# QUESTION BANK

## THIRD SEMESTER (2020)

## MAT201 PARTIAL DIFFERENTIAL EQUATIONS & COMPLEX ANALYSIS

## (For EEE, ECE, CE & ME)

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

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

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

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

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

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

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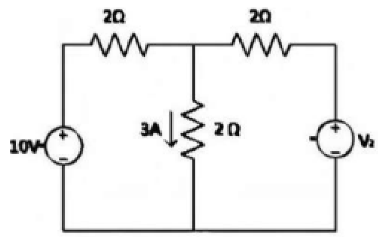
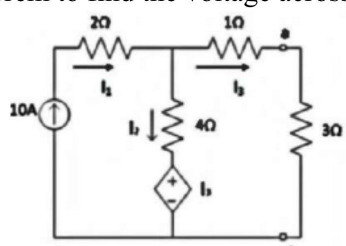
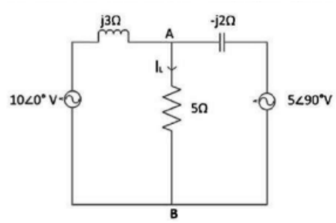
| 15 | Evaluate $\int_c \frac{e^z}{\cos n\pi} dz$, where c is the unit circle $\|z\| = 1$ using Residue theorem. | 8 | KTU Sept 2020 |
| 16 | Evaluate $\int_0^{2\pi} \frac{d\theta}{2+\cos\theta}$ | 8 | KTU Sept 2020 |
| 17 | Give example of<br>(a) removable singularity (b) pole (c) essential singularity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

QUESTION BANK

Subject: EET 201 CIRCUITS AND NETWORKS

S3 EEE

| Sl. no | Question | Marks | Year |
|---|---|---|---|
| | **MODULE 1** | | |
| 1 | Using Superposition Theorem determine the voltage V2 for the circuit shown   | 5 | KTU Jan 2017 |
| 2 | Use Thevenin's Theorem to find the voltage across 3Ω resistor in Fig   | 10 | KTU Jan 2017 |
| 3 | For the circuit shown, determine the load current by using Norton's Theorem   | 10 | KTU Jan 2017 |
| 4 | State and prove Maximum Power Transfer theorem as applied to ac circuits having variable load impedance. | 5 | KTU Dec 2018 |
| 5 | Find the Norton's equivalent circuit across a-b for the network shown in Fig. 2 | 10 | KTU Dec |

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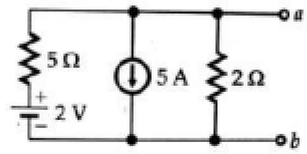
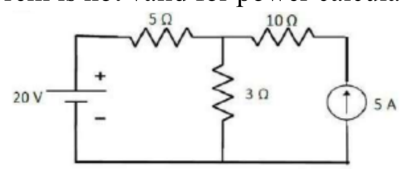
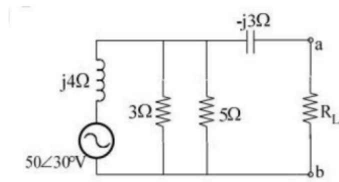
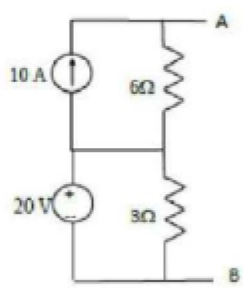
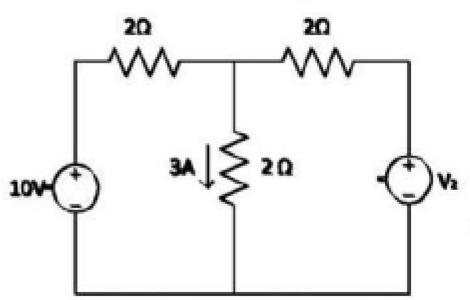
| |   | | 2018 |
| 6 | a)State and prove maximum power transfer theorem<br>b)State Superposition theorem<br>c) Based on the following figure, find the current flowing through a 3 Ω resistor, using the Superposition theorem. Also, prove that the Superposition theorem is not valid for power calculations.<br>  | 10 | KTU Dec 2018 |
| 7 | In the network shown in figure, determine the value of load resistance for the maximum power transfer. Also find the maximum power transferred.<br>  | | KTU Dec 2017 |
| 8 | a) Find the Norton's equivalent circuit for the terminals AB for the circuit shown below<br> <br>b) Using the Superposition theorem, find V2 for the circuit shown<br>  | 10 | KTU Jan 2017 |

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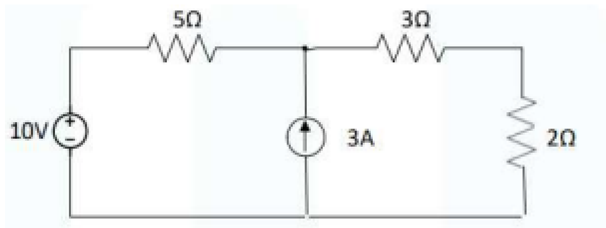
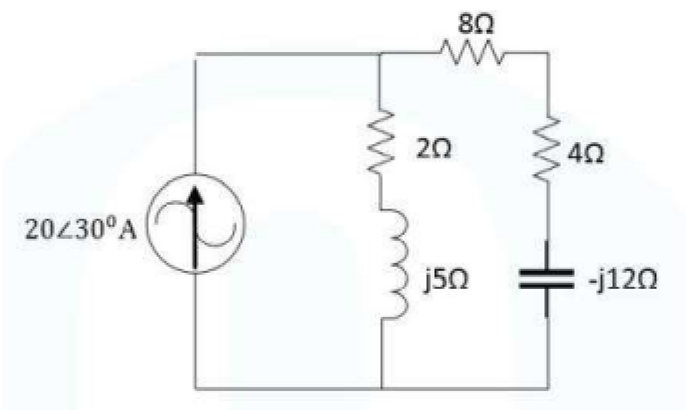
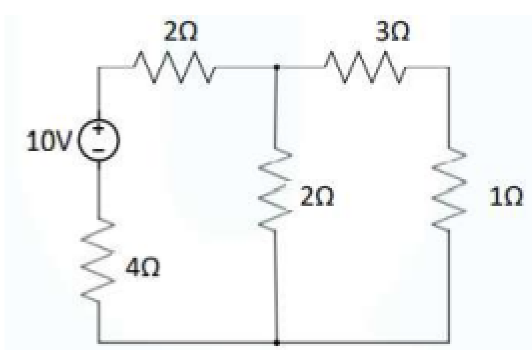
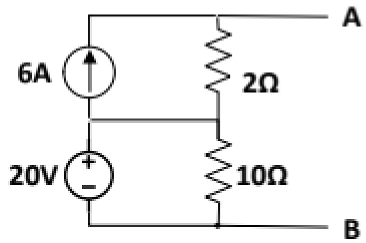
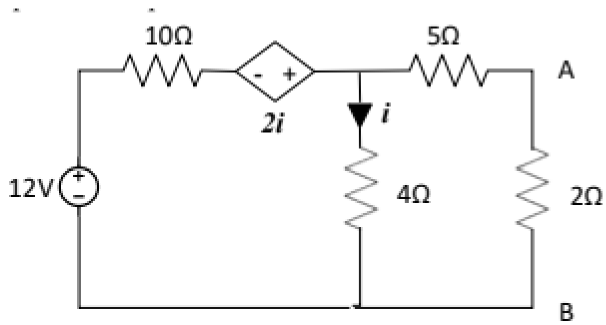
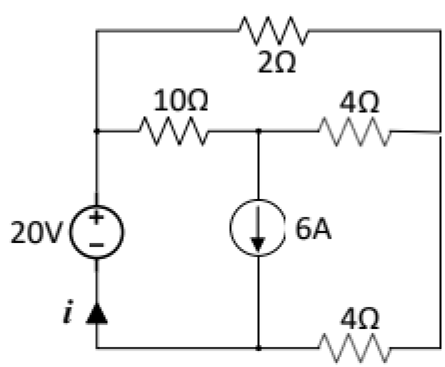
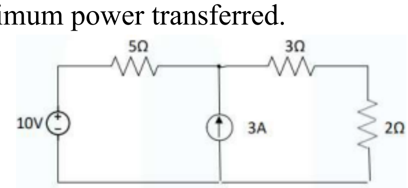
| 9 | Compute the power dissipated in the 2Ω resistance in the network shown below, using the superposition principle. Assume all the active sources as ideal.   | 5 | KTU<br><br>Sep-<br>20 |
| 10 | Determine the voltage drop across the 8Ω resistance in the circuit given below, using Norton's theorem. Also calculate the power dissipated in the resistance.   | 10 | KTU<br><br>Sep-<br>20 |
| 11 | State reciprocity theorem. Verify reciprocity theorem for the circuit given below.   | 5 | KTU<br><br>Sep-<br>20 |
| 12 | State and explain reciprocity theorem using an example. | 3 | KTU<br>DEC 2021 |

<table>
<tr><td>13</td><td>Determine the Norton’s equivalent circuit of the following network.<br><br></td><td>3</td><td>KTU<br>DEC 2021</td></tr>
<tr><td>14</td><td>For the network given below,<br>a) Find the Thevenin’s equivalent circuit across the terminals A and B.<br><br><br>b) Determine the power dissipated in a 10Ω resistance when it is connected across the terminals A and B.<br><br></td><td>14</td><td>KTU<br>DEC 2021</td></tr>
<tr><td>15</td><td>In the circuit given below,<br>a) Determine the value of the load impedance for maximum power transferred by the source to the load.<br>b) Find the maximum power transferred.<br><br></td><td>14</td><td>KTU<br>DEC 2021</td></tr>
<tr><td colspan="4" align="center">MODULE 2</td></tr>
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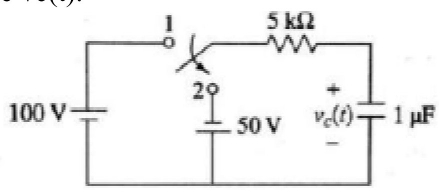
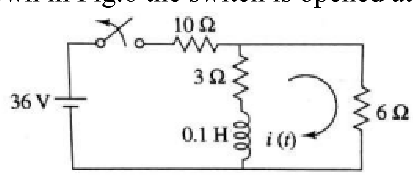
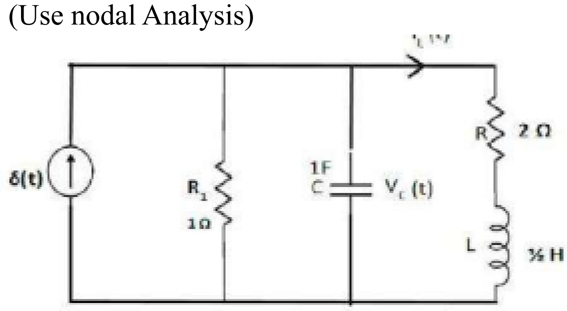
| 1 | What is the difference between transient analysis and steady state analysis of an electrical network? Explain with suitable example | 5 | KTU Jan 2017 |
| 2 | In a series RLC circuit with R = 4Ω, L = 1H and C = 0.25F, a unit step voltage is applied at t = 0. Find the expression for the current in the circuit<br>at t > 0. | 5 | KTU Dec 2018 |
| 3 | The switch in the circuit of Fig.5 is moved from position 1 to position 2 at t= 0. Determine vc(t).<br> | 10 | KTU Dec 2018 |
| 4 | In the network shown in Fig.6 the switch is opened at t = 0. Find i(t)<br> | 10 | KTU Dec 2018 |
| 5 | Find VC(t) & IL(t) in the circuit shown below, assuming zero initial conditions. (Use nodal Analysis)<br> | 10 | KTU Dec 2018 |
| 6 | An RL series circuit is excited by sinusoidal voltage v(t)=Vm sin (wt+ϕ).Derive an expression for the current in the circuit. Discuss the factors which govern the maximum value and rate of decay of transient components of current. | 10 | KTU Jan 2017 |
| 7 | In the given circuit, capacitor C has an initial voltage Vc(0-)= 10 V and at the same instant, current in the inductor is zero. Switch k is closed at time t= 0. Obtain expression for voltage across the inductor L. | 10 | KTU Jan 2017 |

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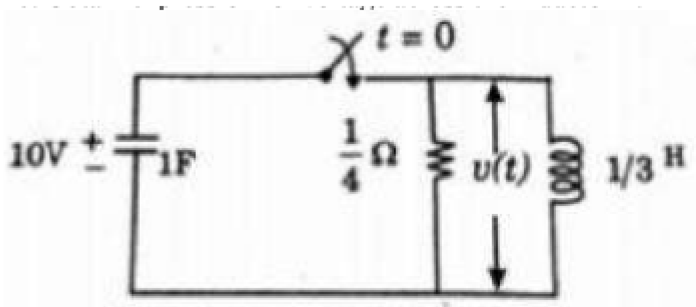
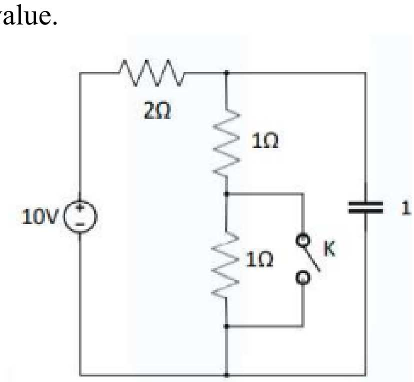
| |  | | |
| 8 | a) Define time constant of a circuit. What is the time constant of an RL circuit?<br>b) How are RLC networks classified according to damping ratios? Sketch the various responses when an RLC series circuit is excited by a DC source. | 10 | KTU Model QP |
| 9 | A series RC circuit has R=10Ω and C=1F. If the circuit is connected to a 10VDC supply at time t=0, determine (i) the time at which the voltage across the capacitor is 5V and (ii) the circuit current at that instant. | 5 | KTU Sep-20 |
| 10 | The circuit shown in the figure is initially at steady state, with the switch K opened. If the switch is closed at time t = 0, determine the expression for the voltage across the capacitor for $t \geq 0$. Also find its final steady state value.<br> | 10 | KTU Sep-20 |
| 11 | A series RLC circuit with R = 5Ω, L = 1H and C = 0.25F is connected to a 10VDC supply at time t = 0. Determine the expression for (i) the current i(t) through the circuit and (ii) voltage across the capacitor v(t). Use Laplace transform technique. | 10 | KTU Sep-20 |
| 12 | Define time constant of a circuit. Illustrate and explain: does time constant affect the charging time of the capacitor in series RC circuits connected to a DC source? | 3 | KTU DEC 2021 |
| 13 | Derive the expression for the current in a series RL circuit when connected to a DC source of voltage V, at time t = 0. Assume zero initial | 3 | KTU DEC 2021 |

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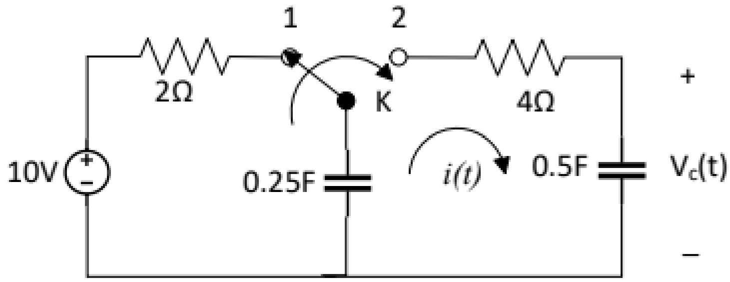
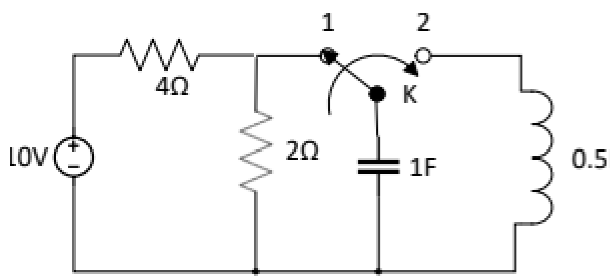
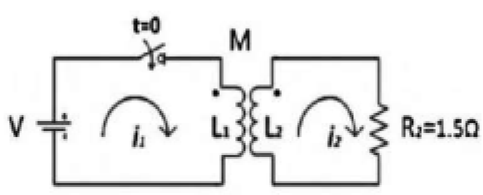
| | conditions. | | |
| 14 | a) In the circuit shown below, the switch was initially at position 1 and the steady state condition is reached. At t = 0, the switch is changed to position 2. Determine the expression for the current $i$(t), for $t > 0$<br><br><br>b) A 0.25F capacitor with an initial voltage of 10V is connected across a coil of 5Ω resistance and 1H inductance, at time $t = 0$. Determine the expression for the current through the coil for $t > 0$. | 14 | KTU DEC 2021 |
| 15 | In the circuit given below, the switch K is closed at $t = 0$. a) Determine the expression for the voltage across the capacitor, $v(t)$ for $t > 0$. (10) b) Calculate the value of $v(t)$ at $t$ = 1 seconds and its final steady state value<br><br> | 14 | KTU DEC 2021 |
| **MODULE 3** | | | |
| 1 | Write the mesh equations in s-domain for the network of figures, when a 10 Vsource is switched on. The primary and secondary self-inductances are L1 =L2 =1 H and M =0.5 H.<br><br> | 5 | KTU Jan 2017 |
| 2 | a) Explain the dot convention used in coupled circuits.<br>b) Derive the s-domain equivalent circuit of an inductor carrying | 10 | KTU Model Question |

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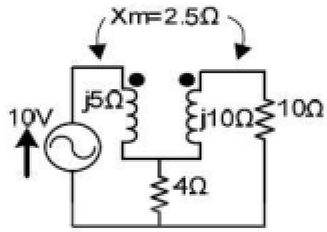
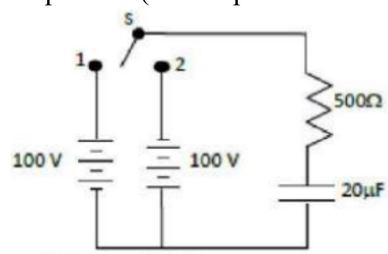
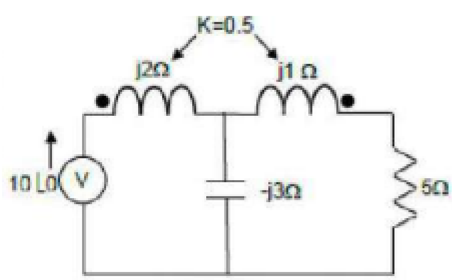
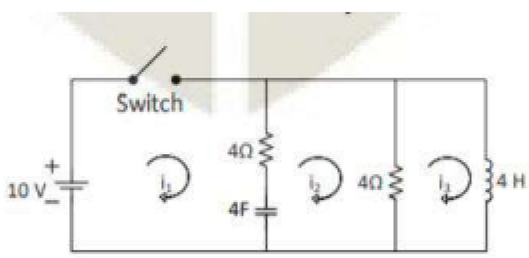
| | an initial current of Io. | | |
| 3 | Figure.7 shows a network with mutual coupling. Find the current in the 10Ω resistance. Assume that inductors have negligible resistance   | 10 | KTU Dec 2018 |
| 4 | In the given circuit shown in fig.(7), the switch is closed to position 1 at t=0 and after a time equal to one time constant it is moved to position 2. Find the expression for current after moving to position 2. Assume zero initial charge on the capacitor. (Use Laplace transform technique).   | 10 | KTU Jan 2017 |
| 5 | Find the voltage across the5 Ω resistor in the circuit shown in fig.   | 5 | KTU Jan 2017 |
| 6 | In the circuit shown, at time t = 0, the switch was closed. a) Model the circuit in s-domain for time t > 0.   | 10 | KTU Model QP |

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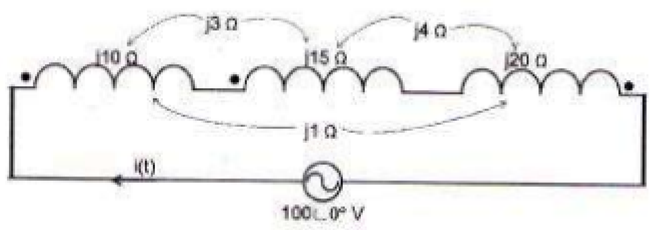
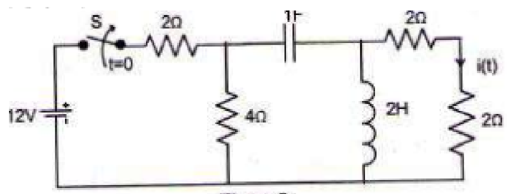
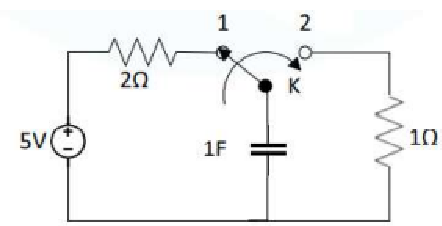
| | b) Through mesh analysis, obtain the time domain values of values of i1, i2 and i3 Given that the capacitor and inductor were initially relaxed. | | |
| 7 | Find the current through circuit shown in Fig. 1.<br> | 5 | KTU April 2018 |
| 8 | The switch S in the circuit of Fig.is in the closed position for a long time at t = 0, the switch opens. Find the expression for the current using Laplace transform.<br><br>Figure 7 | 10 | KTU April 2018 |
| 9 | The switch K in the circuit given below has been at position 1 for a long time. At t = 0, the switch is moved to position 2. Determine the current flowing through the 1Ω resistance for t ≥ 0 using Laplace transform technique.<br> | 5 | KTU Sep-20 |
| 10 | a) A series RL circuit with R = 10Ω and L = 2H is connected to a 20V DC supply at time t = 0. Plot the variation of inductor current and voltage across the resistor for t ≥ 0 by deriving the expression for the same.<br>b) Determine the loop current I2 in the circuit given below. | 10 | KTU Sep-20 |

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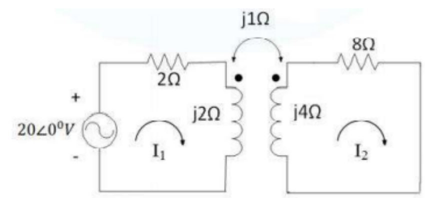
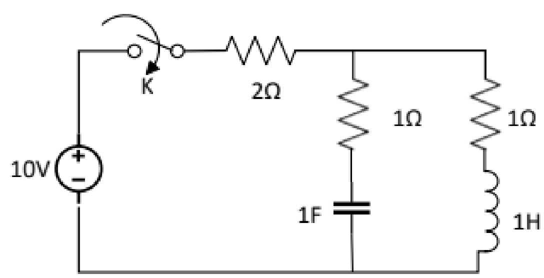
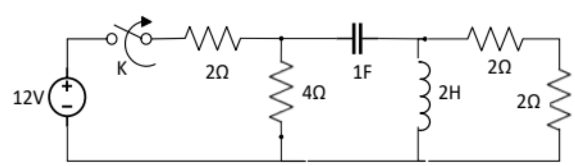
| |  | | |
| 11 | Define coefficient of coupling in coupled circuits. What are its maximum and minimum values? | 3 | KTU DEC 2021 |
| 12 | Obtain the transfer function of a typical series RLC circuit. Take the voltage across the capacitor as the output variable. | 3 | KTU DEC 2021 |
| 13 | a) Obtain the conductively coupled equivalent circuit for the network given below. Also write the mesh equations for the equivalent circuit.<br>b) If the network given below is connected across a 230V, 50Hz AC source, determine the current supplied by the source.<br> | 14 | KTU DEC 2021 |
| 14 | The switch K in the circuit given below is closed at t = 0.<br>a) Determine the transformed circuit for t > 0. Assume zero initial conditions.<br>b) Find the time domain expression for the voltage v(t) across the 5Ω resistor for t > 0. Use mesh analysis.<br> | 14 | KTU DEC 2021 |
| **MODULE 4** | | | |
| 1 | Describe the variation of impedance and phase angle as a function of frequency in a series RLC circuit | 5 | KTU Model QP |
| 2 | Define quality factor. Derive quality factor for inductive and capacitive circuits. | 5 | KTU Model QP |

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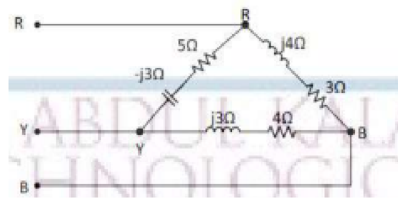
| 3 | The following load is delta connected to a 100V three phase system. Find the phase currents, line currents and total power consumed by the load.<br> | 14 | KTU Model QP |
| 4 | An unbalanced 4 wire, star connected load is connected to a balanced voltage of 400V. The loads are: Z1 = (3 + 6j) Ω; Z2 = (2 + 2j) Ω; Z3 = (14+ 18j) Ω Calculate a) Line currents b) Current in neutral wire c) Total power | 14 | KTU Model QP |
| 5 | Define Quality factor of Series resonance circuit. Give an equation of it. | 5 | KTU Jan 2017 |
| 6 | Derive an expression for an a.c series circuit that has a resistance of 10 W, an inductance of 0.2 H and a capacitance of 60 µF, voltage applied to the circuit is 200 V. Calculate: (a) resonant frequency (b) current (c) power at resonance | 5 | KTU Jan 2017 |
| 7 | Define Quality Factor of Parallel resonance circuit. Give equation of it | 10 | KTU Jan 2017 |
| 8 | Derive an expression for resonant frequency of a series RLC circuit. | 10 | KTU Jan 2017 |
| 9 | Describe the variation of the impedance, power factor and current as a function of frequency in a series resonant circuit. | 3 | KTU DEC 2021 |
| 10 | A series RLC circuit with $R = 10\Omega$, $L = 2H$ and $C = 0.5F$ is connected to a 230V, variable frequency AC source. Determine the frequency of the source at which the circuit current is maximum. Also find the maximum current | 3 | KTU DEC 2021 |
| 11 | A 400 V, three-phase supply feeds an unbalanced three-wire, star-connected load. The branch impedances of the load are $Z_R = 10\Omega$, $Z_Y = -j5\Omega$ and $Z_B = j15\Omega$. Calculate the line currents. | 14 | KTU DEC 2021 |
| **MODULE 5** | | | |
| 1 | The ABCD parameters of a two port network are A=3, B=160, C=0.05, D=3. Find the equivalent T and Π network. | 5 | KTU Jan 2017 |
| 2 | Determine the h-parameters of the network shown in figure below and hence check whether the network is symmetrical. | 5 | KTU Jan 2017 |

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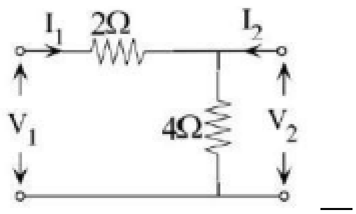
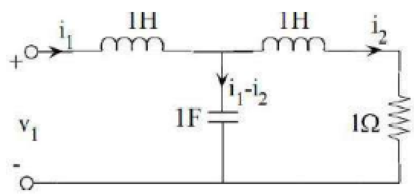
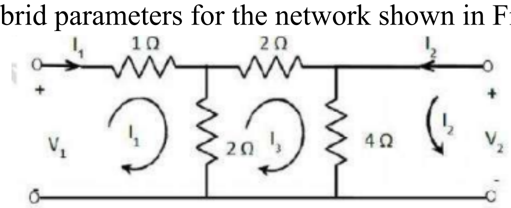
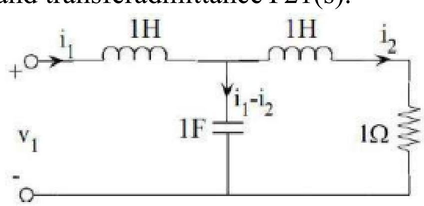
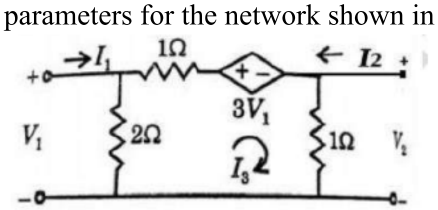
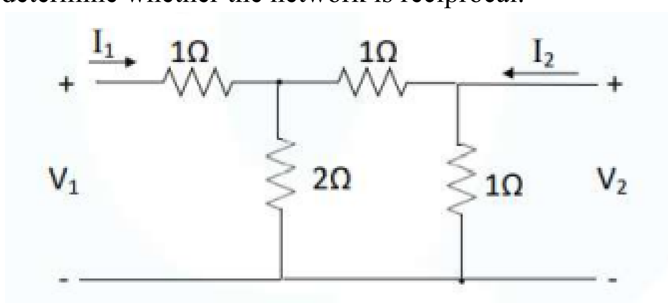
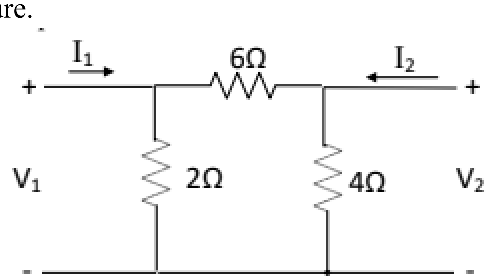
| |   | | |
| 3 | What are T parameters? Express T parameters in terms of Y parameters | 5 | KTU Jan 2017 |
| 4 | Explain the symmetry and reciprocity property of a two port network. State the conditions for them in terms of different parameters. | 5 | KTU Jan 2017 |
| 5 | For the network shown in figure, find a)z-parameters and b) ABCD parameters   | 10 | KTU July 2017 |
| 6 | Determine hybrid parameters for the network shown in Fig. below   | 10 | KTU July 2017 |
| 7 | For the network shown in figure, determine driving point admittance Y11(s) at port 1 and transferadmittanceY21(s).   | 10 | KTU Dec 2018 |
| 8 | Find the Z and Y parameters for the network shown in figure.   | 10 | KTU Dec 2018 |
| 9 | a) What are ABCD parameters? Why are they called transmission parameters?<br>b) Show that for a two-port network [Y]=[Z]-1 | 10 | KTU Sep-20 |

<table>
<tr><td></td><td></td><td></td><td></td></tr>
<tr><td>10</td><td>a) The following measurements are taken while conducting an experiment on a two port network. If two such identical networks are connected in parallel, determine the Parameters of the overall network.<br>
<table>
<tr><td rowspan="2">Input port terminals shorted</td><td>Input Port Current</td><td>Output Port Voltage</td><td>Output Port Current</td></tr>
<tr><td>−2A</td><td>10V</td><td>5A</td></tr>
<tr><td rowspan="2">Output port terminals shorted</td><td>Input Port Voltage</td><td>Input Port Current</td><td>Output Port Current</td></tr>
<tr><td>5V</td><td>2.5A</td><td>−1A</td></tr>
</table>
b)<br>
The port currents of a two port network are given by<br>
Find the equivalent network<br>
$I_1 = 4V_1 - 2V_2$<br>
$I_2 = -2V_1 + 5V_2$</td><td>10</td><td>KTU Sep-20</td></tr>
<tr><td>11</td><td>Find the transmission parameters of the following network and hence determine whether the network is reciprocal.<br>

</td><td>5</td><td>KTU Sep-20</td></tr>
<tr><td>12</td><td>Show that the overall T-parameter matrix of two cascaded 2-port networks is the product of the T-parameter matrix of the individual networks.</td><td>3</td><td>KTU DEC 2021</td></tr>
<tr><td>13</td><td>What are h-parameters? Why are they called hybrid parameters?</td><td>3</td><td>KTU DEC 2021</td></tr>
<tr><td>14</td><td>a) Find the transmission parameters of the network shown in the figure.<br>

<br>
b) Find the driving point impedance of the network given below.</td><td>14</td><td>KTU DEC 2021</td></tr>
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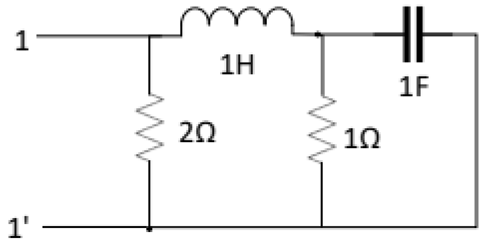
| | <br>c) Determine whether the two port network represented by the following network equations is reciprocal.<br>$V_1 = 3V_2 - 2I_2$<br>$I_1 = 4V_2 - 3I_2$ | | |
| 15 | a) Discuss the series and cascade interconnection of two port networks.<br>b) The Y parameters of a two port network are<br>$Y_{11} = 3℧, Y_{12} = -1℧, Y_{21} = -1℧\ Y_{22} = 2℧.$<br>Determine the equivalent T-network. | 14 | KTU<br>DEC 2021 |

**QUESTION BANK**

# Subject: EET203 MEASUREMENTS AND INSTRUMENTATION

# S3 EEE

| MODULE 1 | | | |
|---|---|---|---|
| **Sl.No** | **Question** | **Marks** | **Year** |
| 1 | Define the following terms in measurement i) Accuracy ii) Resolution iii) Precision | 5 | KTU DEC 2018 |
| 2 | The weight of 5g is used as control weight in a gravity controlled instrument. Find its distance from the spindle, if the deflecting torque for a deflection of 600 is 1.13x10-3 . | 5 | KTU MAY 2019 |
| 3 | Explain the working of attraction type and repulsion type of moving iron instrument with the help of neat diagrams | 10 | KTU MAY 2019 |
| 4 | Write short note on deflecting, damping and controlling torque | 5 | KTU MAY 2019 |
| 5 | Resistance of unknown resistance determined by Wheatstone bridge given by R4= R1R2/R3where limiting values of various resistances are R1= 500Ω + 1%, R2 =615Ω 1%. R3 = 100Ω +0.5 %.Calculate:<br>i) Nominal value of unknown resistor<br>ii) ii) Absolute error of unknown resistor in ohm.<br>iii) iii) Limiting error in percentage of unknown resistor. | 5 | KTU APR 2018 |
| 6 | Draw the block diagram of a typical measurement system and indicate the functional elements in detail. | 5 | KTU APR 2018 |
| 7 | Amoving coil ammeter has fixed shunt of 0.01Ω.With a coil resistance of 750Ω and a voltage drop of 500mV across it, the full scale deflection is obtained. (i) Calculate current through shunt. (ii) Calculate resistance of meter to give full scale deflection if shunted current is 60A | 5 | KTU APR 2018 |
| 8 | Define the following terms in measurement i) Accuracy ii) Resolution iii) Precision | 5 | KTU DEC 2018 |
| 9 | Explain the construction and working principle of a single-phase dynamometer type wattmeter, what are the errors present in it? | 10 | KTU DEC 2018 |
| 10 | Explain the construction and principle of operation of permanent magnet moving coil instrument. | 10 | KTU DEC 2018 |
| 11 | A dc meter having a coil of resistance 3 Ω gives full scale deflection when acurrent of 60milliampere is passed through it. Show that it can be adopted to do work: | 10 | KTU DEC 2018 |

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| | i)As an ammeter with a range of 0-6A,<br>ii)As a voltmeter with arrange of 0-600V. | | |
| 12 | List the different types of errors in measurements? | 5 | KTU<br>SEP 2020 |
| 13 | Explain the construction and operating principle of permanent magnet moving coil instrument. Derive the expression for deflection of PMMC? | 10 | KTU<br>SEP 2020 |
| 14 | How the range of DC ammeter and DC voltmeter can be extended. Derive the expression to find the shunt resistance and multiplier resistance? | 5 | KTU<br>SEP 2020 |
| 15 | What are the different methods of obtaining the controlling torque in an indicating instrument? | 5 | KTU<br>DEC 2019 |
| 16 | Explain the construction and principle of operation of Permanent Magnet Moving Coil Instrument? Derive it's torque equation? | 10 | KTU<br>DEC 2019 |
| 17 | Explain the general requirements for ammeter shunts. | 5 | KTU<br>DEC 2019 |

**MODULE 2**

| Sl.No | Question | Marks | Year |
|---|---|---|---|
| 1 | Explain any two errors that occur in electrodynamometer type wattmeter and its compensation | 5 | KTU<br>MAY 2019 |
| 2 | Explain the working of electronic energy meter. | 5 | KTU<br>MAY 2019 |
| 3 | Write short note on 3 phase induction type energy meter | 5 | KTU<br>MAY 2019 |
| 4 | Draw the phasor diagram of a current transformer. Derive the expressions for ratio and phase angle errors. | 10 | KTU<br>MAY 2019 |
| 5 | Describe the construction and working principle of single phase induction type energy meter. | 5 | KTU<br>APR 2018 |
| 6 | Give the construction and working principle of dynamometer type instrument. Also indicate the different errors in dynamometer type watt meters. | 5 | KTU<br>APR 2018 |
| 7 | The coil of a moving coil voltmeter is 40 mm long and 30 mm wide and has 100 turns on it. The control spring exerts a torque a torque of 240x10-6 Nm when the deflection is 100 divisions on full scale. If the flux density of magnetic field in air-gap is 1wb/m2 . Calculate the resistance that must be put in series with the coil to give 1V/division. The resistance of voltmeter coil may be neglected. | 5 | KTU<br>APR 2018 |
| 8 | A 1000/5A, 50 Hz current transformer has a secondary burden | 5 | KTU |

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| | comprising a non-inductive impedance of 1.6Ω. The primary winding has one turn. Calculate the flux in the core and ratio error at full load. Neglect leakage reactance and assume iron loss in the core to be 1.5W at full load and mmf=100A. | | APR 2018 |
| 9 | Describe the working of hall effect sensors. | 5 | KTU APR 2018 |
| 10 | Write short notes on Electronic Energy Meters. | 5 | KTU DEC 2019 |
| 11 | Explain the construction and working principle of a single-phase dynamometer type wattmeter, what are the errors present in it? | 10 | KTU DEC 2019 |
| 12 | Explain the construction and principle of operation of permanent magnet moving coil instrument. | 10 | KTU DEC 2019 |
| 13 | Write short notes on TOD meter | 5 | KTU DEC 2019 |
| 14 | A dc meter having a coil of resistance 3 Ω gives full scale deflection when a current of 60milliampere is passed through it. Show that it can be adopted to do work: i)As an ammeter with a range of 0-6A, ii)As a voltmeter with arrange of 0-600V. | 5 | KTU DEC 2019 |
| 15 | Write short notes on TOD meter | 5 | KTU DEC 2019 |
| 16 | A current transformer with a bar primary has 400 turns in the secondary. The resistance and reactance of secondary circuit are 1.4ohms and 1.0ohms respectively including the transformer winding with 6A flowing in secondary winding. The magnetizing mmf is 110A and Iron loss is 1.3W. Find the ratio and phase angle errors (Assume nominal ratio to be equal to turns ratio). | 5 | KTU DEC 2019 |
| 17 | Write short notes on TOD meter? | 5 | KTU SEP 2020 |
| 18 | Write short notes on Phasor Measurement Units? | 5 | KTU SEP 2020 |
| 19 | Explain the construction and theory of a single-phase induction type energy meter. Show that number of revolutions in time t is proportional to energy supplied. | 10 | KTU SEP 2020 |
| 20 | Draw the equivalent circuit and phasor diagram of a current transformer. Derive the expression for ratio and phase angle errors? | 10 | Sep 2020 |
| 21 | Explain the construction and working principle of an induction type energy meter. Show that number of revolutions of the disc in induction type energy meter is proportional to energy consumed? | 10 | KTU DEC 2019 |
| 22 | Explain any two errors that occur in electrodynamometer type wattmeter and its compensation? | 5 | KTU DEC 2019 |

| | | | |
|---|---|---|---|
| 23 | Derive the expression for Ratio and Phase angle error in a Current Transformer? ( | 10 | KTU DEC 2019 |
| **MODULE 3** | | | |
| **Sl.No** | **Question** | **Marks** | **Year** |
| 1 | Explain the measurement of insulation resistance by loss of charge method. | 5 | KTU MAY 2019 |
| 2 | How high voltage is tested using the method of sphere gaps? | 5 | KTU MAY 2019 |
| 3 | Derive the equations for balance in the case of Maxwell's inductance –capacitance bridge. | 5 | KTU MAY 2019 |
| 4 | Explain the working of a dc potentiometer with figure. | 5 | KTU MAY 2019 |
| 5 | Classify resistances based on the range of measurement. With neat sketch describe the loss of charge method for the measurement of insulation resistance of length of a cable | 5 | KTU APR 2018 |
| 6 | Define the terms related to instrument transformer: i) Transformation ratio ii) Nominal Ratio iii) Burden. | 5 | KTU APR 2018 |
| 7 | With the help of diagram indicate the calibration of wattmeter using dc potentiometer. | 5 | KTU APR 2018 |
| 8 | With the help of neat sketch describe the method of measurement of earth resistance. | 5 | KTU APR 2018 |
| 9 | Using Schering bridge show how capacitance and dissipation factor of unknown capacitor is measured. | 5 | KTU APR 2018 |
| 10 | What is Maxwell's bridge? Derive the equation of balance for the bridge | | KTU DEC 2019 |
| 11 | Discuss the methods for measuring high AC voltages. | 5 | KTU DEC 2019 |
| 12 | The arm of a four-arm bridge ABCD supplied with sinusoidal voltage have the following values Arm AB: a resistance of 250 Ω in parallel with a capacitance 2 μF Arm BC: 425 Ω Arm CD: 999 Ω Arm DA: a resistance R2 in series with a 2.5 μF capacitance Find the value of R2 and find the frequency at which the bridge will balance. | 5 | KTU DEC 2019 |
| 13 | What is Schering bridge? Develop the equation of balance for the bridge? | 5 | KTU SEP 2020 |
| 14 | Describe the measurement of earth resistance by using fall of potential method | 5 | KTU SEP 2020 |
| 15 | Explain any two applications of DC potentiometer? | 5 | KTU |

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| | | | SEP 2020 |
| 16 | What is Maxwell's bridge? Derive the equation of balance for the bridge?. | 5 | KTU SEP 2020 |
| 17 | Explain basic potentiometer principle. Also explain the calibration of ammeter, voltmeter and wattmeter using potentiometer. | 10 | KTU SEP 2020 |

**MODULE 4**

| Sl.No | Question | Marks | Year |
|---|---|---|---|
| 1 | What is a Lloyd- Fisher square? Explain the measurement of iron losses in a magnetic material employing Lloyd-Fisher square using wattmeter method. | 10 | KTU MAY 2019 |
| 2 | Describe the method for determination of B-H curve of magnetic material using step-by step method | 5 | KTU APR 2018 |
| 3 | Compare temperature measurement using RTD and thermistors. | 10 | KTU APR 2018 |
| 4 | Describe an experiment for obtaining flux density in a specimen of magnetic material with the help of ballistic galvanometer. | 10 | KTU APR 2018 |
| 5 | State the components of iron loss and write down their expressions. | 3 | KTU APR 2018 |
| 6 | A solenoid 1m long and wound with 960 turns has a search coil of 60 turns and cross-sectional area 340mm2 at its centre. Reversing a current of 3.5A in the solenoid causes a deflection of 4 divisions in a ballistic galvanometer connected to the search coil. Calculate:<br>i)Galvanometer constant in flux linkages per division<br>ii) Flux linkage sensitivity | 3 | KTU APR 2018 |
| 7 | Define transducers and classify them. | 5 | KTU APR 2018 |
| 8 | Discuss the determination of iron losses by using Lloyd fisher magnetic square method. | 10 | KTU DEC 2019 |
| 9 | Explain how BH curve can be determined using Ballistic galvanometer? | 5 | KTU DEC 2019 |
| 10 | Write short notes on thermistors. | 5 | KTU DEC 2019 |
| 11 | Describe the method for the measurement of flux density of magnetic material using flux meter? | 5 | KTU SEP 2020 |
| 12 | List any three classifications of transducers? | 5 | KTU SEP 2020 |

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| 13 | Discus the determination of hysteresis loop of a magnetic material by using step by step method? | 6 | KTU SEP 2020 |
| 14 | What is LIoyd Fisher square? | 5 | KTU SEP 2020 |
| 15 | Compare RTD and Thermistor? | 5 | KTU SEP 2020 |
| 16 | Explain how BH curve can be determined using Ballistic galvanometer? | 5 | KTU DEC 2019 |
| 17 | What are primary and secondary transducers? | 5 | KTU DEC 2019 |
| 18 | What do you mean by Lloyd -Fisher square? How it can be used for determination of iron losses in a specimen. Explain. | 10 | KTU DEC 2019 |

## MODULE 5

| Sl.No | Question | Marks | Year |
|---|---|---|---|
| 1 | Draw the diagram of a Cathode Ray Tube. | 5 | KTU MAY 2019 |
| 2 | Explain the flow measurement using ultrasonic transducer. | 5 | KTU MAY 2019 |
| 3 | Explain the working of piezoelectric transducer. | 10 | KTU MAY 2019 |
| 4 | Explain how CRO can be used to measure frequency and phase angle | 10 | MAY 2019 |
| 5 | Explain the measurement of any non-electrical quantity employing load cell. | 5 | KTU MAY 2019 |
| 6 | How strain is measured using a strain gauge? | 5 | KTU MAY 2019 |
| 7 | Describe bonded and unbonded strain gauge with their principle of operation. | 5 | KTU APR 2018 |
| 8 | What is Lissajous pattern? Clearly indicate the factors on which shape of these figures depends. | 5 | KTU APR 2018 |
| 9 | Draw the block diagram of digital Storage oscilloscope. State the three modes of operation | 3 | KTU APR 2018 |
| 10 | Define the deflection sensitivity of CRT. | 10 | KTU APR 2018 |
| 11 | With the help of neat sketch explain the working of LVDT. Also draw its characteristics | 5 | KTU APR 2018 |
| 12 | Write short notes on clamp-on meters. | 5 | KTU |

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| | | | DEC 2019 |
| 13 | Discuss the working of a load cell | 5 | KTU DEC 2019 |
| 14 | Discuss the working of a piezoelectric transducer in detail. | 5 | KTU DEC 2019 |
| 15 | Draw a neat block diagram of a cathode ray oscilloscope, specify the function of each block and explain its working principle. | 10 | KTU DEC 2019 |
| 16 | Explain the basic principle and working of LVDT. | 6 | KTU DEC 2019 |
| 17 | Draw and explain the different parts of cathode ray tube? | 5 | KTU SEP 2020 |
| 18 | Explain the working of a Load cell? | 5 | KTU SEP 2020 |
| 19 | Write short notes on Lissajous patterns. Explain how are they used for the measurement of frequency and phase angle? | 10 | KTU SEP 2020 |
| 20 | With a neat sketch explain the principle of operation of LVDT. | 5 | KTU SEP 2020 |
| 21 | Write short notes on Electromagnetic flow meter? | 5 | KTU SEP 2020 |
| 22 | Discuss the working of a load cell? | 5 | KTU DEC 2019 |
| 23 | Explain the basic principle and working of LVDT? | 6 | KTU DEC 2019 |
| 24 | Write short notes on RTD? | 4 | KTU DEC 2019 |
| 25 | Draw a neat block diagram of a Cathode Ray Oscilloscope and specify the function of each block. Also Explain its working principle | 10 | KTU DEC 2019 |

# QUESTION BANK

## EET 205: ANALOG ELECTRONICS

| Sl No: | Questions | Marks | Year |
|---|---|---|---|
| **Module - 1** | | | |
| 1. | Derive an expression for the collector current $I_C$ and $V_{CE}$ in the case of collector to base biasing in CE amplifier with the circuit diagram and describe how operating point stabilization is provided by this biasing method. | 5 | January 2022 (2015 Scheme) |
| | Draw the collector to base bias circuit of transistor amplifier using the given values and determine the following. i) $I_C$ ii) $V_{CE}$. Given $\beta$=80, $R_B$=100kΩ and $R_C$=10kΩ and $V_{CC}$=15V. | 4 | December 2020 (2019 Scheme) |
| 2. | With circuit diagram explain bias compensation using thermistor. | 5 | January 2022 (2015 Scheme) |
| | Explain any one compensation technique used for reducing the drift of operating point. | 5 | April 2018 (2015 Scheme) |
| | Explain any compensation technique adopted in transistor amplifier for reducing the drift of operating point. | 5 | January 2017 (2015 Scheme) |
| 3. | Show that voltage divider biasing circuit is stable against temperature variations. | 5 | January 2022 (2015 Scheme) |
| | Draw the circuit of a BJT in potential divider bias configuration. Derive the expression for Q point voltage and current. | 5 | September 2020 (2015 Scheme) |
| | Draw a voltage divider bias circuit and derive the equations of voltage and current at input and output terminals. | 5 | July 2017 (2015 Scheme) |
| 4. | In a potential divider biasing circuit, $V_{CC}$ = 22V, $R_1$ = 39kΩ, $R_2$ = 3.9kΩ, $R_E$ = 1.5kΩ, $R_C$ = 10kΩ, $\beta$=100. Determine the operating point. | 5 | December 2020 (2015 Scheme) |
| | Design a Voltage divider circuit for a silicon transistor with $h_{fe}$=100 and S≤8. The desired Q-point is $V_{CE}$=5V, $I_C$=1mA. Assume $V_{CC}$=10V and $R_E$=1kΩ | 10 | December 2019 (2015 Scheme) |
| | Design a voltage divider bias circuit for a NPN transistor with $h_{fe}$ = 100 and $V_{BE}$= 0.6 V, to operate from a 12 V dc supply. The bias conditions are $V_{CE}$= 6V,$V_E$=1.2V and $I_C$ =2 mA. | 5 | April 2018 (2015 Scheme) |

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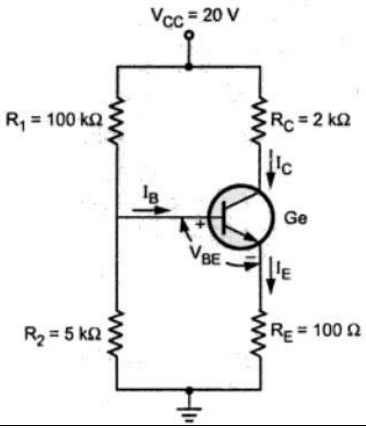
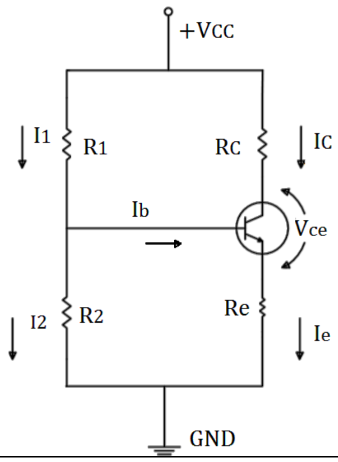
| | For the circuit shown in figure, $V_{CC}$=20V, $R_C$=2kΩ, β=50, $V_{BE}$=0.2V, $R_1$=100kΩ, $R_2$=5kΩ and $R_E$=100Ω. Calculate $I_B$, $V_{CE}$, $I_C$ and stability factor, S.  | 10 | December 2020 (2019 Scheme) |
| | Design a voltage divider bias circuit to obtain the following specifications and determine the stability factor. Assume the ratio of base current to the current through $R_{B2}$ is 1:10. Given $V_{CC}$=22V, β=100, $V_{CE}$=50% of $V_{CC}$, $V_{RE}$ =10% of $V_{CC}$, $I_C$=0.8mA and $V_{BE}$=0.7V. | 6 | May 2019 (2015 Scheme) |
| | Obtain the operating point set by the voltage divider bias circuit for an NPN CE transistor with β = 50 and $V_{BE}$ = 0.7 V. Given $V_{CC}$ = 18 V, $R_1$ = 82kΩ, $R_2$ =22kΩ, $R_C$ = 5.6kΩ and $R_E$ = 1.2kΩ. | 6 | December 2018 (2015 Scheme) |
| | Design a voltage divider bias circuit to operate from an 18V supply in which bias conditions are to be $V_{CE}$ = $V_E$ = 6 V and $I_C$ = 1.5 mA. β = 90. Also calculate the stability factor S. | 10 | December 2017 (2015 Scheme) |
| | | 14 | Model Question Paper |
| | Why is voltage divider bias relatively stable against changes in $h_{fe}$? Design voltagedivider bias circuit to operate from a 12V supply. The bias conditions are $V_{CE}$=3V, $V_E$=5V and $I_c$=1mA.  | 5 | January 2017 (2015 Scheme) |
| 5. | Derive the equation for voltage gain and current gain for a BJT using h-parameter model for Common Emitter configuration. | 6 | December 2020 (2015 Scheme) |

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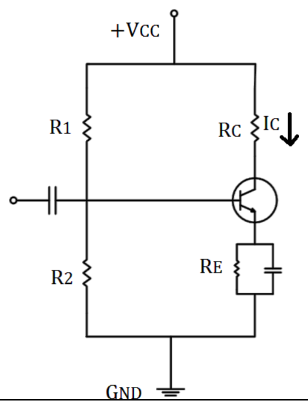
|---|---|---|---|
| | Derive the expressions for current gain, input impedance, voltage gain and output impedance using complete h-parameter equivalent circuit of CE amplifier. | 10 | December 2020 (2019 Scheme) |
| | Draw and explain the h parameter small signal low frequency model for BJT. | 4 | December 2018 (2015 Scheme) |
| | Derive the expressions for current gain, input impedance, voltage gain andoutput impedance using h parameters of BJT. | 6 | December 2018 (2015 Scheme) |
| | Draw the h parameter model of a transistor in CE configuration. Also derive the expression for input impedance, current gain and voltage gain. | 5 | April 2018 (2015 Scheme) |
| | Draw and explain the h parameter small signal low frequency model for BJT. | 3 | Model Question Paper |
| | Derive the equation for voltage gain and current gain for a BJT using approximate h-parameter model for Common Emitter configuration. | 6 | July 2017 (2015 Scheme) |
| 6. | A common emitter amplifier is driven by a voltage source of internal resistance $R_{s=}500\Omega$. The load impedance is $R_L$=2000Ω. The h-parameters are $h_{ie}$=1200Ω, $h_{re}$=2.2x10$^{-4}$, $h_{fe}$=50 and $h_{oe}$=20μA/V. Determine the a) current gain $A_i$, b) input impedance $Z_i$ c) voltage gain $A_v$ | 5 | January 2022 (2015 Scheme) |
| | A CE amplifier has the h-parameters given by $h_{ie}$ = 1000Ω, $h_{re}$ = 2.5 x 10$^{-4}$, $h_{fe}$ = 50 and $h_{oe}$ = 25 x 10$^{-6}$ A/V. If the load resistance $R_L$ = 10kΩ and sourceresistance is 100 Ω, determine the (a) current gain and (b) voltage gain. | 4 | December 2020 (2015 Scheme) |
| | h-parameters of a transistor connected in CE configuration is $h_{ie}$ = 1000 Ω, $h_{re}$ = 10×10$^{-4}$; $h_{fe}$ = 50; hoe= 100 × 10 $^{-6}$℧. If the load resistance $R_L$is 1 KΩ , find: i) The input impedance ii) Current gain iii) Voltage gain | 5 | April 2018 (2015 Scheme) |
| | A CE amplifier has the h-parameters given by $h_{ie}$ = 1000 Ω, $h_{re}$ = 2 x 10$^{-4}$, $h_{fe}$ = 50, $h_{oe}$ = 25μ ℧. If both the load and source resistances are 1kΩ, determine the (a) current gain (b) voltage gain. | 4 | July 2017 (2015 Scheme) |
| | A transistor used in CE connection has the following set of h parameters when the d.c. operating point is $V_{CE}$ =5V and $I_C$ = 1 mA; $h_{ie}$ =1700 Ω; $h_{re}$ =1.3 ×10-4; $h_{fe}$ = 38; $h_{oe}$ = 6 × 10 $^{-6}$ ℧. If the a.c. load $r_L$ seen by the transistor is 2 KΩ, find (i) the input impedance (ii) current gain (iii) voltage gain | 5 | January 2017 (2015 Scheme) |

<table>
<tr><td></td><td>A CE amplifier has the h-parameters given by $h_{ie}$= 1000Ω, $h_{re}$ = $2*10^{-4}$, $h_{fe}$=50,$h_{0e}$= 25μΩ. If both the load and source resistances are 1kΩ, determine the a) current gain and b) voltage gain.</td><td>14</td><td>Model Question Paper</td></tr>
<tr><td>7.</td><td>State the functions of a transistor biasing circuit.</td><td>3</td><td>December 2020 (2019 Scheme)</td></tr>
<tr><td rowspan="2">8.</td><td>With the help of a circuit diagram and relevant equations show that fixed bias is not stable against temperature variations.</td><td>3</td><td>December 2020 (2019 Scheme)</td></tr>
<tr><td>Determine the following parameters for the fixed bias configuration of transistor amplifier. (i) $I_B$ and $I_C$ (ii) $V_{CE}$ and (iii) $V_B$ and $V_C$. Assume $V_{BE}$=0.7V. Given β=100, Vcc=16V, Rc=2.2kΩ and $R_B$=240 kΩ.</td><td>4</td><td>May 2019 (2015 Scheme)</td></tr>
<tr><td rowspan="5">9.</td><td>What are the factors affecting stability of operating point of a transistor?</td><td>2</td><td>April 2018 (2015 Scheme)</td></tr>
<tr><td>What factors are to be considered for selecting the operating point Q for an amplifier?</td><td>5</td><td>July 2017<br>(2015 Scheme)</td></tr>
<tr><td>With neat diagrams, explain DC load line in a transistor and significance of Q-point.</td><td>4</td><td>December 2020 (2019 Scheme)</td></tr>
<tr><td>With neat diagrams explain DC load lines in transistor. What is the significance of Q point?</td><td>3</td><td>Model Question Paper</td></tr>
<tr><td>Draw the dc and ac load lines for the transistor circuit. Given $R_1$=18KΩ, $R_2$=8.2KΩ, $R_C$=2.2KΩ, $V_{cc}$ =20V, $R_E$=2.7KΩ.<br>


</td><td>5</td><td>January 2017 (2015 Scheme)</td></tr>
<tr><td colspan="4">Module - 2</td></tr>
<tr><td rowspan="2">10.</td><td>Draw a Source follower circuit using JFET and derive the expression for voltage gain.</td><td>5</td><td>January 2022 (2015 Scheme)</td></tr>
<tr><td>Draw voltage divider biasing circuit for a JFET and derive the expressions for operating point.</td><td>5</td><td>January 2022 (2015 Scheme)</td></tr>
</table>

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| | How a JFET common drain amplifier is designed using voltage divider biasing? | 5 | Model Question Paper |
| 11. | For an N-channel JFET with a voltage divider biasing circuit has the following parameters, Vp= $-3.8V$ and $I_{DSS}$=9mA, $V_{DD}$=17V, $R_s$=2kΩ, $R_D$=2kΩ, $R_1$=500kΩ and $R_2$=85kΩ. Calculate the drain current $I_D$ and Drain Source Voltage, $V_{DS}$ | 5 | January 2022 (2015 Scheme) |
| | For a JFET connected in voltage divider biasing circuit, calculate $I_D$, $V_{DS}$ and $V_{GS}$ with $V_{DD}$=24V, $R_1$= 910kΩ, $R_2$= 110kΩ, $R_D$= 22kΩ, $R_S$= 1.1kΩ, $I_{DSS}$= 10mA and pinch-off voltage of the JFET is 3.5V. | 8 | December 2020 (2019 Scheme) |
| 12. | With the help of neat diagrams explain the operation of N-channel depletion type MOSFET. | 5 | January 2022 (2015 Scheme) |
| | Explain construction and operation of depletion type metal oxide semiconductor FET with neat diagram. | 5 | December 2020 (2015 Scheme) |
| | Explain the construction and operation of Enhancement type metal oxide semiconductor FET with neat diagrams. | 3 | Model Question Paper |
| 13. | Draw and explain the frequency response characteristics of RC coupled amplifier. | 3 | December 2020 (2019 Scheme) |
| | Draw the frequency response of CE amplifier and explain why gain falls at very high frequencies & very low frequencies. | 5 | December 2019 (2015 Scheme) |
| | Why does the gain of a transistor amplifier vary with frequency? Sketch the frequency response of CE amplifier. | 5 | May 2019 (2015 Scheme) |
| | Draw the frequency response of an amplifier. What is the significance of gainbandwidth product? | 4 | April 2018 (2015 Scheme) |
| | Explain the reasons for reduction of gain at high frequencies of a CE amplifier. | 4 | December 2017 (2015 Scheme) |
| | Why does gain of amplifier falls off at low and high frequencies? | 5 | January 2017 (2015 Scheme) |
| | Sketch the frequency response curve of RC coupled amplifier and discuss methods to improve gain bandwidth product | 7 | Model Question Paper |
| 14. | With a neat diagram, explain the constructional features of n-channel JFET. | 3 | December 2020 (2019 Scheme) |
| | With necessary graphs and equations, explain the transfer characteristics of JFET. | 6 | December 2020 (2019 Scheme) |

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| | Explain using neat sketches, the operation & characteristics of a n-channel JFET. | 10 | December 2019 (2015 Scheme) |
| | Explain the construction, biasing, operation and characteristics of JFET. | 10 | December 2018 (2015 Scheme) |
| | Explain the drain characteristics of JFET and mark the pinch-off voltage. | 5 | July 2017 (2015 Scheme) |
| | | 3 | Model Question Paper |
| | Why the gate of FET is always reverse biased? List the parameters of JFET from characteristics. | 5 | January 2017 (2015 Scheme) |
| | List the four parameters of JFET. Also obtain the mathematical expression for transconductance. | 7 | Model Question Paper |
| | Explain how FET can be used as a voltage controlled resistance. | | December 2020 (2015 Scheme) |
| 15. | The data sheet of N channel JFET gives the following details. $I_{DSS}$=10mA and pinch off voltage of -4.8V.Determine (i) $V_{GS}$ corresponding to drain current of 3.5 mA. (ii) Determine trans-conductance $g_m$ at this drain current. | 5 | May 2019 (2015 Scheme) |
| | The datasheet of an N-channel JFET gives the following details $I_{Dss}$ = 9 mA and pinch off voltage of -4.5V i) At what value of $V_{GS}$ will $I_D$ be equal to 3 mA ii) What is its $g_m$ at this $I_D$? | 5 | January 2017 (2015 Scheme) |
| 16. | With the help of a neat diagram, explain the small signal model of FET. | 4 | September 2020 (2015 Scheme) |
| | | 4 | December 2018 (2015 Scheme) |
| | Draw the small signal AC equivalent circuit of a Common Drain FET amplifier. Derive the expression for voltage gain, input impedance and output impedance. | 5 | May 2019 (2015 Scheme) |
| | Draw the equivalent circuit and derive the expression for (i) input impedance (ii) Current Gain (iii) Voltage gain and (iv) Output impedance of the Common Drain JFET amplifier | 8 | December 2020 (2019 Scheme) |
| 17. | Draw and explain high frequency hybrid pi model of common emitter transistor. | 6 | December 2020 (2019 Scheme) |
| | Explain the high frequency hybrid pi model of a common emitter transistor. | 5 | September 2020 (2015 Scheme) |

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| | Draw the Hybrid-π model of BJT and explain significance of each parameters. | 5 | December 2019 (2015 Scheme) |
| | Draw and explain high frequency hybrid pi model of common emitter transistor. | 5 | April 2018 (2015 Scheme) |
| | Which are the internal capacitances of a BJT? How these are incorporated in the high frequency hybid pi model of BJT? | 9 | Model Question Paper |
| **Module - 3** | | | |
| 18. | Prove that maximum efficiency of class B power amplifier is 78.5%. | 5 | December 2020 (2015 Scheme) |
| | Define conversion efficiency of power amplifier. Prove that the maximum conversion efficiency of a transformer coupled class A amplifier is 50%. | 10 | December 2020 (2019 Scheme) |
| | Prove that the class B push pull amplifier has higher efficiency than class A amplifiers. | 7 | December 2020 (2019 Scheme) |
| | What is class A operation and derive the expression for conversion efficiency of a transformer coupled class A power amplifier. | 5 | September 2020 (2015 Scheme) |
| | Show that the maximum conversion efficiency of class A power amplifier can be increased using transformer coupling. | 10 | December 2019 (2015 Scheme) |
| | Why class AB power amplifiers are preferred over Class B operations? | 5 | May 2019 (2015 Scheme) |
| | Derive the expression for output power and conversion efficiency of class B push pull power amplifier. | 5 | May 2019 (2015 Scheme) |
| | With necessary diagrams explain the working of class A transformer coupled amplifier and obtain the maximum overall efficiency. | 8 | December 2018 (2015 Scheme) |
| | What are the advantages and disadvantages of class A transformer coupled amplifier | 2 | December 2018 (2015 Scheme) |
| | Discuss the operation of a class B power amplifier and derive its maximum power conversion efficiency. | 6 | April 2018 (2015 Scheme) |
| | Derive the equation for power output and conversion efficiency of a class A series fed amplifier. | 10 | July 2017 (2015 Scheme) |
| | Define conversion efficiency of power amplifier. Prove that the maximum conversion efficiency of a series fed class A amplifier is 25%. | 14 | Model Question Paper |

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| 19. | Define the terms collector efficiency and distortion in power amplifiers and determine the a) power rating of transistor b) maximum ac power output and c) maximum collector efficiency of a class A power amplifier having zero signal collector current of 150mA with collector supply voltage of 6V. | 5 | January 2022 (2015 Scheme) |
| | A transformer coupled class A power amplifier draws a current of 250mA from a collector supply of 13 V. When no signal is applied to it determine i) Maximum output power ii) Power rating of the transistor iii) Maximum collector efficiency. | 4 | December 2017 (2015 Scheme) |
| 20. | Explain the principle of feedback in oscillators based on Barkhausen's criterion | 5 | January 2022 (2015 Scheme) |
| | What is Barkhausen's criterion? Explain. | 3 | December 2020 (2019 Scheme) |
| | State Barkhausen criteria for sinusoidal oscillators. | 2 | April 2018 (2015 Scheme) |
| | Explain Barkhausen criteria of sustained oscillation | 5 | December 2017 (2015 Scheme) |
| | Explain the Barkhausen Criteria of oscillations. | 5 | July 2017 (2015 Scheme) |
| | State the Barkhausen criterion for sinusoidal oscillators and why this must be fulfilled to sustain oscillations? | 3 | January 2017 (2015 Scheme) |
| | State and explain Barkhausen's criterion of oscillation. | 3 | Model Question Paper |
| 21. | Draw the circuit of a transformer coupled transistor amplifier. Compare it with RC coupled amplifier. | 5 | January 2022 (2015 Scheme) |
| | Draw the circuit diagram of a RC coupled amplifier. Explain the frequency response curve of RC coupled amplifier. Why does the gain fall off at low and high frequencies? | 5 | December 2020 (2015 Scheme) |
| | Draw the circuit of two stage RC coupled amplifier and explain its operation. | 7 | December 2020 (2019 Scheme) |
| | Draw the circuit diagram of a two stage direct coupled transistor amplifier. Mention its advantages and application. | 5 | September 2020 (2015 Scheme) |
| | Explain the working of a two stage RC coupled amplifier with circuit diagram. | 4 | April 2018 (2015 Scheme) |

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| | Draw the circuit diagrams of two stage RC coupled and Transformer coupled amplifiers. Discuss the important features and applications of both. | 6 | December 2017 (2015 Scheme) |
| | Draw the circuit of a Two Stage RC Coupled amplifier and explain its working and advantages. | 10 | July 2017 (2015 Scheme) |
| | With neat circuit diagrams, explain the working of a two-stage RC coupled amplifier and derive the output relation of each stage. | 14 | Model Question Paper |
| 22. | Draw the circuit diagram of a Colpitt's oscillator using BJT and derive the expression for frequency of oscillation. | 5 | January 2022 (2015 Scheme) |
| | A Hartley oscillator using BJT is designed with two inductances $L_1$ and $L_2$, and their values are 15mH and 2mH respectively. The frequency is to be changed from 800kHz to 2000kHz. Calculate the range over which the capacitor is to be varied. Neglect mutual inductance | 3 | January 2022 (2015 Scheme) |
| | In a RC phase shift oscillator, if $R_1=R_2=R_3=250k\Omega$ and $C_1=C_2=C_3=150pF$. Find the Frequency of oscillation | 2 | January 2022 (2015 Scheme) |
| | With neat diagram, explain the working of Hartley oscillator. Derive theexpression for frequency of oscillation. | 10 | December 2020 (2015 Scheme) |
| | Draw the circuit of crystal oscillator. | 3 | December 2020 (2019 Scheme) |
| | Draw the circuit diagram of Colpitt's Oscillator and explain its principle of operation. | 5 | September 2020 (2015 Scheme) |
| | Derive the expression for frequency of oscillation of a Wien bridge oscillator using BJT. | 5 | September 2020 (2015 Scheme) |
| | Draw the neat circuit diagram of RC phase shift oscillator and derive its frequency of oscillations | 10 | December 2019 (2015 Scheme) |
| | Derive the expression for frequency of oscillation for RC phase shift oscillator using BJT. | 5 | May 2019 (2015 Scheme) |
| | With a neat circuit diagram explain the operation of Colpitt's oscillator using BJT. | 5 | December 2018 (2015 Scheme) |
| | Derive the frequency of oscillation of a RC phase shift oscillator using transistor. | 5 | April 2018 (2015 Scheme) |
| | Explain the operation of Hartley oscillator with a circuit diagram. | 6 | April 2018 (2015 Scheme) |

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| | With a neat diagram explain the working of a Hartley oscillator. | 8 | December 2017 (2015 Scheme) |
| | A Wien bridge oscillator has the following components $R_1 = R_2 = R_4 = 5.6\ k\Omega$, $R_3 = 12\ k\Omega$ and $C_1 = C_2 = 2000pF$. Calculate the oscillating frequency. | 2 | December 2017 (2015 Scheme) |
| | A crystal has the following parameters L = 0.33H, $C_1$ = 0.065pF, $C_2$ = 1.0pF and R=5.5KΩ. Determine series resonant frequency and Q factor of the crystal. | 2 | January 2017 (2015 Scheme) |
| 23. | Explain how a differential amplifier amplifies difference signal and rejects common mode signal. | 5 | January 2022 (2015 Scheme) |
| | Derive the expression for voltage gain of a dual input balanced output differential amplifier. | 7 | December 2017 (2015 Scheme) |
| 24. | What is the role of coupling elements in multistage amplifiers? Compare different types of couplings used in multistage amplifier. | 6 | December 2020 (2015 Scheme) |
| | List the applications of multistage amplifiers. | 4 | December 2020 (2019 Scheme) |
| | List out the advantages and disadvantages of a transformer coupled multistage amplifier. | 5 | December 2019 (2015 Scheme) |
| | Specify different schemes of coupling in multistage amplifiers. Compare their merits and demerits | 5 | May 2019 (2015 Scheme) |
| | Compare different types of multistage amplifiers. | 5 | December 2018 (2015 Scheme) |
| 25. | What is the concept of negative feedback in amplifiers? List out the advantagesof negative feedback in amplifiers. | 5 | December 2019 (2015 Scheme) |
| | Why negative feedback is utilized in amplifiers? How various parameters of an amplifier gets modified by negative feedback? | 5 | May 2019 (2015 Scheme) |
| | List out the merits and demerits of negative feedback on amplifier performance | 5 | December 2018 (2015 Scheme) |
| | Differentiate between positive and negative feedback. Explain how the negative feedback modifies the gain of an amplifier. | 5 | July 2017 (2015 Scheme) |
| | List the characteristics of an amplifier that get modified by negative feedback. | 5 | January 2017 (2015 Scheme) |
| | Discuss the advantages of negative feedback amplifier. | 3 | Model Question Paper |

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| 26. | Draw the schematic of an amplifier with voltage series feedback and derive expression for closed loop voltage gain. | 5 | January 2022 (2015 Scheme) |
| **Module - 4** | | | |
| 27. | What are the characteristics of ideal op-amp? Compare it with practical op-amp | 5 | December 2020 (2015 Scheme) |
| | List any six characteristics of an ideal operational amplifier. | 3 | December 2020 (2019 Scheme) |
| | Explain the concept of virtual short in op-amps. | 5 | September 2020 (2015 Scheme) |
| | Compare the characteristics of ideal Op-Amps and practical Op-Amps. | 5 | December 2018 (2015 Scheme) |
| | What are the properties of an ideal op-amp? | 3 | April 2018 (2015 Scheme) |
| | What are the modes in which an op-amp can be operated? | 2 | January 2017 (2015 Scheme) |
| | Compare the Ideal and Practical characteristics of an op-amp | 3 | Model Question Paper |
| 28. | Why op-amp is not used in open loop for most of the applications? | 5 | September 2020 (2015 Scheme) |
| | Discuss the effect of negative feedback in an Op-Amp circuit. Compare the properties of Op-Amp circuit with and without negative feedback. | 5 | December 2020 (2019 Scheme) |
| | Show that the closed loop gain of op-amp amplifier can be made independent of its open loop gain. | 5 | December 2019 (2015 Scheme) |
| | How do the open-loop voltage gain and closed-loop voltage gain of an op-amp differ? What is the limiting value of output voltage of Op Amp Circuit? Justify with proper characteristics. | 5 | May 2019 (2015 Scheme) |
| | | 14 | Model Question Paper |
| | Why open loop op-amp configurations are not used for linear applications? | 3 | December 2017 (2015 Scheme) |
| 29. | Discuss in detail the operation of 3 input summing amplifier using op-amp with suitable diagrams and derive the equation for output voltage in terms of input voltage and circuit components. | 5 | January 2022 (2015 Scheme) |
| | Design an adder circuit to get the output voltage as $V_O = -[2V_1+3V_2+4V_3]$,where $V_1$, $V_2$ and $V_3$ are inputs to Op-Amp. | 5 | December 2020 (2015 Scheme) |

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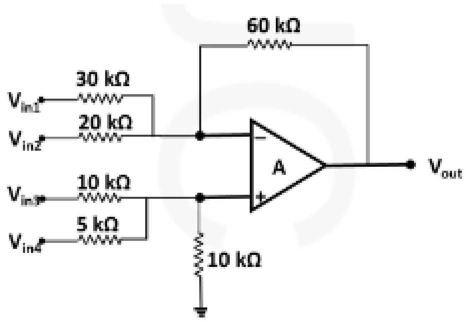
| | For the op-amp circuit shown in the fig.2 find the output voltage equation.<br><br>Fig.2 | 6 | December 2020 (2019 Scheme) |
| | Design an adder circuit using an op-amp to get the output expressions as $V_{out}= - (V_1+5V_2+25V_3)$, where $V_1$, $V_2$ and $V_3$ are the inputs. Given that $R_f$ =50 kΩ. | 5 | September 2020 (2015 Scheme) |
| | Design an Op-Amp circuit to get the output according to the given expression: $V_O = - [0.3V_1+3V_2+V_3]$ where $V_1$, $V_2$ and $V_3$ are the inputs to op-amp. | 5 | May 2019 (2015 Scheme) |
| | With the help of a circuit diagram show how an op-amp is used to get an outputas $V_o= V_1+V_2-V_3-V_4$, Where $V_1$, $V_2$, $V_3$ and$V_4$ are inputs to op-amp. | 5 | April 2018 (2015 Scheme) |
| | Design an adder circuit to get the output expression as $V_o = - [0.1 V_1 + V_2 + 10 V_3]$ where $V_1$, $V_2$ and $V_3$ are the inputs to the Op-amps. | 5 | January 2017 (2015 Scheme) |
| | Design a three input summing amplifier using op-amp having gains of 2, 3 and 5 respectively for each input. | 5 | December 2017 (2015 Scheme) |
| | | 3 | Model Question Paper |
| | Draw an ideal inverting op-amp with voltage shunt feedback and calculate the gain using virtual ground principle. | 5 | January 2022 (2015 Scheme) |
| | Draw the circuit diagram and derive the voltage gain equation of Non-Inverting amplifier. Design a Non-Inverting amplifier with gain of 6. | 9 | December 2020 (2019 Scheme) |
| 30. | Derive the expression for the output voltage of a closed loop non-inverting amplifier using op-amp. | 3 | December 2020 (2019 Scheme) |
| | Deduce the expression for closed loop voltage gain of non-inverting amplifier. | 5 | September 2020 (2015 Scheme) |
| | Draw the circuit of an inverting amplifier and obtain the expression for its closed loop gain. | 5 | December 2018 (2015 Scheme) |

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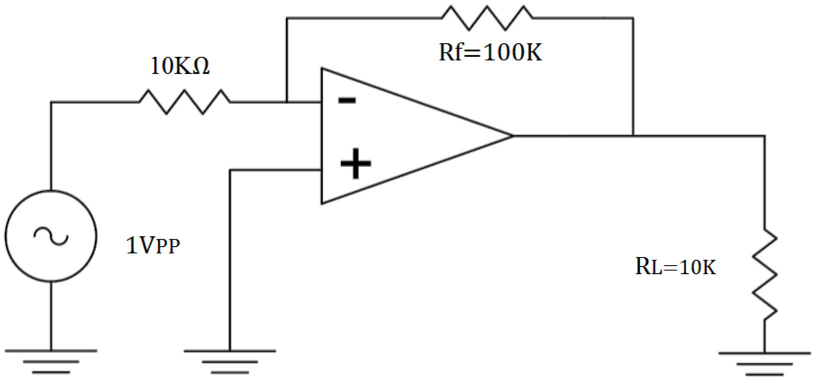
| | Derive the expression for the voltage gain of an op-amp based non-inverting amplifier. | 5 | April 2018 (2015 Scheme) |
| | Derive the expression for voltage gain of a non-inverting amplifier. | 5 | December 2017 (2015 Scheme) |
| | Draw the inverting and non-inverting amplifier circuits of an op-amp in closed loopconfiguration. Obtain the expressions for the closed loop gain in these circuits. | 10 | July 2017 (2015 Scheme) |
| | An inverting op-amp with slew rate 0.5V/µsec is shown in the figure. Determine i) closed loop voltage gain ii) input impedance of the circuit iii) Maximum operating frequency<br><br> | 5 | January 2017 (2015 Scheme) |
| | An input of 3V is fed to the non-inverting terminal of an op-amp. The amplifier has $R_1$=10kΩ and $R_f$=10kΩ. Find the output voltage. | 7 | Model Question Paper |
| 31. | Draw the circuit diagram for an Instrumentation amplifier. Identify each section of the circuit and prove that the gain of the amplifier varies with the variable resistance. | 5 | January 2022 (2015 Scheme) |
| | With neat circuit diagram, explain the operation of an Instrumentation amplifier and derive an expression for its voltage gain. What are its advantages? | 10 | December 2019 (2015 Scheme) |
| | Analyze the circuit diagram of an Instrumentation amplifier using op-amp. Derive the expression for output voltage. | 5 | May 2019 (2015 Scheme) |
| | What are the features of instrumentation amplifier? Derive the expression for output voltage of an instrumentation amplifier. | 5 | April 2018 (2015 Scheme) |
| | Explain the working of Instrumentation amplifier with a neat diagram. | 6 | December 2017 (2015 Scheme) |
| | What are the advantages and features of instrumentation amplifier? Derive the expression for output voltage of instrumentation amplifier. | 5 | January 2017 (2015 Scheme) |

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| | What are the features of instrumentation amplifier? Derive the expression for output voltage of an instrumentation amplifier. | 6 | December 2018 (2015 Scheme) |
| 32. | Explain the following terms regarding an op-amp (i) CMRR, (ii) Slew rate | 4 | December 2020 (2015 Scheme) |
| | How CMRR and Slew rate influence the performance of an op-amp? | 5 | December 2019 (2015 Scheme) |
| | The datasheet of Op Amp gives the values, Open loop Gain = 175,000, common-mode gain = 0.18 and slew rate = 0.5V/µs. Determine the CMRR in decibels. How long does it take the output voltage of an op-amp to go from -10V to +10V? | 5 | May 2019 (2015 Scheme) |
| | A differential amplifier has a gain of 100. A common input of 5mV is applied to both terminals, which result in an output voltage of 18mV. Determine (i) common mode gain (ii) CMRR. If the input signals are changed to 50mV and 100mV with 1mV of noise on each input. Find iii) the output signal iv) the noise on the output. | 8 | December 2020 (2019 Scheme) |
| | Define the following terms: i) CMRR ii) Slew rate iii) Input bias current (iv) Input offset voltage | 8 | December 2018 (2015 Scheme) |
| | Give the typical values of i) CMRR ii) Slew rate iii) Input bias current (iv) Input offset voltage for 741 IC | 2 | December 2018 (2015 Scheme) |
| | Write short notes on the following: i) CMRR ii) Slew rate | 4 | April 2018 (2015 Scheme) |
| | Explain briefly about the following (i) CMRR (ii) Slew Rate | 7 | Model Question Paper |
| | Write short notes on the following: a) CMRR b) Slew rate c) Common mode gain d) Differential mode gain | 10 | July 2017 (2015 Scheme) |
| **Module - 5** | | | |
| 33. | With waveforms explain the operation of an ideal integrator using op-amp. | 5 | January 2022 (2015 Scheme) |
| | Explain how op-amp can be used as a differentiator. | 5 | December 2020 (2015 Scheme) |
| | Explain the operation of ideal integrator circuit using op-amp with circuit diagram. | 3 | December 2020 (2019 Scheme) |
| | Draw the circuit diagram of an ideal differentiator and derive the expression for output voltage. | 4 | December 2020 (2019 Scheme) |

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| | Draw the circuit diagram of an ideal differentiator using op-amp with corresponding input and output waveform. Why the circuit cannot be recommended for practical use? | 5 | May 2019<br>(2015 Scheme) |
| | Explain the operation of Op-Amp integrator and differentiator circuits. | 6 | December 2018<br>(2015 Scheme) |
| | Design an integrator that can integrate a square wave of peak to peak voltage 10V and frequency 1 kHz and draw the output waveform. | 5 | April 2018<br>(2015 Scheme) |
| | What are the limitations of an ideal integrator? Design a circuit which overcome the errors of ideal integrator. | 5 | January 2017<br>(2015 Scheme) |
| | Show the circuit diagram of an Ideal Differentiator using op-amp with corresponding input and output waveform. | 3 | Model Question Paper |
| 34. | Draw the circuit diagrams for an op-amp used as a Zero crossing detector and as a voltage level detector. Show typical input and output waveforms | 5 | January 2022<br>(2015 Scheme) |
| | Explain the working of zero crossing detector | 5 | December 2020<br>(2015 Scheme) |
| | | 5 | July 2017<br>(2015 Scheme) |
| | | 7 | Model Question Paper |
| | With neat circuit diagram and waveforms, explain zero crossing detector. | 3 | December 2020<br>(2019 Scheme) |
| | Explain the operation of an op-amp comparator with circuit diagram and waveforms | 5 | September 2020<br>(2015 Scheme) |
| | Design a comparator using Op-Amp that compares a sinusoidal signal of 3V peak with a fixed dc voltage of 1.5V. Draw corresponding waveforms. | 5 | May 2019<br>(2015 Scheme) |
| 35. | Draw and explain the working of a triangular wave generator using op-amp | 5 | January 2022<br>(2015 Scheme) |
| | Explain the operation of square wave generator using op-amp with capacitor and draw the output voltage waveforms. | 5 | January 2022<br>(2015 Scheme) |
| | Draw and explain square wave generator using op-amp. | 5 | December 2020<br>(2015 Scheme) |
| | Draw and explain the operation of a square waveform generator using Op-Amp. Derive the expression for frequency. | 10 | December 2020<br>(2019 Scheme) |

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| | Draw the circuit diagram and explain the working of a ramp generator using Op-amp | 5 | September 2020 (2015 Scheme) |
| | How triangular wave can be generated using op-amps? | 5 | December 2019 (2015 Scheme) |
| | Draw and explain the operation of a triangular wave generator using op-amp. | 5 | May 2019 (2015 Scheme) |
| | With necessary diagrams explain the operation of OP-Amp square wave generator. | 5 | December 2018 (2015 Scheme) |
| | Explain the working and design of a triangular wave generator circuit with necessary diagrams. | 4 | December 2018 (2015 Scheme) |
| | Explain the operation of a square waveform generator using op-amp. | 5 | April 2018 (2015 Scheme) |
| | Draw and explain the operation of a Triangular waveform generator using op-amp | 5 | April 2018 (2015 Scheme) |
| | Draw and explain the operation of a square waveform generator using op-amp. | 5 | December 2017 (2015 Scheme) |
| | Explain the operation of a triangular wave generator. | 10 | July 2017 (2015 Scheme) |
| | Distinguish between triangular wave and ramp generator using op-amp. | 5 | January 2017 (2015 Scheme) |
| | Explain the operation of a square wave generator using op-amp. | 3 | Model Question Paper |
| 36. | Define slew rate and explain its effect on waveform generation. | 5 | December 2017 (2015 Scheme) |
| | | 5 | September 2020 (2015 Scheme) |
| 37. | Draw the internal diagram of 555 timer IC and explain the function of each components. | 5 | January 2022 (2015 Scheme) |
| | Explain the functional block diagram of Timer IC 555. | 7 | Model Question Paper |
| 38. | With the help of internal functional diagram, explain the working of astable multivibrator using 555 timer. | 10 | December 2020 (2015 Scheme) |
| | Design an astable multivibrator using 555 timer of frequency 200Hz and duty cycle of 70%. | 5 | January 2022 (2015 Scheme) |

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| | Differentiate between astable and monostable multivibrator operation with waveforms. | 5 | December 2020 (2015 Scheme) |
| | With the help of internal functional diagram, explain how a monostable multivibrator works with use of 555 timer. | 8 | December 2020 (2019 Scheme) |
| | With the help of a neat diagram explain the operation of monostable multivibrator using 555 IC. | 10 | September 2020 (2015 Scheme) |
| | Draw the internal circuit diagram of 555 IC and explain its operation as astable multivibrator. | 10 | December 2019 (2015 Scheme) |
| | Determine the output frequency of the 555 astable multivibrator for C=0.01µF, $R_A$=2kΩ & $R_B$=200kΩ. | 5 | December 2019 (2015 Scheme) |
| | Draw a monostable multivibrator circuit for a time period of 1msec with an amplitude of 10V using 555 timer. | 5 | May 2019 (2015 Scheme) |
| | Design an astable multivibrator using 555 timer for an output wave of 60%duty ratio at 2kHz frequency. | 5 | May 2019 (2015 Scheme) |
| | With the help of internal circuit diagram of IC 555 explain the operation of astable multivibrator. Derive the expression for frequency of oscillation. | 10 | December 2018 (2015 Scheme) |
| | With the help of internal circuit diagram of IC 555 explain the operation of a monostable multivibrator. | 5 | April 2018 (2015 Scheme) |
| | Design an astable multivibrator using 555 timer to generate an output signal with frequency 5kHz and 50% duty cycle. | 5 | April 2018 (2015 Scheme) |
| | Draw and explain the circuit of IC 555 in Monostable mode with relevant waveforms. | 7 | December 2017 (2015 Scheme) |
| | In an astable multivibrator using 555, $R_B$ = 750 Ω. Determine the values of $R_A$ and C to generate a 1.0 MHz clock that has a duty cycle of 25%. | 4 | December 2017 (2015 Scheme) |
| | With the help of internal functional diagram, explain how a monostable multivibrator works with use of 555 timer. | 10 | July 2017 (2015 Scheme) |
| | Draw the circuit diagram of an astable-multivibrator using 555 timer to generate the output signal with frequency 2 KHz and duty cycle of 75 %. | 5 | January 2017 (2015 Scheme) |
| | Design an astable multivibrator using 555 Timer for an output wave of 65% duty ratio at 1kHz frequency. | 7 | Model Question Paper |
| 39. | Explain inverting Schmitt trigger circuit with relevant waveforms. | 6 | December 2020 (2019 Scheme) |

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| | Design a Schmitt trigger circuit with, $LTP = -5V$ and $UTP = +5V$. Explain its operation. | 5 | December 2020 (2015 Scheme) |
| | Draw the circuit diagram of a Schmitt trigger. Why it is called as a regenerative comparator? | 5 | December 2019 (2015 Scheme) |
| | Draw the Schmitt trigger circuit and determine the threshold voltages $V_{UT}$ and $V_{LT}$ in a circuit with two resistors 18kΩ and 1kΩ, $V_{ref}$ = 4V and saturation voltage = ±15V | 5 | December 2018 (2015 Scheme) |
| | Explain inverting Schmitt trigger circuit with relevant waveforms. | 5 | December 2017 (2015 Scheme) |
| | What is the significance of UTP and LTP in Schmitt trigger circuits? Why is it called as regenerative comparator? | 5 | April 2018 (2015 Scheme) |
| | What is the significance of UTP and LTP in Schmitt trigger circuits? | 5 | January 2017 (2015 Scheme) |
| | | 7 | Model Question Paper |

# QUESTION BANK-S3

## Subject:Design and Engineering(EST 200)

| Sl.No. | Question | Marks | Year |
|---|---|---|---|
| **MODULE-1** | | | |
| 1. | Discuss the importance of design constraints? | 3 | 2020(Dec) |
| 2. | Describe how to select the "best possible design" from the generated design alternatives. | 3 | 2020(Dec) |
| 3. | Design two alternatives of a chair suitable for a five-year-old child, and then to narrow down to the best design based on objectives and constraints. Sketch both the designs. | 14 | 2020(Dec) |
| 4. | Identify the objectives, functions and constraints for designing a water level indicator. Illustrate the various stages of the design process. Provide suitable sketches. | 14 | 2020(Dec) |
| 5. | Outline the significance of understanding customer requirements in design process | 3 | 2021(July) |
| 6. | Describe any three constraints that can occur in design process of a lunch box. | 3 | 2021(July) |
| 7. | Explain the design process through designing a handbag for women of age group of 15 to 25 years. Use hand sketches to support your idea. | 14 | 2021(July) |
| 8. | Describe the concept of generating design alternatives and choosing a design through designing a coffee mug with the help of sketches. | 14 | 2021(July) |
| 9. | What are the basic vocabularies in engineering design? | 3 | 2021(Dec) |
| 10. | How to identify the customer requirements of design? | 3 | 2021(Dec) |
| 11. | Find the customer requirements for designing a website for an educational institution. Show how the design objectives were finalized considering the design constraints. Sketch a layout of the website showing dropdown menus. | 14 | 2021(Dec) |
| 12. | Show the designing of an iron box going through the various stages of the design process. Use hand sketches to illustrate the processes. | 14 | 2021(Dec) |
| **MODULE-2** | | | |
| 1. | Discuss how to manage the conflicts in a team executing the design thinking process. | 3 | 2020(Dec) |

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| 2. | How does the design thinking approach help engineers in creating innovative and efficient designs? | 3 | 2020(Dec) |
| 3. | Design a water bottle that can be opened with one hand. Illustrate the various stages involved in design thinking. Sketch the final design. | 14 | 2020(Dec) |
| 4. | During the Covid-19 pandemic, people have to wear a mask, but wearing a mask is not comfortable. Empathize about this design problem and arrive at a solution using the design thinking process, so that people can select the level of protection provided by masks according to different situations. Illustrate the solution using sketches. | 14 | 2020(Dec) |
| 5. | Explain convergent questioning in design thinking. | 3 | 2021(July) |
| 6. | Explain how conflict in team environment helps in better design of products. | 3 | 2021(July) |
| 7. | Illustrate the design thinking process through designing a walking stick for elderly people. | 14 | 2021(July) |
| 8. | Design a parachute mechanism for safe landing an egg which is dropped from a height of 3 meters using iterative design thinking process with the help of sketches | 14 | 2021(July) |
| 9. | Describe the iterative process involved in design thinking approach. | 3 | 2021(Dec) |
| 10. | Describe the importance of empathize phase in design thinking. | 3 | 2021(Dec) |
| 11. | Illustrate the design thinking approach for designing a wearable technology for a college student. Describe each stage of the process. Illustrate the solution using sketches. | 14 | 2021(Dec) |
| 12. | Some of the vehicle drivers do not dim the headlights when facing another vehicle at night. Empathize about this design problem and arrive at a solution using the design thinking process. Illustrate the solution using sketches. | 14 | 2021(Dec) |
| **MODULE-3** | | | |
| 1. | Clarify the part of mathematics and physics in the design engineering process. | 3 | 2020(Dec) |
| 2. | What are factors to be considered in preparing technical reports to communicate a design efficiently? | 3 | 2020(Dec) |
| 3. | Design a foldable steel table. Draw the detailed 2D drawings of the same with design detailing, scale drawings and dimensions. Use only hand sketches | 14 | 2020(Dec) |
| 4. | Prepare a technical report for a newly designed website for online training of students with neat diagrams for presenting to a client. | 14 | 2020(Dec) |
| 5. | Describe how prototyping helps in design process | 3 | 2021(July) |

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| 6. | Explain any three advantages of communicating designs in writing. | 3 | 2021(July) |
| 7. | Design an office chair and communicate your design using sketches with design detailing, material selection, scale drawings and dimensions. | 14 | 2021(July) |
| 8. | Describe the role of mathematical modelling in design engineering citing an example. | 14 | 2021(July) |
| 9. | How can a design be communicated through engineering sketches and drawings? | 3 | 2021(Dec) |
| 10. | Explain the role of Prototyping in evaluating a Design. | 3 | 2021(Dec) |
| 11. | Design an integrated water bottle with lunch box. Draw the detailed 2D drawings of the same with design detailing, material selection and dimensions. Use only hand sketches. | 14 | 2021(Dec) |
| 12 | Prepare a technical report for a newly designed portable ladder with neat sketches for presenting to a client. | 14 | 2021(Dec) |
| **MODULE-4** | | | |
| 1. | Describe the use of value engineering in the design process. | 3 | 2020(Dec) |
| 2. | How does intelligence in nature inspire engineering designs? | 3 | 2020(Dec) |
| 3. | Apply value engineering to a pen, and design a lightweight pen torch. Illustrate the solution using sketches. | 14 | 2020(Dec) |
| 4. | Design waste bins to be kept at bus stops for waste collection enabling source separation. The bin should be theft-resistant and protect the contents of the bin from external weather conditions. Design the bins with ergonomic consideration<br>for waste collection workers. Sketch the design using hand drawings. | 14 | 2020(Dec) |
| 5. | Illustrate advantages of reverse engineering in design | 3 | 2021(July) |
| 6. | Explain bio mimicry in design with an example | 3 | 2021(July) |
| 7. | Illustrate modular design approach for designing of desktop computers. | 14 | 2021(July) |
| 8. | Demonstrate the concept of ergonomics through design of a table lamp | 14 | 2021(July) |
| 9. | Explain the importance of project-based learning in design engineering. | 3 | 2021(Dec) |
| 10. | Discuss the role of life cycle design approach in design decisions. | 3 | 2021(Dec) |
| 11. | Show the development of a nature-inspired design for a fashionable umbrella based on a banana leaf. Use hand sketches to support your arguments | 14 | 2021(Dec) |

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| 12. | Develop some design modification for sports utility bag, to improve its functionalities as well as product value. Sketch the design. | 14 | 2021(Dec) |
| **MODULE-5** | | | |
| 1. | How to estimate the cost of a particular design? | 3 | 2020(Dec) |
| 2. | How do ethics play a decisive role in engineering design? | 3 | 2020(Dec) |
| 3. | Design a fan which automatically reduces speed or stops when the temperature reduces during the night for energy conservation. Use hand sketches to support your design. | 14 | 2020(Dec) |
| 4. | Describe how to estimate the cost of a pen and list the various parts. Show how the economics will influence the engineering designs. Use hand sketches to support your arguments. | 14 | 2020(Dec) |
| 5. | Describe ethics to be followed in engineering design. | 3 | 2021(July) |
| 6. | Explain the significance of sustainability in engineering design. | 3 | 2021(July) |
| 7. | Illustrate the changes in design of disposable tea cup in terms of production, use and sustainability. | 14 | 2021(July) |
| 8. | Describe the how to estimate the cost of a table in design stage? Show how economics will influence the engineering designs. | 14 | 2021(July) |
| 9. | What are the factors to be considered for a sustainable design? | 3 | 2021(Dec) |
| 10. | What are design rights, and how can an engineer put it into practice? | 3 | 2021(Dec) |
| 11. | Design a sustainable piping network for reuse of water in a residential building enabling water conservation. Sketch the design. | 14 | 2021(Dec) |
| 12. | Design a door handle with a lock which is easy to use. Use hand sketches and give rationalization for the various features in the design. | 14 | 2021(Dec) |

Question Bank

MCN201 - **SUSTAINABLE ENGINEERING**

**Module 1**

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

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| | programmes and projects. | | | |

**Module 2**

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

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

**Module 3**

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

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

**Module 4**

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

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

**Module 5**

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