
|---|---|---|---|

| MODULE 4 | | | |
|---|---|---|---|
| **1** | Distinguish between magnetic induction and magnetizing field. | 3 | Dec '19 KTU |
| **2** | Distinguish between magnetic induction and magnetizing field. | 3 | Dec '19 KTU |
| **3** | Define magnetic flux density and magnetic field intensity. Give the relation between them. | 3 | Dec '20 KTU |
| **4** | Compare displacement current and conduction current | 3 | Dec '20 KTU |
| **5 a)** | State Gauss' law in magnetism, Ampere's circuital law, faraday's laws of electromagnetic induction and Lenz's law. Give their equations | 10 | Dec '19 KTU |
| **b)** | A magnetizing field of 1800 A/m produces a magnetic flux of 3 x 10 -5 Wb in an iron bar of cross – sectional area 0.2 $cm^2$ . Calculate the permeability. | 4 | Dec '19 KTU |
| **6 a)** | Starting from Maxwell's equations derive the expression for the velocity of electromagnetic waves in vacuum. | 10 | Dec '19 KTU |
| **b)** | State and explain Poynting's theorem. | 4 | Dec '19 KTU |
| **7 a)** | Distinguish between paramagnetic and ferromagnetic substances with two examples for each | 10 | Dec '20 KTU |
| **b)** | Calculate the magnetic susceptibility of a paramagnetic substance at 600 K, if its susceptibility at 200 K is 3.756 x 10-4 | 4 | Dec '20 KTU |
| **8 a)** | Starting from Maxwell's equations show that velocity of electromagnetic waves in free space is 1/(μ0Ɛ0) 1/2 . | 10 | Dec '20 KTU |
| **b)** | State Gauss' divergence theorem and Stokes' theorem. | 4 | Dec '20 KTU |
| **9 a)** | Compare the properties of paramagnetic, diamagnetic and ferromagnetic materials. | 10 | Jan '21 KTU |

| SUB CODE | PHT 100 | SUBJECT NAME | ENGINEERING PHYSICS - A (2019 SCHEME) |
|---|---|---|---|

| | | | |
|---|---|---|---|
| **b)** | Find the relative permeability of a ferromagnetic material if a field strength of 200 A/m produces a magnetization of 3100 A/m. | 4 | Jan '21 KTU |
| **10 a)** | Starting from Maxwell's equations show that electromagnetic waves are existing in free space and find an expression for velocity. | 10 | Jan '21 KTU |
| **b)** | Calculate the value of Poynting's vector at the surface of the sun if the power radiated by sun is $3.8 \times 10^{26}$ Watts and its radius is $7 \times 10^{8}$m. | 4 | Jan '21 KTU |
| | **MODULE 5** | | |
| **1** | Show that superconductors are perfect diamagnets | 3 | Dec '19 KTU |
| **2** | Distinguish between step index and graded index fibres. | 3 | Dec '19 KTU |
| **3** | Give a qualitative account of BCS theory. | 3 | Dec '20 KTU |
| **4** | Explain the working of a Photo diode | 3 | Dec '20 KTU |
| **5 a)** | Explain the characteristics of Type I and Type II superconductors with appropriate diagrams and examples | 10 | Dec '19 KTU |
| **b)** | Discuss BCS theory of superconductivity. Give any four applications of superconductivity. | 4 | Dec '19 KTU |
| **6 a)** | Explain construction and working of a solar cell and draw its I-V characteristics. Mention any two applications of solar cells. | 7 | Dec '19 KTU |
| **b)** | The numerical aperture of an optic fibre is 0.295 and refractive index of core is 1.54. Calculate refractive index of cladding and acceptance angle. | 7 | Dec '19 KTU |
| **7 a)** | Explain Meissner effect and show that superconductors are perfect diamagnets. Distinguish between Type I and Type II superconductors with appropriate graphs. | 10 | Dec '20 KTU |
| **b)** | Explain high temperature superconductors with two examples. | 4 | Dec '20 KTU |
| **8 a)** | Define numerical aperture and acceptance angle of an optical fibre and derive the expression for numerical aperture of a step index fibre with a neat diagram. | 10 | Dec '20 KTU |

| SUB CODE | PHT 100 | SUBJECT NAME | ENGINEERING PHYSICS - A (2019 SCHEME) |
|---|---|---|---|

| | | | |
|---|---|---|---|
| **b)** | Calculate the numerical aperture and acceptance angle of an optical fibre with a core of refractive index 1.62 and a cladding of refractive index 1.52. | 4 | Dec '20 KTU |
| **9 a)** | Write a note on high temperature superconductors. Distinguish between Type I and Type Il superconductors with appropriate diagrams and examples. | 10 | Jan '21 KTU |
| **b)** | Mention any four applications of superconductivity. | 4 | Jan '21 KTU |
| **10 a)** | Draw the block diagram of optical fibre communication system and explain its various functional blocks. Mention the advantages of optical fibres over conventional transmission lines. | 8 | Jan '21 KTU |
| **b)** | What are sensors? Explain the Working of intensity modulated sensor | 6 | Jan '21 KTU |

| SUB CODE | PHT 110 | SUBJECT NAME | ENGINEERING PHYSICS- B (2019 SCHEME) |
|---|---|---|---|

| | | | |
|---|---|---|---|
| | **ENGINEERING PHYSICS -B** | | |
| | **MODULE 1**<br>**HARMONIC OSCILLATIONS & WAVES** | Marks | Year |
| **1** | Derive the differential equation of a damped harmonic oscillaton | 3 | Dec '19 KTU |
| **2** | Find the equation of a progressive wave of amplitude 2cm, frequency 1 Hz and velocity 20 cm/s moving along positive x-axis. | 3 | Dec '19 KTU |
| **3** | List any six points to compare mechanical and electrical oscillators. | 3 | Dec '20 KTU |
| **4** | Derive one dimensional wave equation | 3 | Dec '20 KTU |
| **5 a)** | What is amplitude resonance? Give any two examples. Derive an expression for resonant frequency. What is sharpness of resonance? | 10 | Dec '19 KTU |
| **b)** | In the case of a forced harmonic oscillator, the amplitude of vibrations increases from 0.05 mm at very low frequencies to a value 7.5mm at the frequency 210Hz. Find Q-factor, damping constant and relaxation time. | 4 | Dec '19 KTU |
| **6 a)** | Obtain an expression for fundamental frequency of transverse vibrations in a stretched string. | 10 | Dec '19 KTU |
| **b)** | A wave of wavelength 30cm is travelling through a 300m long wire whose mass is 15kg. If the wire is under tension of 1kN, compute the speed and frequency of the wave. | 4 | Dec '19 KTU |
| **7 a)** | Frame the differential equation of a damped harmonic motion and obtain its solution. Mention the different cases | 10 | Dec '20 KTU |
| **b)** | The frequency of a tuning fork is 300Hz. If its Q- factor is 5X 104 , find the time after which its energy becomes (1/10)th of its initial value. | 4 | Dec '20 KTU |
| **8 a)** | Discuss the propagation of a transverse wave along a stretched string and derive the expression for frequency. | 10 | Dec '20 KTU |
| **b)** | A uniform steel wire has length 10m and mass 2 kg. Find the Tension in the string if the speed of transverse wave on the wire is 340m/s. | 4 | Dec '20 KTU |
| | **MODULE 2** | | |
| **1** | How will you test the planeness of a surface using air wedge? | 3 | Dec '19 KTU |

| | | | |
|---|---|---|---|
| **2** | Distinguish between Fresnel and Fraunhofer classes of diffraction. | 3 | Dec '19 KTU |
| **3** | Explain the principle and working of antireflection coatings. | 3 | Dec '20 KTU |
| **4** | Distinguish between Fresnel and Fraunhofer classes of diffraction | 3 | Dec '20 KTU |
| **5 a)** | Explain how Newton's rings are formed? Show that the radius of dark ring formed by Newton's rings is proportional to square root of the order of the ring. | 10 | Dec '19 KTU |
| **b)** | Light of wavelength 5893Å is reflected at nearly normal incidence from a soap film of refractive index 1.42. What is the least thickness of the film that will appear (i) dark and (ii) bright? | 4 | Dec '19 KTU |

| | | | |
|---|---|---|---|
| **6 a)** | What is a plane transmission grating? Derive the grating equation. What is Rayleigh's criterion for spectral resolution? | 10 | Dec '19 KTU |
| **b)** | What is a plane transmission grating? Derive the grating equation. What is Rayleigh's criterion for spectral resolution? | 4 | Dec '19 KTU |
| **7 a)** | Explain the formation of Newton's rings. Obtain the expression for finding the wavelength of light. | 10 | Dec '20 KTU |
| **b)** | An air wedge is formed using two optically plane glass strips of length 15cm. A spacer of thickness 0.015 mm is introduced at one end. If the light used is of wavelength 5893Å, find the separation between consecutive bright fringes. | 4 | Dec '20 KTU |
| **8 a)** | What is grating? Give the theory of plane transmission grating. How can it be used to find the wavelength of light? | 10 | Dec '20 KTU |
| **b)** | A plane transmission grating has 6000 lines/cm. It is used to obtain a spectrum of light from sodium lamp in second order. Calculate the angular separation between two sodium lines of wavelength5890 Å and 5896 Å. | 4 | Dec '20 KTU |
| | **MODULE 3** | | |
| **1** | What is de Broglie hypothesis of matter waves? Write the equation of de Broglie wave length | 3 | Dec '19 KTU |
| **2** | Give three medical applications of nanotechnology. | 3 | Dec '19 KTU |
| **3** | List any two characteristics of matter waves. Find the expression for de Broglie wavelength? | 3 | Dec '20 KTU |

| | | | |
|---|---|---|---|
| **4** | Define zero, one- and two-dimensional nanomaterials. | 3 | Dec '20 KTU |
| **5 a)** | Derive Schrodinger's time dependent equation and hence obtain time independent equation. | 10 | Dec '19 KTU |
| **b)** | Explain the absence of electron in the nucleus. | 4 | Dec '19 KTU |
| **6 a)** | Write the significance of material at nanoscale and explain the quantum confinement in nanomaterials | 10 | Dec '19 KTU |
| **b)** | Discuss quantum mechanical tunnelling and give two examples. | 4 | Dec '19 KTU |
| **7 a)** | Starting from a plane wave equation,obtain Schrodinger's time dependent equation, by using de Broglie's formula and Einstein's relation for photon energy. | 9 | Dec '20 KTU |
| **b)** | Using position - momentum uncertainty relation show that electrons cannot exist in the nucleus | 5 | Dec '20 KTU |
| **8 a)** | Explain the mechanical, electrical and optical properties of nanomaterials. | 9 | Dec '20 KTU |
| **b)** | Mention any five applications of nanotechnology. | 5 | Dec '20 KTU |
| | **MODULE 4** | | |
| **1** | What is meant by intensity of sound? Give the equation connecting intensity and amplitude. | 3 | Dec '19 KTU |
| **2** | What are ultrasonic waves? Mention any four properties of them. | 3 | Dec '19 KTU |
| **3** | Compare displacement current and conduction current | 3 | Dec '20 KTU |
| **4** | Compare displacement current and conduction current | 3 | Dec '20 KTU |
| **5 a)** | Explain any six factors affecting acoustics of a hall and give their remedial measures | 9 | Dec '19 KTU |

| | | | |
|---|---|---|---|
| **b)** | An auditorium has dimensions 45m X 10m X 8m. The average absorption coefficients of wall, ceiling and floor are 0.8, 0.4 and 0.5 respectively. Evaluate reverberation time of the hall. | 5 | Dec '19 KTU |
| **6 a)** | What is inverse piezoelectric effect? How is ultrasonic wavesdetected using piezoelectric effect? What is NDT? Explain any one NDT method. | 10 | Dec '19 KTU |
| **b)** | Calculate the fundamental frequency of vibration of quartz crystal of thickness 8mm at resonance if its Young`s modulus is $y = 7.9 \times 10^{10}\, N/M^2$ and density = 2650 $kg/m^3$ | 4 | Dec '19 KTU |
| **7 a)** | Explain the terms absorption coefficient and reverberation time. What is thesignificance of reverberation time? Discuss the factors on which the reverberation time depends and write the Sabine's formula. | 10 | Dec '20 KTU |
| **b)** | A hall has dimensions of 25m 20m 8m. The reverberation time is 4s.Determine the average absorption coefficient of the surfaces. | 4 | Dec '20 KTU |
| **8 a)** | What is meant by magnetostriction effect?Give two examples for magnetostrictive materials. Explain the production of ultrasonic waves by magnetostriction method. Mention any two medical applications of ultrasonic waves. | 10 | Dec '20 KTU |
| **b)** | A quartz crystal of 2mm is vibrating at resonance. Calculate the fundamental frequency of vibration, if Young`s modulus of quartz is 8.5X1010 N/m2 and density3000Kg/m3 . | | Dec '20 KTU |

| | | | |
|---|---|---|---|
| | **MODULE 5** | | |
| **1** | What is an optical resonator? Explain its role in laser emission. | 3 | Dec '19 KTU |
| **2** | Discuss the advantages of optical fibre over conventional transmission lines. | 3 | Dec '19 KTU |
| **3** | Define metastable state and population inversion. | 3 | Dec '20 KTU |
| **4** | Differentiate between step index and graded index fibre. | 3 | Dec '20 KTU |
| **5 a)** | Explain the construction and working of a ruby laser with schematic and energy level diagrams. | 10 | Dec '19 KTU |
| **b)** | What are Einstein's coefficients?Give their significance in lasing action | 4 | Dec '19 KTU |
| **6 a)** | Explain total internal reflection. With the help of a neat diagram derive expression for numerical aperture of a step index fibre. | 10 | Dec '19 KTU |
| **b)** | An optic fibre has an acceptance angle of 450 . If the refractive index of core is 1.57, calculate numerical aperture and refractive index of cladding | 4 | Dec '19 KTU |
| **7 a)** | Explain construction and working of Ruby laser. | 10 | Dec '20 KTU |

| | | | |
|---|---|---|---|
| **b)** | Describe the recording of hologram | 4 | Dec '20 KTU |
| **8 a)** | Define numerical aperture of an optical fibre. With a neat diagram derive an expression for numerical aperture of a step index fibre. | 10 | Dec '20 KTU |
| **b)** | The sum of refractive indices of core and cladding is 2.9 and difference is 0.03. Determine numerical aperture and acceptance angle of optical fibre. | 4 | Dec '20 KTU |

| SUB CODE | PH100 | SUBJECT NAME | ENGINEERING PHYSICS (2015 SCHEME) |
|---|---|---|---|

| | MODULE 1<br>HARMONIC OSCILLATIONS & WAVES | Marks | Year |
|---|---|---|---|
| 1 | What is the effect of damping on the frequency and time period of an oscillator? | 2 | July '16 KTU |
| 2 | 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 |
| 3 | What do you mean by Quality factor of an oscillator | 2 | Jan '16 KTU |
| 4 | What is resonance in forced oscillation? Give one example | 2 | Dec '16KTU |
| 5 | Frame and solve the differential equation of a forced harmonic oscillator | 6 | July '16 KTU |
| 6 | Distinguish between longitudinal waves and transverse waves | 2 | April '18KTU |
| 7 | What is meant by sharpness of resonance? | 4 | June '16KTU |
| 8 | Frame the differential equation of a forced harmonic oscillator and obtain its solution. | 6 | Dec'18 KTU |
| 9 | Considering transverse vibration of stretched string derive one dimensional wave equation. | 4 | Jan'16,Dec '17 |
| 10 | Derive an expression for fundamental frequency of transverse vibration of a stretched string. . | 6 | Dec '16KTU |
| | **MODULE 2<br>INTERFERENCE & DIFFRACTION** | | |
| 1 | Two independent sources of light cannot produce interference fringes. why | 2 | Jan '16 KTU |
| 2 | 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 |
| 3 | 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 **6000**Å | 4 | Dec '18 KTU |

| | | | |
|---|---|---|---|
| **4** | With necessary theory write the formation of interference pattern in an air wedge and derive an expression for the bandwidth | 6 | July '16 KTU |
| **5** | 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 |
| **6** | Write Rayleigh's criteria for resolution . State Rayleigh's criteria for geometrical and spectral resolution | 6 | Jan '16KTU |
| **7** | Define resolving power of a grating | 2 | July'16K TU |
| **8** | Distinguish between Fresnel's and Fraunhofer Diffraction | 2 | May '17KTU |
| **9** | What is plane transmission grating? Describe how is it used to determine the wavelength of light | 6 | Dec '17KTU |
| **10** | 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**<br>**POLARIZATION & SUPERCONDUCTIVITY** | | |
| **1** | What is double refraction? | 2 | Aug '16 KTU |
| **2** | What is a half wave plate? Write the expression for its thickness | 2 | July '16 KTU |
| **3** | Explain positive crystal and negative crystal | 2 | Dec'16\Jan '17 KTU |
| **4** | With the help of a neat diagram of the principal section of a nicol prism write how it produces plane polarised light and how it can be used for the analysis of plane polarised light? | 6 | May '16KTU |
| **5** | Describe the experimental procedure for production and detection of circularly and elliptically polarised light. | 4 | May '17 KTU |
| **6** | Calculate the thickness of a doubly refracting crystal required to introduce a path difference of $\lambda/2$ between O-ray and E-ray when $\lambda = 6000Å$ ,$\mu_0 = 1.544$, $\mu_e = 1.5533$ | 4 | Aug'16K TU |
| **7** | How do you distinguish circularly polarised light from an unpolarised light? | 4 | May'16 KTU |

| | | | |
|---|---|---|---|
| **8** | The refractive index of calcite is **1.658** for ordinary ray and it is **1.486** for extraordinary ray . A slice having thickness $0.9\times10^{-4}$**cm** is cut from the crystal. For what wavelengths this slice will act as a (i)Quarter wave plate (ii)Half wave plate | 4 | Jan '16KTU |
| **9** | What is Meissner effect? Show that a superconductor is a perfect diamagnet. | 6 | July '16KTU |
| **10** | Explain **superconductivity .** Distinguish between **type I** and **type II** superconductors with examples. | 6 | Dec '16KTU |

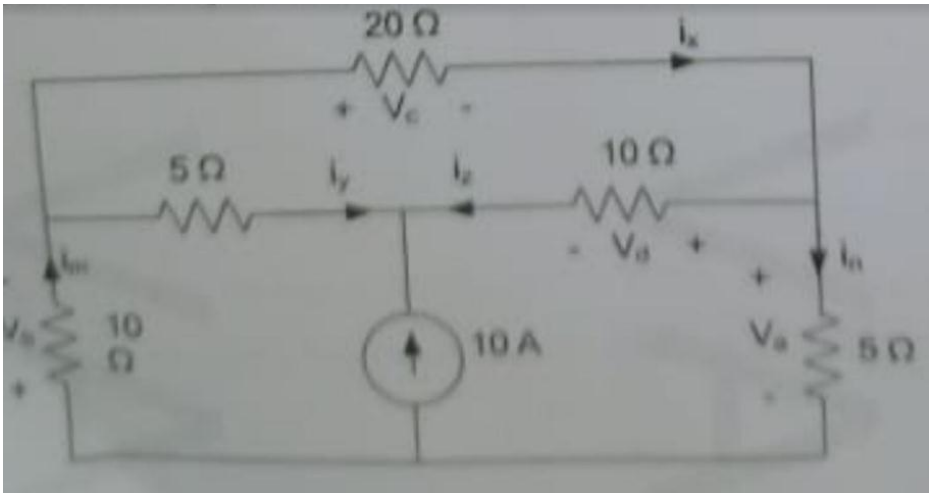
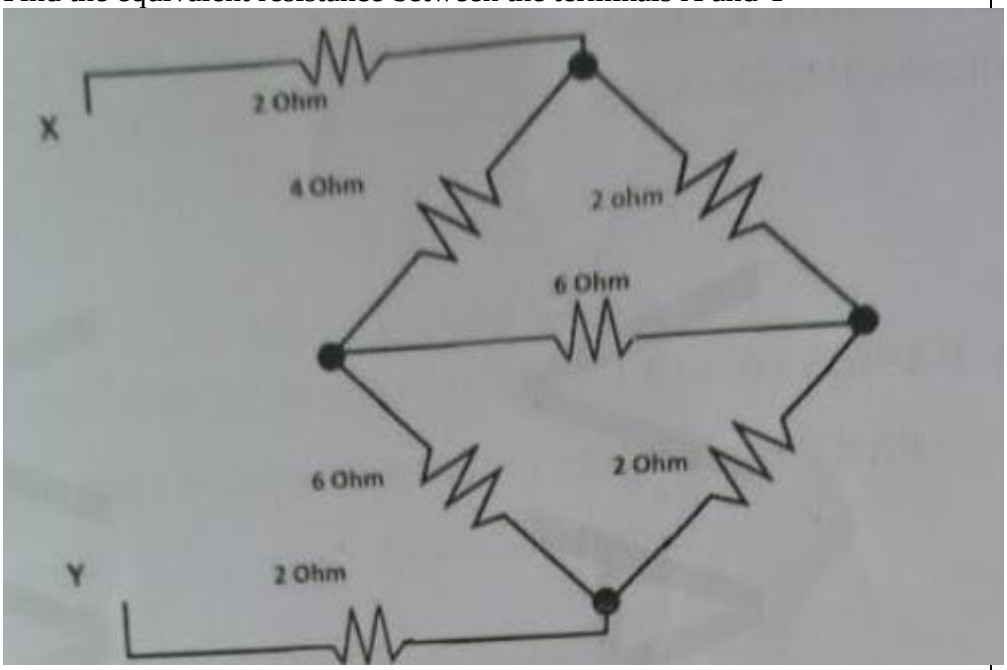
| | | | |
|---|---|---|---|
| | **MODULE 4**<br>**QUANTUM MECHANICS & STATISTICAL MECHANICS** | | |
| **1** | Write the normalisation condition of a wave function and its significance | 2 | Aug '16 KTU |
| **2** | Calculate the de Broglie wavelength of electron whose Kinetic energy is **10keV** | 4 | Jan '16 KTU |
| **3** | State Uncertainty principle. With help of it, explain the absence of electrons inside the nucleus.<br>. | 4 | July '16 KTU |
| **4** | Solve Schrodinger's equation for a particle in a one dimensional box and obtain the following(i)energy values (ii)normalised wave function . | 6 | July '17KTU |
| **5** | Explain the Quantum Mechanical Tunneling<br>. | 4 | July '16 KTU |
| **6** | What is Phase space ?With the help of Heisenberg's Uncertainty relation, Show that the minimum size of the unit cell in quantum statistics is $\mathbf{h}^{\mathbf{f}}$ ,where **h** is the Planck's constant and f is the degree of freedom of the system. | 4 | May'16 KTU |
| **7** | Obtain energy and momentum operators | 4 | Dec '18KTU |
| **8** | Compare M-B , B-E, F-D statistics.<br>. | 6 | May '16KTU |
| **9** | What do you mean by Fermi energy level and Fermi energy? | 2 | May'16 KTU |
| **10** | Derive Schrodinger's time independent equation from time dependent one | 6 | Dec '17KTU |
| | | | |
| | **MODULE 5**<br>**ACOUSTICS & ULTRASONICS** | | |
| **1** | Define absorption co-efficient of sound . | 2 | July '16 Dec '18 KTU |
| **2** | 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 |

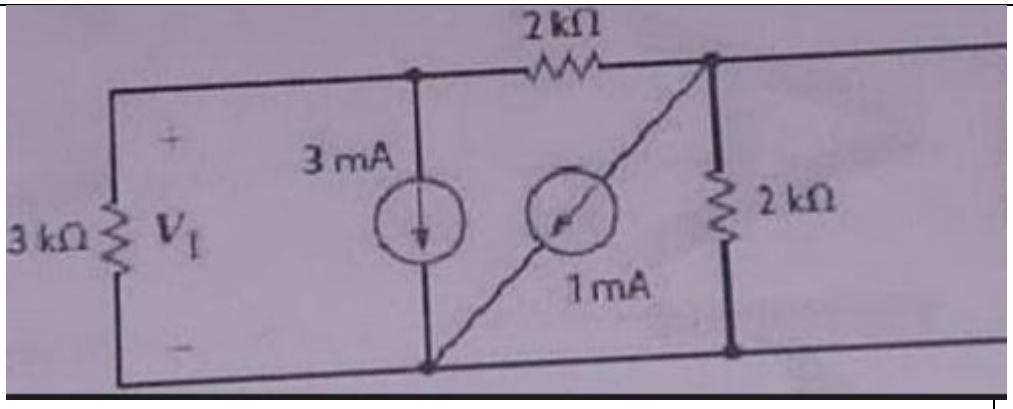
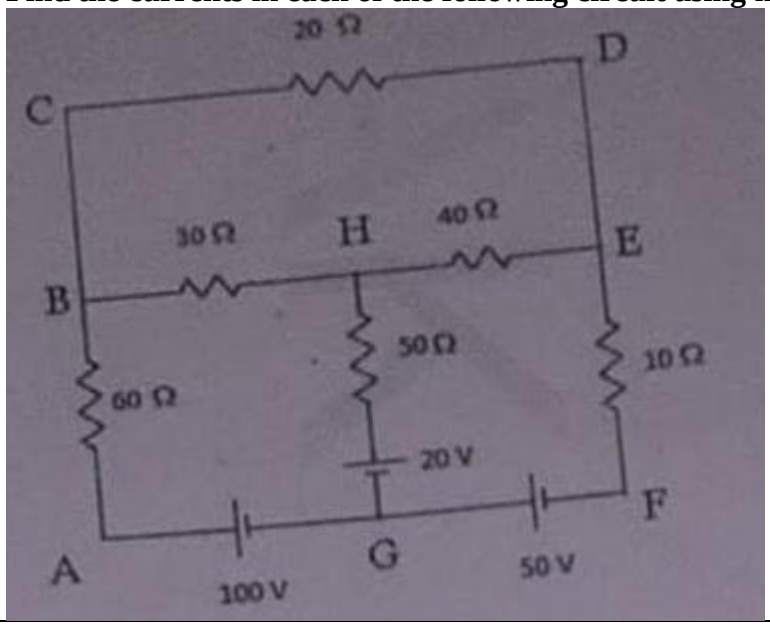
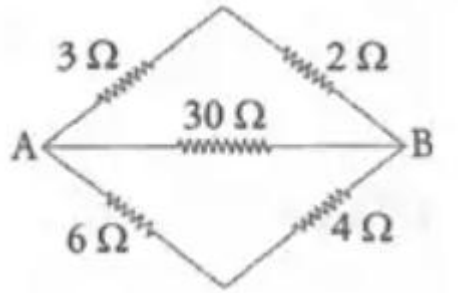
| | | | |
|---|---|---|---|
| **3** | What is reverberation and reverberation time? What is its significance?<br>6Write the factors on which the reverberation time depends. Write Sabine's formula. | 6 | July '16 KTU |
| **4** | What is piezo electric effect? With a neat circuit diagram explain the working of a Piezoelectric oscillator to produce ultrasonic waves | 6 | Jan '16 KTU |
| **5** | What are the factors affecting acoustics of a building ? Give remedies | 6 | Jan '16 \July'17 KTU |
| **6** | 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'16KTU |
| **7** | What are NDT and SONAR? How ultrasonic waves is used in it? | 6 | Dec '16 KTU |
| **8** | 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'16KTU |
| **9** | Name and explain two methods for the detection of ultrasonic waves. Name any four medical applications of ultrasonic waves | 6 | July '16KTU |
| **10** | 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 6**<br>**LASERS & FIBER OPTICS** | | |
| **1** | 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 |
| **2** | What is the difference between spontaneous emission and stimulated emission.? | 2 | Jan '16 Dec '18 KTU |
| **3** | What is a laser? What are the three requisites for laser action to take place?<br><br>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 |
| **4** | 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 |
| **5** | Outline the principle and working of Ruby laser | 6 | Jan '16 KTU |
| **6** | With a neat figure and energy level diagrams, explain the construction and working of He-Ne laser . | 6 | Dec '18 KTU |

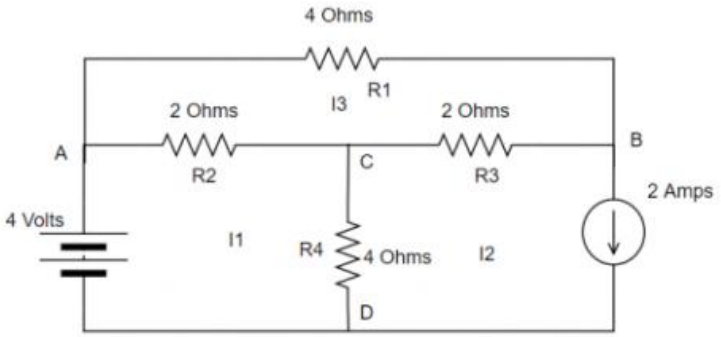
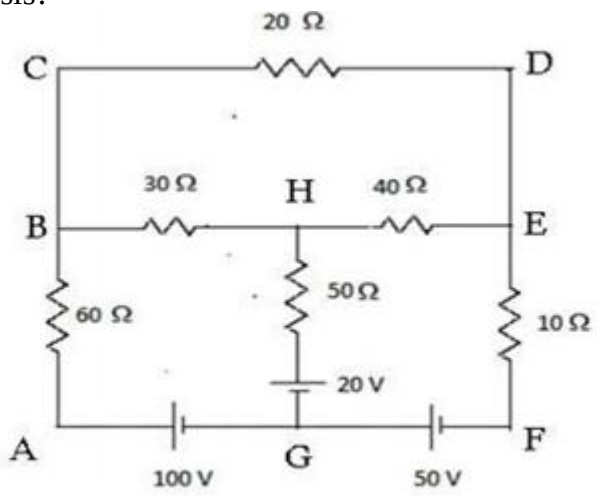
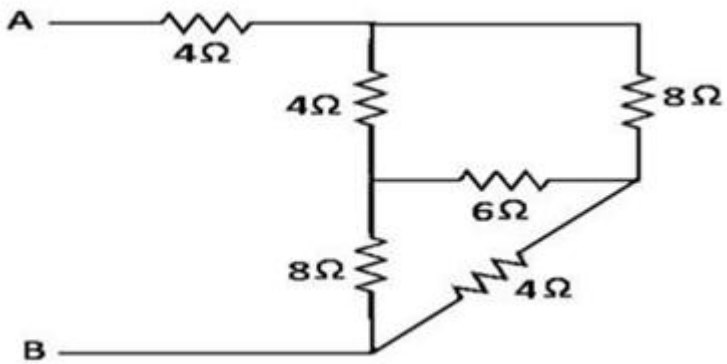
| SUB CODE | PH100 | SUBJECT NAME | ENGINEERING PHYSICS (2015 SCHEME) |
|---|---|---|---|

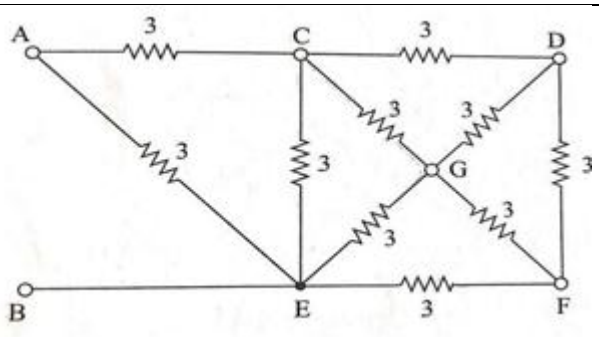
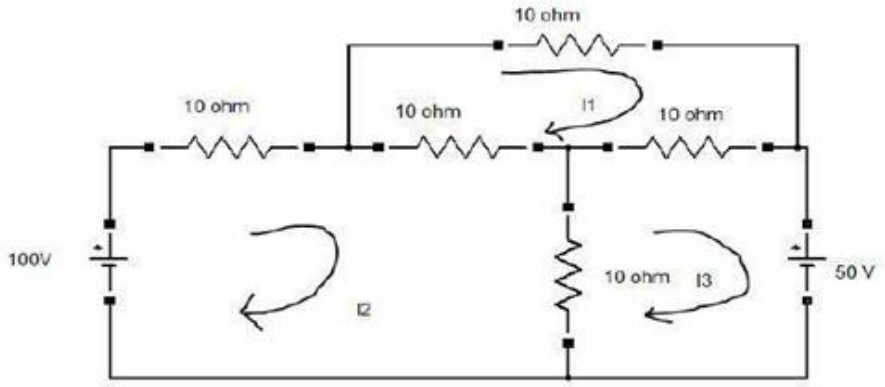
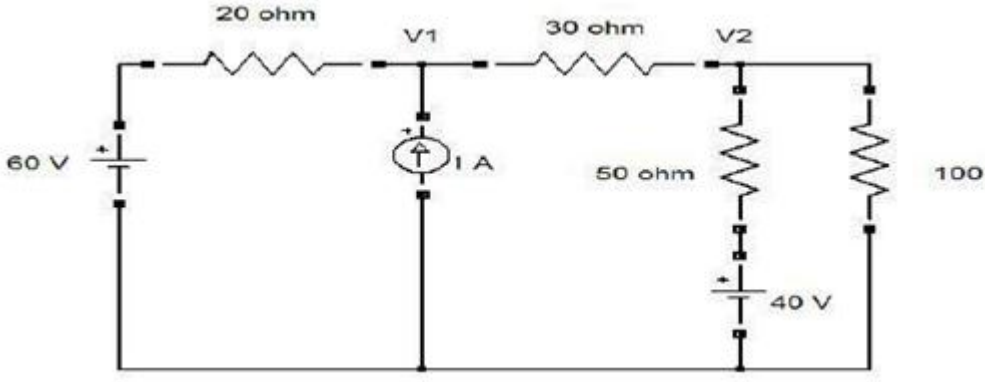
| | | | |
|---|---|---|---|
| **7** | What is an LED? Give its working principle. Hint: Fig, Explanation , Working with the concept of direct bang gap semiconductor. | 2 | Jan '16<br>Dec'18<br>KTU |
| **8** | Name the principle behind the propagation of light through an optic fibre. How the essential conditions for this phenomenon is satisfied in optic fibres. List three advantages of fibre optic communication. | 4 | Aug '16<br>KTU |
| **9** | What are fibre optic sensors? Name two different types. | 2 | July '16<br>KTU |
| **10** | 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<br>Dec '18<br>KTU |

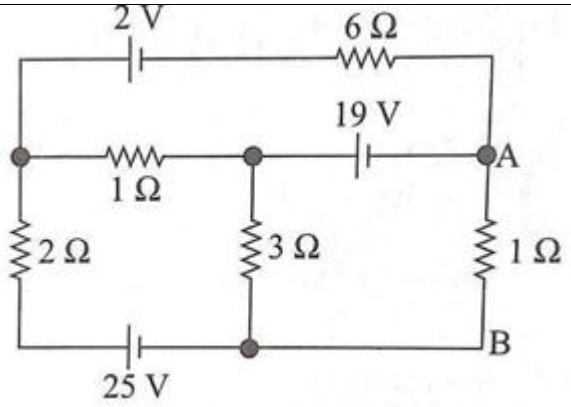
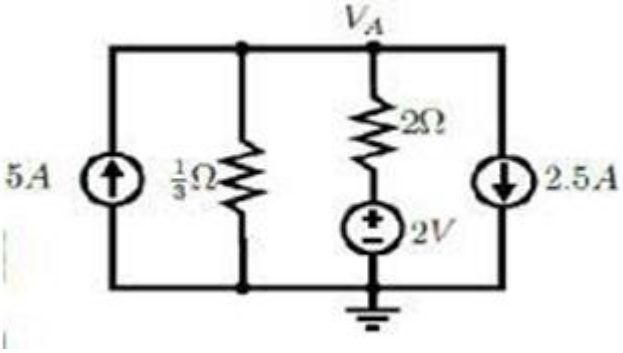
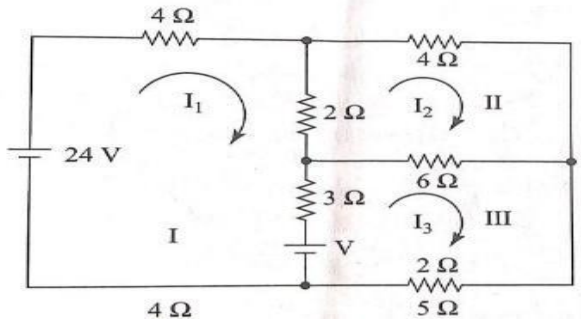
## BASICS OF ELECTRICAL ENGINEERING (EST130 PART-1)

| MODULE 1 | | | |
|---|---|---|---|
| **Sl No** | | **Marks** | **KTU, Year** |
| **1** | Use nodal analysis to find voltages Va, Vb,Vc and Vd<br>  | 10 | KTU-DEC 2021 |
| **2** | Find the equivalent resistance between the terminals X and Y<br>  | 10 | KTU-DEC 2021 |
| **3** | Use nodal analysis to find V1 in the given circuit | **10** | KTU-JULY 2021 |

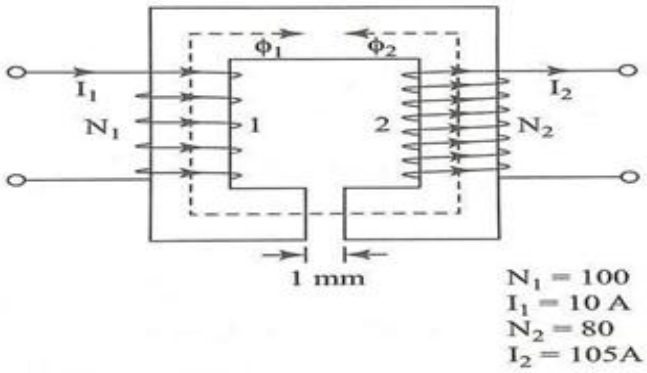
| | | | |
|---|---|---|---|
| |  | | |
| **4** | **Find the currents in each of the following circuit using mesh analysis**<br>  | **10** | KTU-JULY 2021 |
| **5** | Find the current through the circuit shown below if the voltage applied is 50V<br>  | 10 | KTU-DEC 2020 |
| **6** | Find the current in R2 using mesh analysis | 10 | KTU-DEC 2020 |

| | | | |
|---|---|---|---|
| |  | | |
| 7 | State and explain Kirchhoff's laws with examples | 4 | KTU-DEC 2019 |
| 8 | Calculate the current in each branch of the following circuit using mesh analysis?<br>  | 10 | KTU-DEC 2019 |
| 9 | Using star-delta transformation, determine the equivalent resistance $R_{AB}$<br>  | 10 | KTU-DEC 2019 |
| 10 | Calculate equivalent resistance across B and A | 4 | KTU |

| | | | |
|---|---|---|---|
| |  | | MAY 2016 |
| 11 | 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 bythe unknown resistor R1 is 150W with 5A passing through it. | 4 | KTU MAY 2017 |
| 12 | Find mesh currents in the figure shown by mesh analysis  | 10 | KTU MAY 2017 |
| 13 | Find current in 100 ohm resistor using node analysis  | 10 | KTU-DEC-2018 |
| 14 | By applying Kirchhoff's laws calculate current flowing through the 6Ω resistor in the network shown | 10 | KTU-DEC-2016 |

| | | | |
|---|---|---|---|
| |  | | |
| 15 | From the figure use node voltage analysis to find voltage $V_A$<br>  | 10 | KTU-DEC-2016 |
| 16 | A network with three meshes is shown. Apply mesh current method to determine the valueof unknown voltage V, for which mesh current $I_1$=0.<br>  | 10 | KTU-DEC-2016 |

| | MODULE 2 | | |
|---|---|---|---|
| | **Questions** | **Marks** | **KTU, Year** |
| **1** | A coil of 180 turns is linked with a flux of 0.03 Wb when carrying a current of 10A. Calculate the inductance of the coil. If the current is uniformly reversed in 0.04 sec, calculate the emf induced in the coil. | 4 | KTU DEC 2021 |
| **2** | An alternating current is represented by i(t)=14.14 sin (377t). Find (i)rms value (ii) frequency (iii)time period and (iv)instantaneous value of the current at t=3ms. | 4 | KTU-DEC 2021 |
| **3** | An iron ring has a cross section area of 3 cm2 and a mean diameter of 25 cm. An cut across the section of the ring. The ring is wound with a coil of 200 turns through which a current of 3A is passed. If the total magnetic mWb, find the relative permeability of iron, assuming no magnetic leakage | 10 | KTU-DEC 2021 |
| **4** | The instantaneous value of an alternating voltage is given by y v=110 sin 314t<br>Find a) the angular velocity, frequency, and time period of b) Differentiate between statically and dynamically induced emfs. | 10 | KTU-DEC 2021 |
| 6 | Define the terms i) mmf ii) magnetic field strength iii) magnetic flux and<br>iv) magnetic flux density | 4 | KTU-DEC 2019 |
| 7 | State and explain i) Faraday's laws and ii) Lenz's law. | 4 | KTU-DEC 2019 |
| 8 | An alternating current varying sinusoidally with a frequency of 50Hz has an rms value of 20A.<br>i) Write down the equation for the instantaneous current<br>ii) Find the instantaneous value of current at 0.0025s.<br>iii) Find the instantaneous value of current 0.125s after passing through a positive maximumvalue<br>iv) At what time, measured from a positive maximum value, will the instantaneous currentbe 14.14 A? | 10 | KTU-DEC 2019 |
| 9 | Determine the average and rms values of the triangular voltage wave having maximumvalue Em volt | 10 | KTU-DEC 2019 |

| | | | |
|---|---|---|---|
| 10 | Compare Electric and Magnetic Circuit | 4 | KTU-DEC 2018 |
| 11 | Calculate the flux produced in the air gap in the magnetic circuit shown in figure which isexcited by the MMF of two windings. The mean length of the flux path is 40 cm. The permeability of iron is 2000. The uniform cross sectional area is 10 cm²<br>  <br> | 10 | KTU-DEC 2018 |
| 12 | Draw the circuit of a series parallel magnetic circuit. Show its electrical equivalent | 4 | KTU DEC 2016 |
| 13 | A ring shaped electromagnet has an air gap of 6mm and cross sectional area of 12 cm². Themean length of the core (excluding air gap) is 60cm. Calculate the mmf required to producea flux density of 0.4 Wb/m²in the gap. Take the relative permeability of the material as 400 | 10 | KTU-DEC 2018 |
| 14 | A steel ring of 25 cm diameter and of circular section 3 cm in diameter has an air gap of1.5mm length. It is uniformly wound with 1000 turns of wire carrying a current of 2A.<br>Calculate<br>i) Magneto motive force<br>ii) magnetic flux density in air gap<br>iii) magnetic flux<br>iv) relative permeability of steel ring. Assume that iron path takes about 40% of the total mmf. | 10 | KTU-MAY 2019 |
| 15 | Determine the RMS, Average and Form Factor of the waveform shown below | 10 | KTU-DEC 2018 |

| | MODULE 3 | | |
|---|---|---|---|
| | **Questions** | **Marks** | **KTU, Year** |
| **1** | Derive an expression for the energy stored in an inductor. | 4 | KTU-DEC 2021 |
| **2** | Derive the expression for the current in an ac series RLC *circuit* | 10 | KTU-DEC 2021 |
| **3** | A resistance of 10Ω, an inductance of 0.3 H, and a capacitance of 100μF are connected in series across 230V, 50 Hz single phase power supply. Calculate the impedance, current through te circuit (iii) voltage across R,L &C and(d) power factor of the circuit | 10 | KTU-DEC 2021 |
| **4** | A balanced delta connected 3 phase load is fed from a 3 phase, 400 V 50 Hz supply. The line current is 20A and the total power absorbed by the load is 10kW. Calculate (i) the impedance in each branch (ii) the power factor and (iii) the total power consumed if the same impedances are star connected in the network (10) | 10 | KTU-DEC 2021 |
| 5 | Explain the advantage of three phase system of power supply compared to single phasesystem of power supply | 4 | KTU MAY 2019 |
| 6 | When an alternating voltage of (80+j60) V is applied to a circuit, the resulting current flowis (-4+j10)A. Find the impedance, power consumed and the phase angle of the circuit. | 4 | KTU-DEC 2019 |
| 7 | Two impedances Z1 and Z2 when connected separately across a 220V, 50 Hz supply, consume 300W and 150W at a power factor of 0.4 lagging and 0.7 leading respectively. When the two impedances are connected in series across the same supply, find total power consumed and overall power factor. | 10 | KTU-DEC 2019 |
| 8 | A balanced three phase load has per phase impedance of (30+j50) Ω. If the load is connected across 400V, 3 phase supply, find (i) phase current (ii) line current and (iii) power supplied to load when it is connected in (a) star (b) delta | 10 | KTU-DEC 2019 |

| | | | |
|---|---|---|---|
| 9 | . In a single phase ac circuit consisting of an impedance of 10Ω, the RMS value of appliedvoltage is 230V.<br>i. Write down the expression for instantaneous voltage<br>ii. If the current lags the applied voltage by 30º write down the expression for instantaneouscurrent<br>Calculate the power consumed in the circuit | 4 | KTU<br>MAY 2019 |
| 10 | 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 phasevoltage, phase current, power factor and active power when the loads are connected in (i) star (ii) delta | 10 | KTU<br>MAY 2019 |
| 11 | 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-DEC 2017 |
| 12 | i) An alternating voltage of (80 + j60) V is applied to a circuit and the current flowing is (-4<br>+ j10) A. Find<br>(i) the impedance of the circuit, (b) the power consumed and (c) the phase angle.<br>ii) Each phase of a delta connected load has a resistance of 25Ωand an inductanceof0.15<br>H. The load is connected across a 400 V, 50 Hz, three phase supply. Determine the linecurrent, power factor and power consumed. | 10 | KTU-DEC 2017 |
| 13 | Two impedences, 10\|_-30 and 20 \|_60 are connected in parallel. Evaluate the equivalentimpedance. What is the nature (capacitive or inductive) of the equivalent impedence? If acurrent 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<br>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-DEC 2016 |
| 14 | An alternating voltage is defined as v=100 sin α $0<\alpha<\pi$ v=0V $\pi<\alpha<2\pi$<br>What is the RMS value of this voltage | 4 | KTU-DEC 2017 |

| BASICS OF ELECTRONICS ENGINEERING (EST 130 PART-2)<br><br>QUESTION BANK | | | |
|---|---|---|---|
| **Qn. No** | **MODULE – 4** | **Marks** | **Year** |
| 1 | In a 4 band resistor the last colour in the colour band is gold. If the upper range of resistance is 3.465Ω find its colour code. | 4 | KTU-JULY 2021 |
| 2 | Differentiate between Avalanche breakdown and Zener breakdown? | 4 | KTU-JULY 2021 |
| 3 | What are the different types of inductors? Give two typical applications of inductor | 5 | KTU-JULY 2021 |
| 4 | Describe the VI characteristics of PN junction diode. | 6 | KTU-JULY 2021 |
| 5 | Derive the relation between common base current gain and common emitter current gain, | 4 | KTU-JULY 2021 |
| 6 | Sketch the output characteristic of a transistor and explain different regions of operation. | 6 | KTU-JULY 2021 |
| 7 | Distinguish between active and passive electronic components with examples for each | 4 | KTU DEC 2020 |
| 8 | Explain Avalanche breakdown? | 4 | KTU DEC 2020 |
| 9 | What are the specifications of a resistor? Define any three | 5 | KTU DEC 2020 |
| 10 | What do you understand by depletion region? | 5 | KTU DEC 2020 |
| 11 | Describe the colour coding of a resistor. | 4 | KTU DEC 2020 |
| 12 | Explain the VI characteristics of a diode with relevant sketches. | 6 | KTU DEC 2020 |

| | | | |
|---|---|---|---|
| 13. | What are the different types of capacitors? Give any two applications of capacitors. | 4 | KTU-DEC 2019 |
| 14. | Describe the forward characteristics of a diode? | 4 | KTU-DEC 2019 |
| 15. | Explain the working of an NPN transistor. Describe with suitable sketches the input-output characteristics of an NPN transistor. | 10 | KTU-DEC 2019 |
| 16 | a) Explain the formation of a potential barrier in a P-N junction diode.<br>b) What do you understand by Avalanche breakdown? Draw and explain the reverse V-I characteristics of a diode. | 4<br>6 | KTU-DEC 2019 |
| 17. | What are passive components? Mention at least three components with symbol. | 4 | KTU-DEC 2019 |
| 18. | Explain the Different types of Variable resistors? Mention their applications. | 5 | KTU-DEC 2018 |
| 19. | Write down the color code for a given resistor of 47-Kilo-ohms with a tolerance of 10%. | 4 | KTU-DEC 2018 |
| 20. | Write the significance of specifying tolerance value of a component. A ceramic capacitor has got the following code marked on its surface. Identify the capacitance value.<br>(i) 103J (ii) 2n2 | 5 | KTU-DEC 2017 |
| 21 | Give the specifications of a resistor. The color bands marked on a resistor are Blue, Grey, Yellow and Gold. What are the minimum and maximum resistance values expected from that resistance? | 4 | Model question 2019 |
| 22. | What is meant by avalanche breakdown? | 4 | Model question 2019 |

| Qn. No | MODULE – 5 | Marks | Year |
|---|---|---|---|
| 1 | Draw and explain the block diagram of a public address system. | 4 | KTU-JULY 2021 |
| 2 | Give reasons for decrease in transistor amplifier gain at low frequencies and high frequencies | 4 | KTU-JULY 2021 |
| 3 | Explain the working of a full wave bridge rectifier. | 5 | KTU-JULY 2021 |
| 4 | Explain the working of an RC coupled amplifier. | 5 | KTU-JULY 2021 |
| 5 | Describe the working of a zener diode voltage regulator | 5 | KTU-JULY 2021 |
| 6 | Draw and explain the frequency response of an RC coupled amplifier. | 5 | KTU-JULY 2021 |
| 7 | Write a note on potential divider biasing | 4 | KTU-DEC 2020 |
| 8 | Describe gain and bandwidth of an RC coupled amplifier | 4 | KTU-DEC 2020 |
| 9 | Explain the working of a full wave bridge rectifier with capacitor filter. | 7 | KTU-DEC 2020 |
| 10 | With a neat sketch explain the block diagram of an instrumentation system | 3 | KTU-DEC 2020 |
| 11 | Define line regulation and load regulation | 4 | KTU-DEC 2020 |
| 12 | Draw the circuit diagram of a CE amplifier and discuss the role of each component used in it. | 6 | KTU-DEC 2020 |

| | | | |
|---|---|---|---|
| 13 | Draw the block diagram of a public address system and write the role of each block. | 4 | KTU-DEC 2019 |
| 15 | Explain the working of a bridge rectifier | 4 | KTU-DEC 2019 |
| 16 | a) What is the need of biasing? Draw the potential divider biasing circuit?<br>b) Explain the working of a simple Zener voltage regulator | 4<br>6 | KTU-DEC 2019 |
| 17 | a) Draw the circuit diagram of an RC coupled amplifier and explain its frequency response.<br>b) Narrate how capacitor filter eliminate ripples from the output of a rectifier. | 4<br>6 | KTU-DEC 2019 |
| 18 | Explain the working of Zener voltage regulator with a neat diagram. | 5 | KTU-DEC 2018 |
| 19 | With necessary diagrams, explain the working of a full wave bridge rectifier. | 7 | KTU-DEC 2018 |
| 20 | Draw the block diagram of a DC power supply and mention the functions of each block. | 5 | KTU-DEC 2017 |
| 21 | Discuss the role of coupling and bypass capacitors in a single stage RC coupled amplifier. | 4 | Model question 2019 |
| 22 | a) With a neat circuit diagram, explain the working of an RC coupled amplifier.<br>b) Draw the frequency response characteristics of an RC coupled amplifier and state the reasons for the reduction of gain at lower and higher frequencies. | 6<br>4 | Model question 2019 |
| 23. | a) With the help of block diagram, explain how an electronic instrumentation system.<br>b) Explain the principle of an antenna. | 6<br>4 | Model question 2019 |

| Qn. No | MODULE – 6 | Marks | Year |
|---|---|---|---|
| 1 | Explain the relevance of Intermediate Frequency in a superheterodyne receiver | 4 | KTU-JULY 2021 |
| 2 | Draw the frequency spectrum of an amplitude modulated (AM) wave. Given that modulating signal is of frequency fm and amplitude Vm and carrier is of frequency fc and amplitude Vc. Take modulation index as m. What is the bandwidth requirement of this AM wave? | 5 | KTU-JULY 2021 |
| 3 | With a neat sketch explain AM super heterodyne receiver | 5 | KTU-JULY 2021 |
| 4 | Explain the concept of cells and frequency reuse in cellular communication | 5 | KTU-JULY 2021 |
| 5 | Distinguish between AM and FM | 4 | KTU-DEC 2020 |
| 6 | With a neat sketch explain the basic block diagram of a GSM system | 7 | KTU-DEC 2020 |
| 7 | Explain the principle of an antenna | 3 | KTU-DEC 2020 |
| 8 | Write the expression for an AM wave and comment on the bandwidth requirement and modulation index. | 5 | KTU-DEC 2020 |
| 9 | Explain the concept of cellular communication systems | 5 | KTU-DEC 2020 |
| 10 | Explain the concept of cells in cellular communication | 4 | KTU-DEC 2019 |
| 11 | a) What are the merits of AM compared to FM. The carrier amplitude of a given AM wave is 5V and the message signal amplitude is 3V. Find the modulation index.<br>b) Explain the block diagram of super heterodyne receiver. | 5<br>5 | KTU-DEC 2019 |
| 12 | a) Describe the principle of an antenna.<br>b) With necessary block diagram explain the working of a GSM system | 3<br>7 | KTU-DEC 2019 |

| | | | |
|---|---|---|---|
| 13 | Compare AM and FM. | 5 | KTU-DEC 2019 |
| 14 | Draw and explain functional block diagram of cellular communication system. | 10 | KTU-DEC 2018 |
| 15 | Write the principle of frequency modulation and list the advantages of FM over AM. | 5 | KTU-DEC 2017 |
| 16 | a) With the help of a block diagram, explain the working of Super hetrodyne receiver.<br>b) Explain the importance of antenna in a communication system. | 6<br>4 | Model question 2019 |
| 17 | a) With neat sketches explain a cellular communication system.<br>b) Explain GSM communication with the help of a block diagram. | 5<br>5 | Model question 2019 |
| 18 | Differentiate AM and FM communication systems. | 4 | Model question 2019 |

## Course Code: HUN102

## Course Name: PROFESSIONAL COMMUNICATION

**MODULE 1**

1) Find the misspelt words from each set of words given here.

a) Defendant, defendant, difendent, defandent

b) Assumption, assumption, assumption, accumption

c) Appreciation, appreciation, appreciation, appreciation

d) Superintendent, superantendant, superintendent, superintendent (4)

2) Write the definition of the compound words of the following.

a) Swimming pool

b) Paddle boat

c) Neck tie

d) Black bird

e) Foot print

f) Sunset (3)

3) In each of the following sentences there are two blank spaces. Find out which pair of words from the options can be filled up in the blanks in the sentence in the same sequence to make the sentence meaningfully complete.

i. A committee has been ---------- to -------- the transformation of the city into an International Finance Center.

a) Constituted, convert b)appointed, oversee

c) Convergent , evaluate d)inaugurated, determent

ii. Keeping in mind the --------- to develop the sector the Govt has ------- solicited foreign investment.

a) Importance, never b) proposal, forcibly

c) objective, wanted d) need, actively

iii. In his speech he vowed to ---------- the four billion unbanked individuals across the world into the ---------- of financial inclusion.

a) Represent, sphere b) Target, area

c) bring, realm d) convince, era

iv. Although he puts in --------- of overtime and takes few holidays, he ----- cannot support his family.

a) Sufficient, however b) Lot, besides

c) Plenty, still d) Frequency, yet

v. They have been ------ on incentives to ---------- these practices are implemented at grass root level.

a) Relying, ensure b) Improving, secure

c) advocating, confirm d) debating, necessitate (5)

4) Complete the sentence as directed.

a) He said, " I shall go as soon as it is possible." (Change into Indirect speech)

b) He proposed that they should wait for the award. (Change into Direct speech)

c) The guard refused him admittance. (Rewrite the sentence using "Admittance…..") (3)

**MODULE 2**

5) Help your friend by suggesting and explain SQ3R methods and PQRST method to improve his reading skills? (6)

**MODULE 3**

6) You are asked to make a presentation on a tough subject to 10th standard school students. Share your strategies to make your presentation interesting and effective? (4)

7) a) Point out the differences between debate and group discussion? (2)

b) How body language could help you in a group discussion. Write down 6 points. (3)

**MODULE 4**

8) a) How we can develop effective listening skills? (3)

b) How active listening plays an important role in communication? (3)

9) What are the advantages and disadvantages of telephonic or video interviews? (5)

**MODULE 5**

10) Write a letter to the HR manager of a leading company, requesting permission to do two-weeks internship at his company as a part of your academic curriculum. (6)

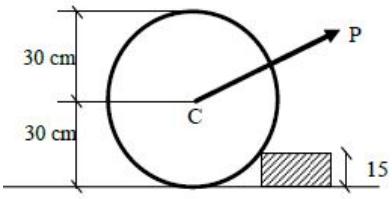
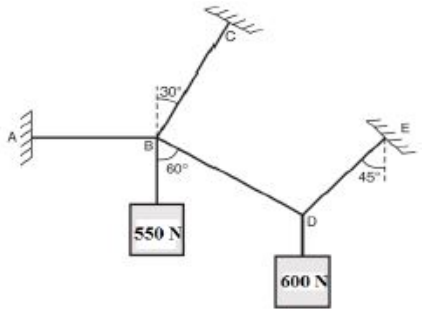
11) a) What is technical communication? (1)

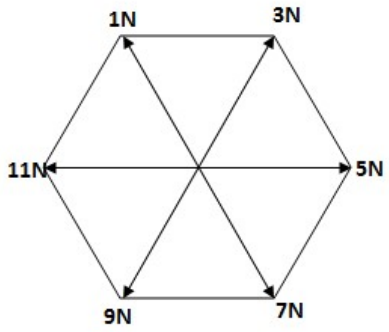
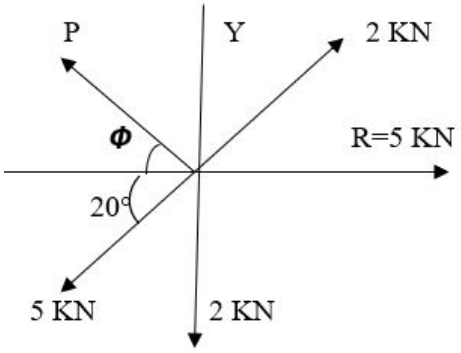
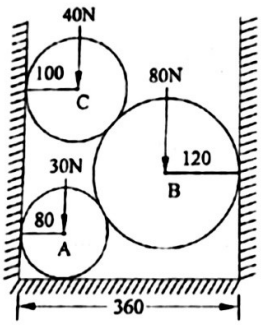
b) What are the different types of reports? (2)

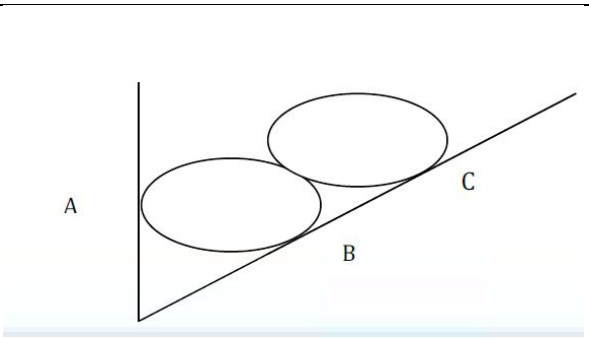
# QUESTION BANK

# EST 100 ENGINEERING MECHANICS

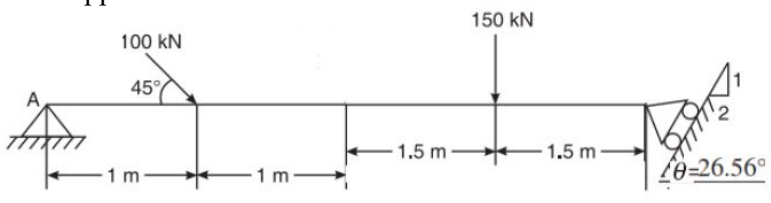
**MODULE 1**

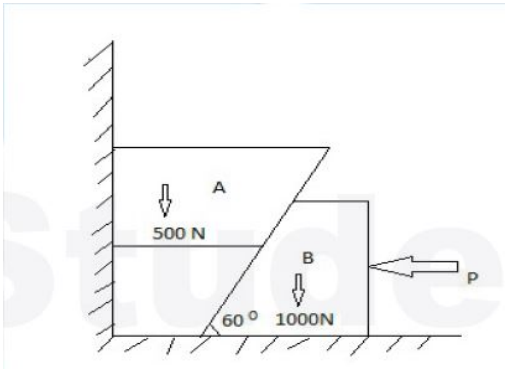
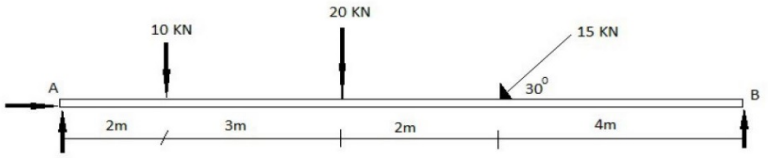
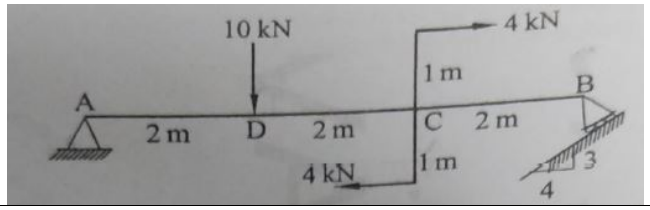
| | | | |
|---|---|---|---|
| 1 | Define a free body diagram with sketches | 3 marks | KTU July 2021 |
| 2 | State and explain Lami's theorem. | 3 marks | KTU July 2021 |
| 3 | A uniform wheel 60 cm diameter weighing 1000 N rests against a rectangular obstacle 15 cm height as shown in fig. Determine the least force required which when acting through the centre of the wheel will just turn the wheel over the corner of the block   | 5 marks | KTU Dec 2019 |
| 4 | The system of connected flexible cables shown in Fig.is supporting two loads of 550 N and 600 N at points B and D, respectively. Determine the tensions in the various segments of the cable.   | 9 marks | KTU Dec 2019 |
| 5 | Concurrent forces of 1,3,5,7,9,11 N are applied to the center of a regular hexagonacting towards its vertices as shown in fig . Determine the magnitude and directionof the resultant. | 9 marks | KTU Dec 2019 |

| | | | |
|---|---|---|---|
| |  | | |
| 6 | A rope 9m long is connected at A and B, two points on the same level, 8 m apart. A load of 300 N is suspended from a point C on the rope 3m from A. Calculate load connected to a point D on the rope 2 m from B is necessary to keep portion CD parallel to AB. | 5 marks | KTU July 2021 |
| 7 | The resultant of a system of four forces is 5 KN directed towards right along x direction. Calculate the force P and its direction $\boldsymbol{\Phi}$<br>  | 9 marks | KTU July 2021 |
| 8 | Three cylinders are piled in a rectangular ditch as shown in fig. Neglecting friction, determine the reaction between cylinder A and vertical wall<br>  | 14 marks | KTU July 2021 |
| 9 | Two identical rollers each of weight 100 N are supported by an inclined plane, making an angle of 30° with the vertical, and a vertical wall. Find the reaction at the points of contact A, B, C. Assume all the surfaces to be smooth | 14 marks | KTU Model question paper |

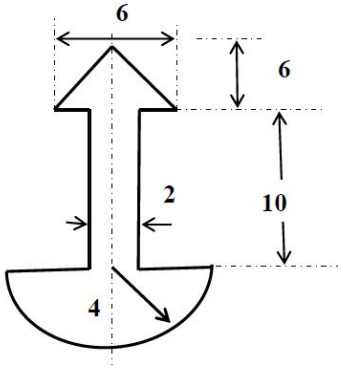
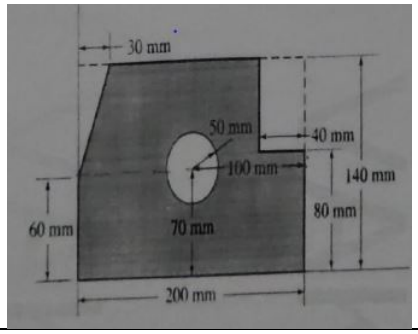
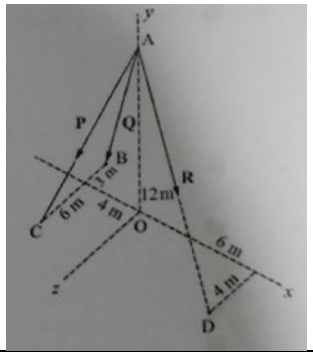
| | | | |
|---|---|---|---|
| |  | | |
| 10 | A string tied to a wall is made to pass over a pulley placed 2m away from it. A weight P is attached to the string such that the string stretches by 2m from the support on the wall to the location of attachment of weight. Determine the force P required to maintain 200 kg body in position for Θ= 30 , The diameter of pulley B is negligible. | 14 marks | KTU Model question paper |

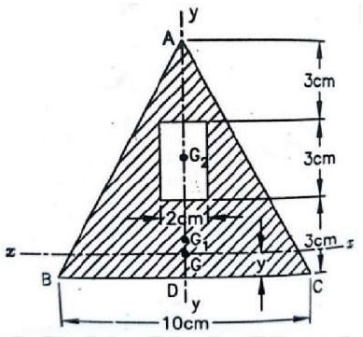
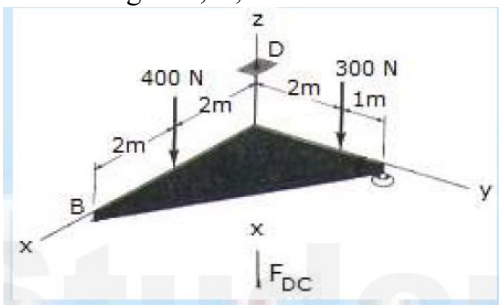
**MODULE II**

| | | | |
|---|---|---|---|
| 1 | A uniform ladder 4 m long weighs 200 N. It is placed against a wall making an angleof 60° with the floor. The coefficient of friction between the wall and the ladder is0.25 and that between the ground and the ladder is 0.35. The ladder in addition to itsown weight, has to support a man of 1000 N at the top at B. Calculate:<br>(i) Thehorizontal force P to beapplied to the ladder at the ground level to prevent slipping.<br>(ii) If the force P is not applied, what should be the minimum inclination of the ladderwith the horizontal, so that it does not slip with the man at the top? | 14 marks | KTU Dec 2019 |
| 2 | Find the force required to move a load of 30N up a roughinclined plane, appliedparallel to the plane. The inclination of the plane is such that when the same body iskept on a perfectly smooth plane inclined at an angle, a force of 6Napplied at aninclination of 30° to the plane keeps the same in equilibrium. Assume coefficient offriction between the rough plane and the load is equal to 0.3. | 7 marks | KTU Dec 2019 |
| 3 | For the beam with loading shown in Fig., determine the reactions at the supports<br>  | 7 marks | KTU Dec 2019 |
| 4 | Briefly explain the analysis of forces acting on a wedge with a suitable example | 3marks | KTU dec 2021 |

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

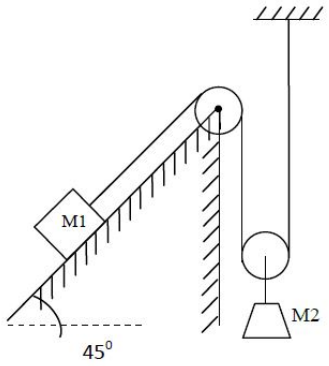
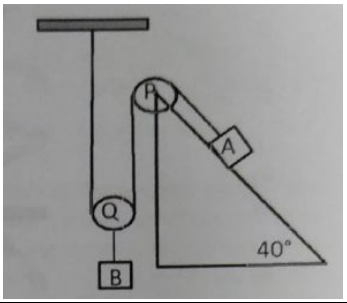
**MODULE III**

| | | | |
|---|---|---|---|
| 1 | Find the moment of inertia of shaded area about the horizontal and vertical centroidalaxis. All dimensions in cm   | 14 Marks | KTU Dec 2019 |
| 2 | A force P is directed from a point A(4,1,4) meters towards a point B (-3,4,1)metres.Determine the moment of force P about x and y axis if it produces a moment of1000Nm about z axis | 14 Marks | KTU Dec 2019 |
| 3 | A force 2i+4j-3k is applied at the point A(1,1,-2). Find themoment of the forceabout the point (2,-1,2) | 3 marks | KTU Dec 2019 |
| 4 | Calculate the area moment of inertia of a rectangular cross-section of breadth ‘b’ anddepth ‘d’ about the centroidal horizontal axis | 3 marks | KTU Dec 2019 |
| 5 | Find the centroid of the shaded area shown   | 14 marks | KTU July 2021 |
| 6 | State Pappus Guldinus theorems. | 3 marks | KTU July 2021 |
| 7 | Find the resultant of the force system shown in fig in which P= 280N,Q= 260 N and R= 210 N   | 14 Marks | KTU July 2021 |

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

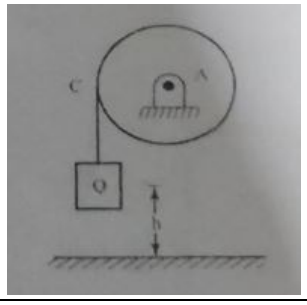
**MODULE IV**

| | | | |
|---|---|---|---|
| 1 | An object of mass 5 kg is projected with a velocity of 20m/s at an angle of 600 to thehorizontal. At the highest point of its path the projectile explodes and breaks up intotwo fragments of masses 1kg and 4kg. The fragments separate horizontally afterexplosion. The explosion releases internal energy such that KE ofthe system at thehighest point is doubled. Calculate the separation distance between two fragmentswhen they reach the ground | 14 Marks | KTU Dec 2019 |
| 2 | A block of mass M1 resting on an inclined plane is connected by a string and pulleysto another block of mass M2 as shown in Fig.Find the tension in the string andacceleration of the | 14 Marks | KTU Dec 2019 |

| | | | |
|---|---|---|---|
| | blocks.Assume the coefficient of friction between the blocks M1and the plane to be 0.2. M1 =1500N, M2 = 1000N. Angle of inclined plane = 45°.<br>  <br> | | |
| 3 | Determine the tension in the inextensible string and the acceleration of the masses. Consider the pulley as massless and co efficient of friction as 0.20.Block A= 200kg and block B=100 Kg.<br>  <br> | 14 marks | KTU July 2021 |
| 4 | A glass ball is dropped on to a smooth horizontal floor from which it bounces to height of 9 m. On the second bounce, it rises to a height of 6m. From what height the ball was dropped and what is the co efficient of restitution between the glass and the floor | 5 marks | KTU July 2021 |
| 5 | Two cars A and B travelling in same direction get stopped at a traffic signal. When signal turns green ,car A accelerates at 0.75m/$s^2$ and 1.75 seconds later, car B starts and accelerates at 1.1 m/$s^2$, Determine i) when and where B will overtake and ii) the speed of each car at that time | 9 marks | KTU July 2021 |
| 6 | Differentiate between curvilinear motion and Projectile motion | 3 marks | KTU July 2021 |
| 7 | A body is projected at an angle such that the horizontal displacement is 3 times that of maximum height. Find the angle of projection | 3 marks | KTU July 2021 |
| 8 | A cricket ball is thrown by a fielder from a height of 2 m at an angle of 300 to the horizontal with an initial velocity of 20 m/s ,hits the wickets at a height of 0.5 m from the ground. How far was the fielder from the wicket? | 14 marks | KTU model question paper |

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

**MODULE V**

| | | | |
|---|---|---|---|
| 1 | A rotor of an electric motor is uniformly accelerated to a speed of 1800 rpm from rest for 5 seconds and then immediately power is switched off and the motor deceleratesuniformly. If the total time elapsed from start to stop is 12.5 second determine thenumber of revolutions made while (a) acceleration (b) deceleration. Also find thevalue of deceleration. | 14 marks | KTU Dec 2019 |
| 2 | A spring stretches by 0.015m when a 1.75kg object is suspended from its end. Howmuch mass should be attached to the spring so that its frequency of vibration is 3 Hz | 5 marks | KTU Dec 2019 |
| 3 | A particle moving with simple harmonic motion has velocities 8m/s and 4m/s whenat the distance of 1m and 2m from the mean position. Determmine (a) amplitude(b) period (c) maximumvelocity, and (d) maximum acceleration of the particle. | 9 Marks | KTU Dec 2019 |
| 4 | A Circular disc of radius r= 30cm and weight W= 145N is free to rotate about its geometric axis. A flexible cord carrying a weight of Q=45N is wound around the circumference of the disc as shown in fig. If the weight Qis released from rest, find a) the time t required fot it to fall through the height h= 300cm, b) with what velocity v will it strike the floor  | 14 marks | KTU July 2021 |
| 5 | A 50N weight is suspended from a spring of constant K= 8 N/cm. Neglecting the mass of spring, find the period for small amplitudes of vertical oscillations | 5 marks | KTU July 2021 |
| 6 | A particle performing simple harmonic motion . When it is at | 9 | KTU |

| | | | |
|---|---|---|---|
| | distances of 10.0 cm and 20.0cm from the mean position, its velocities are 1.2 m/s and 0.8 m/s respectively. Find a) amplitude of ocillations b) time period of oscillation c) maximum velocity and d)its maximum acceleration | marks | July 2021 |
| 7 | A motor car is uniformly accelerated from 40 kmph to 50kmph over a distance of 300 m. If the wheels are 1 m diameter find the angular acceleration of wheels | 3 marks | KTU July 2021 |
| 8 | A cylindrical disc, 50 cm diameter and 10 cm thickness having mass of 10 kg, is in contact with a horizontal conveyor belt running at uniform speeds of 5 m/s. Assuming there is no slip at points of contact determine ( i) angular velocity of disc ( ii) Angular acceleration of disc if velocity of conveyor changes to 8 m/s in 10 seconds. Also compute the moment acting about the axis of the disc in both cases. | 14 marks | KTU Model Question Paper |
| 9 | A wheel rotating about fixed axis at 20 rpm is uniformly accelerated for 70 seconds during which time it makes 50 revolutions. Find the ( i) angular velocity at the end of this interval and (ii) time required for the velocity to reach 100 revolutions per minute | 14 marks | KTU Model Question Paper |
| 10 | Compare damped and undamped free vibrations | 3 marks | KTU Model Question Paper |