Dr. Vasantraodada Patil Shetkari hikshan Mandal's

PADMABHOOSHAN VASANTRAODADA PATIL INSTITUTE OF TECHNOLOGY,

Sangli, Maharashtra 416304

DEPARTMENT OF FIRST YEAR ENGINEERING

Academic Year 2024-25

QUESTION BANK

I SEMESTER

(Group B)

Dr.Vasantraodada Patil Shetkari shikshan Mandal's
PADMABHOOSHAN VASANTRAODADA PATIL INSTITUTE OF TECHNOLOGY,
Sangli, Maharashtra 416304

DEPARTMENT OF FIRST YEAR ENGINEERING

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Sangli, Maharashtra 416304
DEPARTMENT OF FIRST YEAR ENGINEERING

Course Name & Code: Engineering Mathematics-I (24AF1000BS101)

UNIT-I: Linear Algebra- Matrices

Sr. No **Questions**

1. Use Gauss Jordan Method to find A^{-1}, where $A = \begin{bmatrix} 2 & 1 & -1 \\ 0 & 2 & -1 \\ 5 & 2 & -3 \end{bmatrix}$.

2. Use Gauss Jordan Method to find A^{-1}, where $A = \begin{bmatrix} 1 & 1 & 1 \\ 1 & 1 & -1 \\ 1 & -1 & 0 \end{bmatrix}$.

3. Use Gauss Jordan Method to find A^{-1}, where $A = \begin{bmatrix} 2 & 1 & 3 \\ 1 & 0 & 1 \\ 1 & 1 & 1 \end{bmatrix}$.

4. Use Gauss Jordan Method to find A^{-1}, where $A = \begin{bmatrix} 1 & 1 & 3 \\ 1 & 3 & -3 \\ -2 & -4 & -4 \end{bmatrix}$.

5. Reduce the matrix to normal form and find its rank $A = \begin{bmatrix} 1 & 2 & 3 & 4 \\ 2 & 4 & 6 & 8 \\ 3 & 6 & 9 & 12 \\ 4 & 8 & 12 & 16 \end{bmatrix}$.

6. Reduce the following matrices into normal form and find its ranks $A = \begin{bmatrix} 1 & -1 & 2 & 3 \\ 4 & 1 & 0 & 2 \\ 0 & 3 & 1 & 4 \\ 0 & 1 & 0 & 2 \end{bmatrix}$.

7. Reduce the following matrix into normal form and find its ranks $A = \begin{bmatrix} 1 & -1 & -1 \\ 1 & 1 & 1 \\ 3 & 1 & 1 \end{bmatrix}$.

8. Find the rank of matrix A by reducing to normal form $\begin{bmatrix} 1 & 2 & -1 & 3 \\ 3 & 4 & 0 & -1 \\ -1 & 0 & -2 & 7 \end{bmatrix}$.

9. Find the rank of a matrix A by reducing to normal form $A = \begin{bmatrix} 1 & 2 & 3 & 0 \\ 2 & 4 & 3 & 2 \\ 3 & 2 & 1 & 3 \\ 6 & 8 & 7 & 5 \end{bmatrix}$.

10. Find the rank of matrix A by reducing to normal form $\begin{bmatrix} 1 & 2 & 3 & -1 \\ -1 & -1 & -3 & -1 \\ 1 & 0 & 1 & 1 \\ 0 & 1 & 1 & -1 \end{bmatrix}$.

11. Test for consistency and hence solve the equation.
$x + y + z = 6, x - y + 2z = 5, 3x + y + z = 8 \quad 2x - 2y + 3z = 7$.

12. Test for consistency and if possible, solve the equations.
$x + y + z + 3 = 0, 3x + y - 2z + 2 = 0, 2x + 4y + 7z = 7$.

13. Determine the consistency of the set of equations

$x - y - z = 2;\ x + 2y + z = 2; 4x - 7y - 5z = 2$ And solve them if found consistence.

14. Examine for the consistency and if consistent. Solve the system
$2x - y - z = 2;\ x + 2y + z = 2;\ 4x - 7y - 5z = 2$.

15. Investigate for what values of λ and μ the simultaneous equation $x + y + z = 6;$ $+2y + 3z = 10$; $x + 2y + \lambda z = \mu$ have i) no solution ii) a unique solution and iii) an infinite number of solution.

16. Solve the equation $2x - y + 3z = 0, 3x + 2y + z = 0, x - 4y + 5z = 0.$

17. Determine the value of k for which the following system has nonzero solution and find the solution for each value of $k, 3x + y - k z = 0, 4x - 2y - 3z = 0, 2k x + 4y + kz = 0.$

18. Test for consistency and solve
$4x-2y+6z=8\,; x+y-3z=-1; 15x-3y+9z=21.$

19. Test the consistency and solve;
$2x+y-z+3w=11,\ x-2y+z+w=8,\ 4x+7y+2z-w=0,\ 3x+5y+4z+4w=17.$

20. For what value of λ the following system of linear equations is consistent and solve it completely in each case:
$x+y+z=1, x+2y+4z=\lambda, x+4y+10z=\lambda^2$.

21. Find the Eigen values and Eigen vectors of the matrices
$\begin{bmatrix} -2 & -8 & -12 \\ 1 & 4 & 4 \\ 0 & 0 & 1 \end{bmatrix}$.

22. Find Eigen values and Eigen vector for smallest Eigen value of the matrices $\begin{bmatrix} 2 & 0 & 1 \\ 0 & 2 & 0 \\ 1 & 0 & 2 \end{bmatrix}$

23. Find the Eigen values and corresponding Eigen vectors of the matrix
A= $\begin{bmatrix} 2 & -2 & 2 \\ 1 & 1 & 1 \\ 1 & 3 & -1 \end{bmatrix}$.

24. Find Eigen values and Eigen vector for largest Eigen value of the matrices $\begin{bmatrix} 8 & -6 & 2 \\ -6 & 7 & -4 \\ 2 & -4 & 3 \end{bmatrix}$.

25. Find the Eigen values and corresponding Eigen vectors of the matrix
A = $\begin{bmatrix} 3 & 1 & 1 \\ 1 & 3 & -1 \\ 1 & -1 & 3 \end{bmatrix}$.

26. Verify Cayley–Hamilton theorem and find A^{-1} of the matrices $\begin{bmatrix} 2 & 2 & 1 \\ 1 & 3 & 1 \\ 1 & 2 & 2 \end{bmatrix}$.

27. Verify Cayley Hamilton theorem and find A^{-1} & A^4. $A=\begin{bmatrix} 2 & -1 & 1 \\ -1 & 2 & -1 \\ 1 & -1 & 2 \end{bmatrix}$.

28. Verify Cayley Hamilton theorem and find A^{-1}&A^4.
$A=\begin{bmatrix} 1 & 0 & -2 \\ 2 & 2 & 4 \\ 0 & 0 & 2 \end{bmatrix}$.

29. Verify Cayley–Hamilton theorem and Also find the matrix represented by $A^5-4A^4-7A^3+11A^2-A-10I$ where $A=\begin{bmatrix} 1 & 4 \\ 2 & 3 \end{bmatrix}$

30. Find the characteristic equation of the matrix A given below and also find the matrix represented by $A^7-4A^6-20A^5-34A^4-4A^3-20A^2-33A+I$ where $A=\begin{bmatrix} 1 & 3 & 7 \\ 4 & 2 & 3 \\ 1 & 2 & 1 \end{bmatrix}$

31. Verify Cayley–Hamilton theorem and find A^{-1}, of the matrix A=
$\begin{bmatrix} 8 & -8 & -2 \\ 4 & -3 & -2 \\ 3 & -4 & 1 \end{bmatrix}$

UNIT-II: Partial Differentiation

Sr. No **Questions**

1. Evaluate $\frac{\partial u}{\partial x}, \frac{\partial u}{\partial z}$ if $z = \tan^{-1}\left(\frac{x^2+y^2}{x+y}\right)$.

2. If $z(x+y) = x^2+y^2$, show that $\left(\frac{\partial z}{\partial x}-\frac{\partial z}{\partial y}\right)^2 = 4\left(1-\frac{\partial z}{\partial x}-\frac{\partial z}{\partial y}\right)$

3. If $u = x^y$ show that $\frac{\partial^3 u}{\partial x^2 \partial y} = \frac{\partial^3 u}{\partial x \partial y \partial x}$

4. If $u = f(y-z, z-x, x-y)$ show that $\frac{\partial u}{\partial x}+\frac{\partial u}{\partial y}+\frac{\partial u}{\partial z}=0$

5. If $z = \tan(y+ax)+(y-ax)^{\frac{3}{2}}$ then prove that $\frac{\partial^2 z}{\partial x^2}-a^2\frac{\partial^2 z}{\partial y^2}=0$

6. If $u = x^2 tan^{-1}\left(\frac{y}{x}\right)-y^2\tan^{-1}\left(\frac{x}{y}\right)$, *find* $\frac{\partial^2 u}{\partial x \partial y}$

7. If $u = \log\sqrt{x^2+y^2+z^2}$ *then show that*
$(x^2+y^2+z^2)\left(\frac{\partial^2 u}{\partial x^2}+\frac{\partial^2 u}{\partial y^2}+\frac{\partial^2 u}{\partial z^2}\right)=1$

8. If $z = f(x,y)$ where $x = e^u+e^{-v}$ and $y = e^{-u}-e^v$ then show that,
$\frac{\partial z}{\partial u}-\frac{\partial z}{\partial v} = x\frac{\partial z}{\partial x}-y\frac{\partial z}{\partial y}$

9. If u = f(r) where, $r^2 = x^2+y^2+z^2$ then show that $\frac{\partial^2 u}{\partial x^2}+\frac{\partial^2 u}{\partial y^2}+\frac{\partial^2 u}{\partial z^2} = f''(r)+\frac{2}{r}f'(r)$

10. If $u = f(r,s,t)$ and $r = \frac{x}{y}, s = \frac{y}{z}, t = \frac{z}{x}$ show that $x\frac{\partial u}{\partial x} + y\frac{\partial u}{\partial y} + z\frac{\partial u}{\partial z} = 0$

11. If $u = \frac{y}{z} + \frac{z}{x} + \frac{x}{y}$, show that $x\frac{\partial u}{\partial x} + y\frac{\partial u}{\partial y} + z\frac{\partial u}{\partial z} = 0$

12. Evaluate $\frac{\partial u}{\partial x}, \frac{\partial u}{\partial z}$ if $z = \tan^{-1}\left(\frac{x^2+y^2}{x+y}\right)$.

13. If $x = logu, y = logv$ and $z = f(x, y)$ then prove that $\frac{\partial^2 u}{\partial x \partial y} = uv\left(\frac{\partial^2 z}{\partial u \partial v}\right)$

14. If $v = log(x^2 + y^2 + z^2)$, prove that $(x^2 + y^2 + z^2)\left(\frac{\partial^2 v}{\partial x^2} + \frac{\partial^2 v}{\partial y^2} + \frac{\partial^2 v}{\partial z^2}\right) = 2$

15. If $u = \sin^{-1}\left(\frac{x}{y}\right) + \tan^{-1}\left(\frac{y}{x}\right)$, prove that $x\frac{\partial u}{\partial x} + y\frac{\partial x}{\partial y} \equiv 0$

16. If $logu = \frac{x^3+y^3}{3x+4y}$ then prove that $x\frac{\partial u}{\partial x} + y\frac{\partial u}{\partial y} = 2ulogu$

17. $u = \sin^{-1}\left(\frac{x+y}{\sqrt{x-y}}\right)$ then prove that $x\frac{\partial u}{\partial x} + y\frac{\partial u}{\partial y} = \frac{1}{2}\tan u$

18. If $z = x^4y^2 sin^{-1}\left(\frac{x}{y}\right) + \log x - \log y$,

find $x\frac{\partial z}{\partial x} + y\frac{\partial z}{\partial y} and x^2\frac{\partial^2 z}{\partial x^2} + 2xy\frac{\partial^2 z}{\partial x \partial y} + y^2\frac{\partial^2 z}{\partial y^2}$

19. If $u = x^2\tan^{-1}\left(\frac{y}{x}\right) + y^2\sin^{-1}\left(\frac{y}{x}\right)$, prove that $x^2\frac{\partial^2 u}{\partial x^2} + 2xy\frac{\partial^2 u}{\partial x\,\partial y} + y^2\frac{\partial^2 u}{\partial y^2} = 2u$

20. Verify Euler's Theorem for $u = \sin^{-1}\sqrt{x^2 + y^2}$

21. If $u = \log(x^2 + xy + y^2)$, *show that* $x\frac{\partial u}{\partial x} + y\frac{\partial u}{\partial y} = 2$

22. If $u = sin^{-1}\left(\frac{x^{\frac{1}{4}}+y^{\frac{1}{4}}}{x^{\frac{1}{5}}+y^{\frac{1}{5}}}\right)$, *prove that* $x\frac{\partial u}{\partial x} + y\frac{\partial u}{\partial y} = \frac{1}{20}tanu$

23. If $u = sin^{-1}\left(\frac{x+y}{\sqrt{x}+\sqrt{y}}\right)$, then prove that,

$$x^2\frac{\partial^2 u}{\partial x^2} + 2xy\frac{\partial^2 u}{\partial x \partial y} + y^2\frac{\partial^2 u}{\partial y^2} = \frac{-sinu.cos2u}{4cos^3 u}$$

24. If $u = \tan^{-1}\left[\frac{\sqrt{x^2+y^2}}{x+y}\right]$, find $x^2\frac{\partial^2 u}{\partial x^2} + 2xy\frac{\partial^2 u}{\partial x \partial y} + y^2\frac{\partial^2 u}{\partial y^2}$

25. If $u = e^{xyz}$ find $\frac{\partial^3 u}{\partial x \partial y \partial z}$

26. If $u = \log(x^3 + y^3 + z^3 - 3xyz)$ prove that $(\frac{\partial}{\partial x} + \frac{\partial}{\partial y} + \frac{\partial}{\partial z})^2 u = \frac{-9}{(x+y+z)^2}$

27. If $u = \tan^{-1}(\frac{x^3+y^3}{x-y})$ prove that $x\frac{\partial u}{\partial x} + y\frac{\partial u}{\partial y} = \sin 2u$

28. If $u = \sin\left(\frac{x}{y}\right)$ and $x = e^t, y = t^2$ verify $\frac{du}{dt} = \frac{\partial u}{\partial x}\frac{dx}{dt} + \frac{\partial u}{\partial y}\frac{dy}{dt}$

29. If $f(u)$ is a homogeneous function of degree n in x & y then show that $x^2\frac{\partial^2 u}{\partial x^2} + 2xy\frac{\partial^2 u}{\partial x.\partial y} + y^2\frac{\partial^2 u}{\partial y^2} = G(u).[G'(u) - 1]$ where $G(u) = n\frac{f(u)}{f'(u)}$

30. Verify Euler theorem for $u = \frac{x^2+y^2}{x+y}$

31. Evaluate $\frac{\partial u}{\partial x}, \frac{\partial u}{\partial z}$ if $z = \tan^{-1}\left(\frac{x^2+y^2}{x+y}\right)$.

UNIT-III: Applications of Partial differentiation

Sr. No Questions

1. If $u = x + 2y^2 - z^3$, $v = 2x^2yz$, $w = 2z^2 - xy$ then evaluate $\frac{\partial(u,v,w)}{\partial(x,y,z)}$

2. Discuss the maxima and minima for the function $x^2 + y^2 + (30 - x - y)^2$ and hence find the extreme value of the function.

3. Using Lagrange's undetermined multipliers find the maximum value of function $x^2 + y^2 + z^2$ when $x + y + z = 3a$

4. Expand $f(x,y) = e^{x+y}$ in Maclaurin's theorem up to fourth term.

5. If $x = u(1-v), y = uv$ prove that $JJ' = 1$

6. A rectangular box open at the top is to have volume of 256 cubic feet, determine the Dimensions of the box required least material for the construction of the box.

7. Examine the function $x^3 + y^3 - 3axy$ for maxima & minima where $a > 0$

8. Find the points on the surface $z^2 = xy + 1$ nearest to the origin.

9. If $u = \frac{yz}{x}$, $v = \frac{zx}{y}$, $w = \frac{xy}{z}$ show that $\frac{\partial(u,v,w)}{\partial(x,y,z)} = 4$

10. Expand $f(x,y) = \cos x \sin y$ as far as the terms of third degree.

11. If $u = x^2 - y^2$, $v = 2xy$ and $x = r\cos\theta$, $y = r\sin\theta$, find $\frac{\partial(u,v)}{\partial(r,\theta)}$.

12. Find the first six terms of the expansion of the function $f(x,y) = e^x \log(1+y)$ in the powers of x and y.

13. Test the function $f(x,y) = x^4 + y^4 - x^2 - y^2 + 1$ for the maxima, minima and saddle point.

14. Find Maxima and Minima values of the function $f(x,y) = \sin x + \sin y + \sin(x+y)$

15. Find the maximum value of $x^m y^n z^p$ when $x + y + z = a$

16. Find the maximum and minimum distances from the origin to the curve $3x^2 + 4xy + 6y^2 = 140$

17. Find the volume of the largest parallelepiped that can be inscribed in the ellipsoid $\frac{x^2}{a^2} + \frac{y^2}{b^2} + \frac{z^2}{c^2} = 1$

18. Find the stationary values of $x^2 + y^2 + z^2$ subject to $ax^2 + by^2 + cz^2 = 1$ and $lx + my + nz = 0$

19. Determine the point in the plane $3x - 4y + 5z = 50$ nearest to the origin.

20. The sum of three numbers is a constant. Prove that their product is maximum when they are equal.

21. If $u^3+v^3+w^3=x+y+z$, $u^2+v^2+w^2=x^3+y^3+z^3$, $u+v+w=x^2+y^2+z^2$ the show that $\frac{\partial(u,v,w)}{\partial(x,y,z)}=\frac{(x-y)(y-z)(z=x)}{(u-v)(v-w)(w-u)}$

22. If $u^3+v^3=x+y$, $u^2+v^2=x^3+y^3$ then show that $\frac{\partial(u,v)}{\partial(x,y)}=\frac{1(x^2-y^2)}{2uv(u-v)}$

23. If $x=e^u cosv$; $y=e^u sinv$ then prove that $JJ'=1$

24. As the dimension of a triangle ABC are varied of $\cos A.\cos B.\cos C$ is obtained when the triangle is equilateral.

25. Using Lagrange's method divide 24 into three parts such that, the continued product of the first, square of the second and cube of the third may be maximum.

UNIT-IV: Reduction Formulae and Tracing of Curves

Sr. No	**Questions**
1.	Evaluate $\int_0^{\frac{\pi}{2}} cos^6\, x\, dx$
2.	Evaluate $\int_0^{\frac{\pi}{2}} \sin^8 x\cos^7 x\, dx$
3.	Evaluate $\int_0^{\frac{\pi}{6}} \cos^4 3\theta \sin^3 6\theta d\theta$
4.	Evaluate $\int_0^{2a} x\sqrt{(2ax-x^2)}\, dx$
5.	Evaluate $\int_0^a x^2(a^2-x^2)^{\frac{3}{2}}\, dx$
6.	Evaluate $\int_0^4 x^3\sqrt{4x-x^2}\, dx$
7.	Evaluate $\int_0^\infty \frac{t^2}{(1+t^2)^{\frac{7}{2}}}\, dt$
8.	Evaluate $\int_0^{\frac{\pi}{2}} \sin^3 x\sin^4 x\, dx$
9.	Evaluate $\int_0^{\pi} x\sin^7 x\cos^4 x\, dx$
10.	Evaluate $\int_0^1 x^4\,(1-x^2)^{\frac{3}{2}}\, dx$
11.	Evaluate $\int_0^1 \frac{x^7}{\sqrt{1-x^2}}\, dx$
12.	Evaluate $\int_0^1 \frac{x^2(4-x^2)}{\sqrt{1-x^2}}\, dx$
13.	Evaluate $\int_{-\pi}^{\pi} \sin^4 x\cos^2 x\, dx$
14.	Evaluate $\int_0^{\frac{\pi}{2}} \sin^8 x\, dx$
15.	Evaluate $\int_0^{2a} \frac{x^3}{\sqrt{2ax-x^2}}\, dx$
16.	Integrate $\int \sin^4 x\, dx$
17.	Integrate $\int cos^4\, x\, dx$
18.	Trace the curve : $y^2(a-x)=x^2(a+x)$
19.	Trace the curve $r=1-2\sin\theta$
20.	Trace the curve: $xy^2=4a^2(2a-x)$
21.	Trace the curve: $y^2(2a-x)=x^3$
22.	Trace the curve: $r=a(1+\cos\theta)$
23.	Trace the curve: $r=2\sin 3\theta$
24.	Trace the curve: $y^2=x^3$

26. Trace the curve: $x = a\cos^3 t, y = a\sin^3 t$

27. Trace the curve: $r = a\cos 3\theta$

28. Trace the curve: $r = 1 + 2\cos\theta$

29. Trace the curve: $r^2 = a^2 cos2\theta$

30. Trace the curve: $xy^2 = a(x^2 - a^2)$

31. Trace the curve: $y^2(4 - x) = x(x - 2)^2$

32. Trace the curve: $y^2(x - a) = x^2(2a - x)$

33. Trace the curve: $r = 3 + 2cos\theta$

34. Trace the curve: $y^2 = x^2(1 - x)$

35. Trace the curve: $\sqrt{x} + \sqrt{y} = \sqrt{a}$

36. Trace the curve: $ay^2 = x^2(a - x)$

37. Trace the curve: $r = \frac{2a}{1+sin\theta}$

UNIT-V: Multiple Integral

Sr. No	Questions
1.	Evaluate: $\int_0^5 \int_0^{x^2} x\left(x^2 + y^2\right)dxdy$
2.	Evaluate: $\int_{-1}^{1} \int_0^x \int_{x-z}^{x+z} (x + y + z)dxdydz$
3.	Evaluate: $\int_0^a \int_0^x \int_0^{x+y} e^{x+y+z}\, dzdydx$
4.	Evaluate: $\int_1^e \int_1^{\log y} \int_1^{e^x} \log z dzdxdy$
5.	Evaluate: $\int_{-c}^{c} \int_{-b}^{b} \int_{-a}^{a} \left(x^2 + y^2 + z^2\right)dxdydz$
6.	Evaluate the integrals by Changing the order of integration: $\int_0^{4a} \int_{x^2/4a}^{2\sqrt{ax}} dydx$
7.	Evaluate the integrals by Changing the order of integration: $\int_0^a \int_{\sqrt{ax}}^{a} \frac{y^2}{\sqrt{y^4 - a^2x^2}} dxdy$
8.	Evaluate the integrals by Changing the order of integration: $\int_0^1 \int_{x^2}^{2-x} xydxdy$
9.	Evaluate the integrals by Changing the order of integration: $\int_0^1 \int_x^{\sqrt{2-x^2}} \frac{x}{\sqrt{x^2 + y^2}} dxdy$
10.	Evaluate the integrals by Changing the order of integration: $\int_0^3 \int_1^{\sqrt{4-y}} (x + y)dxdy$
11.	Evaluate the integrals by Changing the order of integration: $\int_0^{a/\sqrt{2}} \int_y^{\sqrt{a^2-y^2}} \log\left(x^2 + y^2\right)dxdy$

12. Evaluate the integrals by Changing the order of integration: $\int_0^1 \int_x^{\sqrt{x}} xydydx$

13. Evaluate the integrals by Changing the order of integration: $\int_0^{\infty} \int_x^{\infty} \frac{e^{-y}}{y} dydx$

14. Evaluate the integrals by Changing the order of integration: $\int_0^{\infty} \int_0^{x} xe^{-x^2/y} dydx$

15. Change to polar and evaluate the $\int_0^a \int_0^{\sqrt{a^2-y^2}} e^{-x^2-y^2} dxdy$

16. Change to polar and evaluate the $\int_0^1 \int_{x^2}^{x} \frac{dxdy}{\sqrt{x^2+y^2}}$

17. Change to polar and evaluate the $\int_{-1}^{1} \int_{-\sqrt{1-y}}^{0} \frac{4\sqrt{x^2+y^2}}{1+x^2+y^2} dxdy$

18. Change to polar and evaluate the $\int_0^3 \int_{\sqrt{3x}}^{x} \frac{dxdy}{\sqrt{x^2+y^2}}$

19. Change to polar and evaluate the $\int_0^1 \int_0^{\sqrt{1-x^2}} x^2y^2 dxdy$

20. Find the area of a plate in the form of a quadrant of the ellipse $\frac{x^2}{a^2}+\frac{y^2}{b^2}=1$

21. Show that the area between the parabolas $y^2=4ax$ and $x^2=4ay$ is $\frac{16a^2}{3}$

22. Find, by double integration, the area lying inside the circle $r=a\sin\theta$ and outside the cardioid $r=a(1-\cos\theta)$

23. Find the area lying between the parabolas $y=x^2$ and the line $x+y-z=0$

24. Find the volume bounded by the cylinder $x^2+y^2=4$ and the planes $y+z=4$ and $z=0$

25. Find the volume of the ellipsoid $\frac{x^2}{a^2}+\frac{y^2}{b^2}+\frac{z^2}{c^2}=1$

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	Dr.Vasantraodada Patil Shetkari shikshan Mandal's **PADMABHOOSHAN VASANTRAODADA PATIL INSTITUTE OF TECHNOLOGY,** Sangli, Maharashtra 416304
	DEPARTMENT OF FIRST YEAR ENGINEERING
	Course Name & Code: Engineering Physics (24AF2PHYBS202)

Unit 1- Acoustic, Ultrasonic and Dielectrics

1) Differentiate between echo and reverberation.

2) Define acoustics and architectural acoustic.

3) What are the requirements of good acoustical hall?

4) Describe factors affecting architectural acoustics and their remedies.

5) What is reverberation time and state Sabine's formula for it.

6) Define absorption coefficient and state its formula.

7) What is magnetostriction effect? Explain construction and working of magnetostriction oscillator.

8) What is piezoelectric effect? Explain construction and working of piezoelectric oscillator.

9) State any five properties ultrasonic waves.

10) Explain any three applications of ultrasonic waves in detail.

11) Explain various types of polarization in dielectric materials?

12) What is electric polarization? Explain With diagrams different types of polarization in dielectric.

13) What are different types of dielectric materials?

14) Numerical-

Unit 2-Engineering Optics

1) Discus Interference of light in thin film for reflected rays.

2) Derive an expression for diameter of Newton's bright and dark ring.

3) Explain interference in thin films due to wedge shaped thin film.

4) Define Polarization? Explain different Types of polarization?

5) Define optical activity and specific rotation.

6) Write characteristics of laser.

7) Explain principle and working of He-Ne laser.

8) Explain principle and working of semiconductor laser.

9) Explain the terms i) Stimulated emission ii) Metastable state iii) Population inversion iv) Spontaneous emission v) Resonant cavity

10) Write applications of laser.

11) Write a note on different types of pumping

12) Explain Principle and structure of optical fibre.

13) What is acceptance angle for an optical fibre? Obtain mathematical expression for acceptance angle and numerical aperture.

14) State various applications of optical fibres.

15) Numerical

Unit 3 - Quantum mechanics

1) State and explain De-Broglie's hypothesis of matter waves

2) Write a note on wave function and its physical significance.

3) State and explain Heisenberg uncertainty principle.

4) Derive an expression for Schrodinger time dependent wave equation.

5) Derive an expression for Schrodinger time independent wave equation.

6) Write a note on Quantum computing.

7) Numerical

Unit 4 - Crystal Structure and Nuclear Physics

1) Define the terms i) Lattice ii) Basis, iii) Unit cell

2) Write a short note on seven crystal system.

3) Explain terms i) Atomic radius ii) Co-ordination number iii) No. of atoms per unit cell iv) Cubic system v) Lattice planes and Miller Indices

4) Calculate atomic radius of SC, BCC & FCC lattice with suitable diagram.

5) Define packing density? Calculate packing density (Atomic packing factor) of SC, BCC & FCC lattice with suitable diagram.

6) Derive the relation between lattice constant and density of cubic crystal.

7) Write a note on mass defect and Q value of nuclear reaction

8) Define properties of i) α-rays ii) β-rays iii) γ-rays

9) Explain the construction and working of Geiger-Muller (G.M.) counter.

10) Numerical.

Unit 5-Physics of advanced materials

1) Explain Different types of magnetic materials.

2) Explain B-H Curve (Hysteresis curve) for ferromagnetic material. Define the term coercively and retentivity.

3) Define i) Conductivity ii) Resistivity iii) Mobility iv) Current density

4) What is Hall Effect? Derive an expression for Hall voltage and Hall coefficient.

5) State applications of Hall Effect.

6) Define critical temperature and critical magnetic field

7) Explain Meissner effect.

8) Explain types of superconductor. (Type I and Type II).

9) Properties of superconductor

10) Application of superconductor

11) Write a note on BCS theory

12) Explain in detail top down and bottom up approach of Nano materials.

13) Explain in brief i) XRD ii) FESEM iii) VSM

14) Write a note on CNT.

15) Write applications of Nano materials

16) Numerical

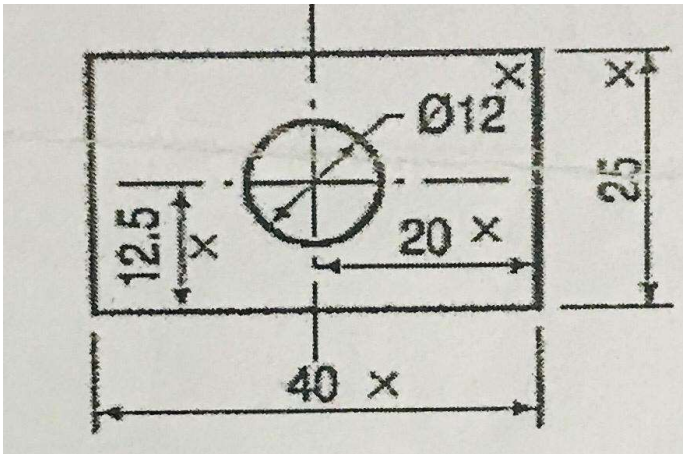
=====END====

	Dr.Vasantraodada Patil Shetkari shikshan Mandal's **PADMABHOOSHAN VASANTRAODADA PATIL INSTITUTE OF TECHNOLOGY,** Sangli, Maharashtra 416304
	DEPARTMENT OF FIRST YEAR ENGINEERING
	Course Name & Code: Engineering Graphics (24AF2EGRES204)

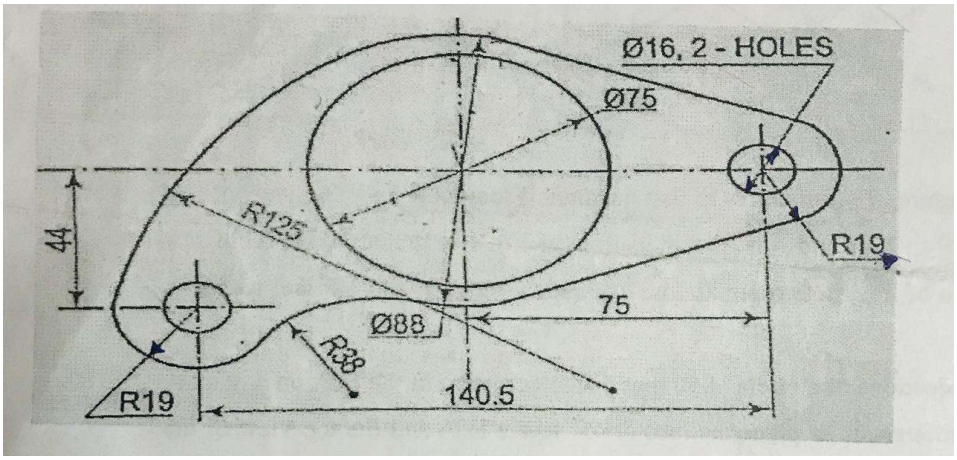
Unit 1: Introduction to Engineering Drawing

Exercise Problems:

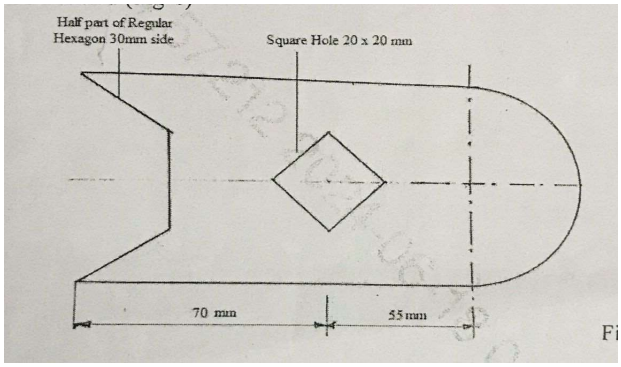
1. Explain Principles of Engineering graphics and their significance.
2. Draw different types of lines and also state its applications.
3. Explain type of scales with suitable example.
4. Draw the lettering of Type A & Type B (E.g. letters Ato Z and Numbers 0 to 9. Take height 'h' of Type A letter is 14 and in case of Type B 'h'=10)
5. Draw the following sentence according to drawing standard SP 46(or any other standard convention) **[DBATU, Supplementary Exam, July 2024]**
   Dr. Babasaheb Ambedkar Technological University
6. Draw the correct way of dimensioning. (e.g. (i) & (iv) from "Engg. Drawing", N.D. Bhatt, page no. 47)
7. Explain the different methods of dimensioning. **[DBATU, End Semester Exam, August 2022]**
8. Explain the two systems of placing dimensions with the help of sketches. **[DBATU, End Semester Exam, July 2023]**
9. Divide a given line AB of 65mm length into six equal parts. **[DBATU, Supplementary Exam, July 2024]**
10. Redraw the following figure with correct dimensioning.



11. Redraw the following figure with correct dimensioning.



12. Redraw the following figure with correct dimensioning.



13. Inscribe a regular heptagon in a circle of 60mm diameter. **[DBATU, Supplementary Exam, May 2017]**
14. Draw a regular heptagon of 30mm side. **[DBATU, End Semester Exam, July 2023]**

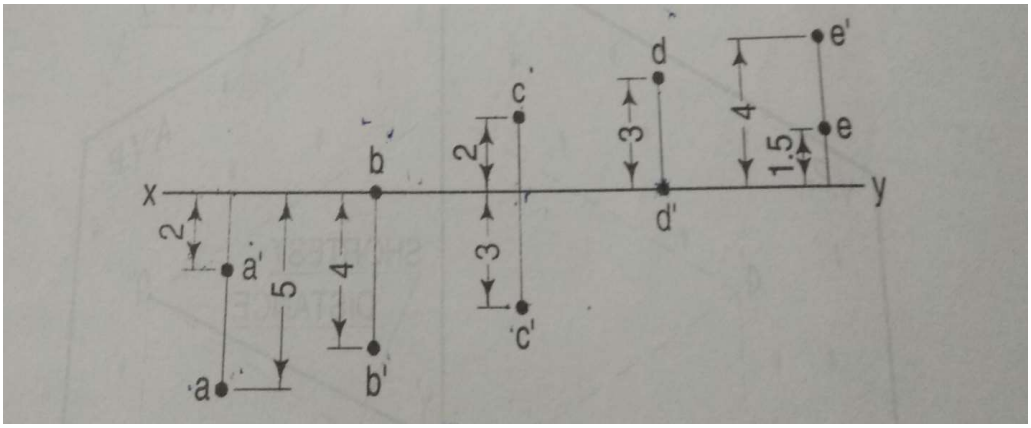
15. Inscribe a regular pentagon in a given circle of diameter 70mm. **[DBATU, End Semester Exam, December 2017]**
16. Inscribe a regular octagon in a square of side 50mm. **[DBATU, Supplementary Exam, May 2017]**
17. Inscribe a regular hexagon in a circle of diameter 60mm**. [DBATU, Summer Semester Exam, May 2017]**
18. Construct a pentagon if length of side is 30mm, such that one of the vertex (point) is on XY (ground) and one of the edge is parallel to the ground is away from XY. (use any method)
19. Inscribe a regular dodecagon (polygon having 12 sides) in a circle of diameter 70mm. **[DBATU, Summer semester exam May 2018]**
20. Inscribe a regular square in a circle of diameter 40mm. **[DBATU, Summer Semester Exam, May 2017]**
21. Inscribe a Square in a circle of diameter of 70mm. **[DBATU, End Semester Exam, December 2017]**

Unit 2: Projections of Points and Projection of lines

2.1Exercise Problems for projection of points:-

1. Draw the projection of the following points on the same ground line, keeping the projector 25mm apart.
   i. A, in the H.P. and 20mm behind the V.P.
   ii. B, 40mm above the H.P. and 25mm infront of V.P.
   iii. C, in the V.P. and 40mm above the H.P.
   iv. D, 25mm below the H.P. and 25mm behind the V.P.
   v. E, 15 mm above the H.P. and 50mm behind the V.P.
   vi. F, 40mm below the H.P. and 25mm infront of the V.P.
   vii. G, in both the H.P. and V.P.
2. State the quadrants in which following points are situated:
   a) A point P, its top view is 40mm above xy; the front view, 20mm below the top view.
   b) A point Q, its projections coincide with each other 40mm below xy line.

3. Projections of various points are given in figure below. State the position of each point with repect to the planes of projection, giving the distances in the centimeters.



4. A point A is situated in the first quadrant. Its shortest distance from the intersection of H.P., V.P. and auxililary plane is 60mm and it is equidistant from the principal planes. Draw the projections of the point and determine its distance from the principal planes.
5. A point Q is situated in the first quadrant. It is 40mm above H.P. and 30mm infront of V.P. draw its projections and find its shortest distance from the intersection of H.P., V.P. and auxiliary plane.
6. Draw the projection of following points on the same reference line, keeping the projectors 30mm apart. **[DBATU, End Semester Exam, March 2023]**
   a) Point P, 30mm above the HP and 25mm behind the VP.
   b) Point Q, 40mm below the HP and 20mm behind the VP.
   c) Point C, in the VP and 50mm above the HP.
7. Draw the front view and Top view of the following points. **[DBATU, End Semester Exam, June 2024]**
   1) Point A 15mm below HP and 20mm behind VP.
   2) Point B in VP and 20mm above HP.
   3) Point C in HP and 25mm in front of VP

2.2 Exercise Problems for Projection of lines:

1. A line AB, 90mm long, is inclined at 30^0 to the H.P. Its end A is 12mm above H.P. and 20mm in front of V.P. Its front view measures 65mm. Draw the top view of AB and determine its inclination with the V.P. **[DBATU, Summer Examination, May 2018] [06M].**

2. A line AB, 75mm long, is inclined at 45^0 to the H.P. and 30^0 to V.P. Their ends B is in the H.P. and 40mm in front of V.P. Draw its projections and determine its traces.
3. The top view of line AB measures 60mm and inclined to reference line at 60^0. The end point A is 15mm above the H.P. and 30mm in front of V.P. Draw the projections of the line when it is inclined at 45^0 to the H.P. and is situated in the first quadrant. Find true length and inclination of the line with the V.P. and traces.
4. The end A of the AB is 10mm above the HP and 30mm in front of VP. The end B is 50mm below the HP and 15mm behind VP. The true length of the line is 80mm. Draw the projections and locate the traces. What are the inclinations of the line with the reference planes?
5. The projectors through two ends A & B of a line are 80mm apart. The end A is 20mm above H.P. and whole line is in the first quadrant. The line is 110mm long and its front view makes an angle of 30^0 with H.P. The V.T. of the line is situated in reference line. Draw the projections of line AB and determine its inclinations with H.P. & V.P. also locate its H.T.
6. A line AB is 80mm long has its end point A is in H.P. Front view of line makes an angle of 30^0 to XY line. H.T. of the line is 45mm infront of V.P. and V.T. of the line is 60mm above H.P. draw the projections of the line. Find true inclination of the line with principal planes H.P. and V.P.
7. A line PQ has its end P, 10mm behind the VP and 20mm below the HP. Its end Q is 30mm behind the VP and 40mm below the HP. The distance between the end projectors is 40mm. Draw the projections of line PQ, find its TL and inclinations with HP and the VP. **[DBATU, Mid Term Examination, March 2018]**
8. A top view of a 75mm long line AB measures 65mm, while the length of its front view is 50mm. Its one end A is in the HP and 12 mm infront of VP. Draw the projections of AB and determine its inclinations with HP and VP. **[DBATU, Summer Examination, May 2017] [10M].**
9. Draw the projections of line AB, if point A is 20 mm above HP and 30mm infront of VP, Point B is 75mm above HP & 60mm infront of VP & distance between the projectors of AB is 60mm. Find HT, VT, True length of line and angle made with HP. **[DBATU, End Semester Examination, Dec 2017] [12M].**
10. The ends of line PQ are on the same projector. The end P is 30mm below the HP and 12mm behind VP. The end Q is 55mm above HP and 45mm infront of VP. Dertermine

the true length and traces of PQ and its inclinations with two planes. **[DBATU, Supplementary Examination, May 2017] [10M].**

11. A line CD, 90mm long, measures 72mm in FV and 65mm in TV. Draw the two views of the line, if it fully lies in the 1st quadrant. Find the true inclination of line. Assume point C at suitable distance from the RPs. **[DBATU, Winter Semester Examination, Dec 2019] [12M].**
12. Line AB is 75mm long. It's F.V. and T.V. measures 50mm and 60mm long respectively. End A is 10mm above H.P. and 15mm in front of V.P. Draw projections of line AB if end B is in first quadrant. Find angle with HP & VP. **[DBATU, Summer Semester Examination, Aug 2022] [6M].**
13. End A of line AB is 25mm below HP and 35mm behind VP. Line is 30^0 inclined to HP. There is a point P on AB contained by both HP & VP. Draw projections, find inclinations with VP and Traces. **[DBATU, Summer Semester Examination, Aug 2022] [6M].**
14. FV of a line measures 70mm and makes an angle of 30^0 with XY. The end A is in the HP and VT of the line is 10mm below XY. The line is inclined at 45^0 to the VP. Draw the projections of the line and find its TL and true inclination with the HP. Also locate the HT. **[DBATU, Winter Semester Examination, Mar 2023] [12M].**
15. The front view of a line AB makes an angle of 30^0 with xy. The HT of the line is 45mm in front of the VP, while its VT is 30mm below the HP. The end A is 10mm above the HP and the end B is 100mm in front of VP. Draw the projections of the line and determine: (i)its true length, and (ii) its inclination with HP and VP. [. **[DBATU, Summer Semester Examination, July 2023] [12M].**
16. The front view of 75mm long line measures 55mm. The line is parallel to the H.P. and one of its end is in the V.P. and 25mm above the H.P. Draw the projections of the line and determine its inclination with the V.P. **[DBATU, Summer Supplementary Examination, Aug 2023] [6M].**
17. Line AB measures 75mm and is in first quadrant. Front view and Top view of line inclined at 45^0 to XY. End A is 20mm in front of VP, and 30mm above HP. Draw the projections of line, determine its true inclination with HP and VP and locate its traces. **[DBATU, Regular & Supplementary Winter Examination, Jan 2024] [12M].**
18. Horizontal line AB 75mm long is inclined to VP by 40^0. Point A is 20mm above HP and 15mm in front of VP. Complete the projection and find its Plan Length and Elevation

Length. **[DBATU, Regular & Supplementary Summer Examination, June 2024][4M].**

19. The top view of 75mm long line AB measures 65mm, while the length of its front view is 50mm. It's one end A is in the HP and 12 mm in front of VP. Draw the projections of AB and determine its inclination with the HP & the VP. **[DBATU, Supplementary Summer Examination, July 2024] [12M].**

Unit 3: Projection of Planes and Projection of solids.

3.1Exercise Problems for Projection of Planes:

1. A square ABCD of 50mm side has its corner A in the H.P., its diagonal AC is inclined at 30^0 to the H.P. and the diagonal BD inclined at 45^0 to the V.P. and parallel to H.P. Draw its projections.
2. Draw the projections of regular hexagonof 25 mm sides, having one of its side in H.P. and inclined at 60^0 to the V.P. and its surface making an angle of 45^0 with H.P.
3. Draw the projections of 50mm diameter resting in the H.P. on a point A on the circumference, its plane inclined at 45^0 to the H.P. and
    a) The top view of the diameter AB making 30^0 with V.P.
    b) The diameter AB making an angle 30^0 with the V.P.
4. The thin 30^0-60^0 set square has its longest edge is 80mm, in the V.P. and inclined at 30^0 to H.P. Its surface makes an angle of 45^0 with the V.P. Draw its projections.
5. A thin rectangular plate of sides 60mm×30mm has its shorter side in V.P. and inclined at 30^0 to the H.P. Project its top view if its front view is a square of 30mm long sides.
6. ABCDE, a regular pentagon of 40mm side, has corner A on HP. The pentagon is inclined to HP such that the plan lengths of the edges AB & AE are each 35mm. Draw the projections of the pentagon and fiind its inclination with HP. **[DBATU, Mid Semester Examination, March 2018] [5M].**
7. Draw the projections of regular hexagon of 30mm side, having one of its side in theHP and its surface making an angle of 45^0 with the HP. **[DBATU, Supplementary Examination, May 2018] [6M].**
8. Draw the projections of a circle of 60mm diameter resting in the HP on a point A on the circumference, its plane inclined at 45^0 to the HP and the diameter AB making an angle of 30^0 with the VP. **[DBATU, Summer Semester Examination, May 2018] [12M].**

9. A regular Hexagonal plane of 30mm side has one of its corner on H.P. The surface of the plane is inclined at 30^0 to H.P. Draw the projections of the plane when diagonal passing through that corner on H.P. makes an angle of 45^0 to V.P.
10. A semicircular plate of 80mm diameter has its straight edge in the V.P. and inclined at 45^0 to the H.P. The surface of the plate makes an angle of 30^0 with the V.P. Draw its projections.
11. A hexagon of 30mm side is resting on a corner in the H.P., with its surface making an angle of 30^0 with the H.P. The top view of diagonal passing through that corner is inclined at 60^0 to the V.P. Draw the three principal views. **[DBATU, Summer Semester Examination, May 2018] [10M].**
12. Draw the projections of a regular hexagon of 30mm side, which is resting on a corner in the HP with its surface making an angle of 30^0 with the HP. The top view of the diagonal passing through that corner is inclined at 60^0 to the VP. **[DBATU, Winter Semester Examination, Dec 2019] [12M].**
13. A hexagonal plane has its one side in HP and its opposite parallel side is 25mm above HP and in VP. Draw its projections. Take side of hexagon 30mm long**. [DBATU, Summer Semester Examination, Aug 2022] [6M].**
14. A circular plate of negligible thickness and diameter 80mm has a point A on its circumference in the VP. The surface of the plate is inclined to the VP in such a way that the SV is seen as an ellipse of 50mm long minor axis. Draw the projections of the plate when FV of diameter AB makes 45^0 with the HP. Find inclination of plate with the VP. **[DBATU, Winter Semester Examination, Mar 2023] [12M].**
15. A regular hexagon of 40mm side has a corner in the HP. Its surface is inclined at 45^0 to the HP and the top view of the diagonal through the corner which is in the HP makes an angle of 60^0 with the VP. Draw its projections. **[DBATU, Summer Semester Examination, July 2023] [12M].**
16. A rectangular plane surface of size L× W is positioned in the first quadrant and is inclined at an angle of 60^0 with the HP and 30^0 with the VP. Draw its projections. (Consider L= 50mm and W= 30mm) **[DBATU, Summer Supplementary Examination, Aug 2023] [6M].**
17. Draw the projections of circle of 50mm diameter resting in the HP on a point A on the circumference, its plane inclined at 45^0 to the HP and the top view of the diameter AB

making 30^0 angles with the VP. **[DBATU, Regular & Supplementary Winter Examination, Jan 2024] [12M].**

18. A regular pentagon of 40mm side is resting in VP on one of its edges with surface inclined to VP by 45^0. Complete the projections. **[DBATU, Regular & Supplementary Summer Examination Jun 2024] [8M].**

19. A rectangular plate of 70 × 40mm sides resting on edge, is inclined in such a way that it is observed as a Square of 40 × 40mm in the TOP VIEW. Complete the projections and find inclination of plate with HP. **[DBATU, Regular & Supplementary Summer Examination Jun 2024] [8M].**

20. Draw the projection of regular hexagon of 30mm side, which is resting on a corner in the HP, with its surface making an angle of 30^0 with the HP. The top view of the diagonal passing through that corner is inclined at 60^0 to the VP. **[DBATU, Supplementary Summer Examination July 2024] [12M].**

3.2: Exercise Problems for Projection of Solids

1. A square pyramid, base 38mm side and axis 50mm long is free suspended from one of the corners of its base. Draw its projections, when axis as vertical plane makes an angle of 45^0 with the V.P. When a pyramid is suspended freely from a corner of its base, the imaginary line joining that corner with the centre of gravity of the pyramid will be vertical.
2. A triangular prism with side of base 40mm and length of axis 70mm has its edge of base in the V.P. and inclined at 60^0 to the H.P. The rectangular face containing that edge makes 30^0 with the V.P. Draw the projections of the prism**. [DBATU, Supplementary Examinations, May 2017] [10M]**
3. A regular pentagonal pyramid with the sides of its base 30mm and height 80mm rests on an edge of the base. The base is tilted until its apex is 50mm above the level of the edge of the base on which it rests. Draw the projections of the pyramid when the edge, on which it rests, is parallel to the V.P. and the apex of the pyramid points towards V.P.
4. Draw the projections of a cone, base 50mm diameter and axis 75mm long, lying on a generator on the ground with the top view of the axis making an angle of 45^0 with the V.P.
5. A cylinder 40mm diameter & 50mm axis is resting on one point of a base circle on VP while its axis makes 45^0 with V.P. and front view of the axis makes 35^0 with H.P. Draw the projections.

6. A regular pentagonal pyramid, base 3mm side and height 80mm rests on one edge of its base on the ground so that the highest point in the base is 30mm above the ground. Draw its projections when axis is parallel to V.P. **[DBATU, Summer Examinations, May 2017] [10M]**
7. A right hexagonal prism of side 25mm and 20mm thick with one side of the base is perpendicular to V.P. resting on the ground. A vertical frustum of a square of base 20mm sides and top face side 30mm height 50mm is resting on the prism such that one side of the square makes 45^0 with the VP. Assume that the axis of the both the solids are coinciding. Draw the projections of the combined solids when top corner of the square pyramid is 70mm above the ground (H.P.) **[DBATU, Supplementary Examinations, May 2018] [12M]**
8. A pentagonal prism is resting on one of the corners of its base on HP. The longer edge containing that corner is inclined at 45^0 to the HP. The top view of the axis of the prism makes an angle 30^0 with the V.P. Draw the projections of this solid having side of the base as 45mm and height of 70mm. **[DBATU, Summer Examinations, May 2018] [12M]**
9. A circular disc of diameter 80mm and thickness 30mm has a centrally cut triangular hole of side 45mm. The disc rests on H.P. on a pont on the circumference of an end such that a flat surface of the hole makes 45^0 with the H.P. Draw the projections of the disc with the hole if the axis is seen inclined at 55^0 in the T.V.
10. A cylinder of base 60mm and height 80mm has the midpoint of the axis 60mm away from both the reference planes. The axis is inclined at 30^0 to the VP and 60^0 to the HP. Draw the projections.
11. A hexagonal pyramid base 25mm side and axis 50mm long has an edge of its base on the ground (H.P). Its axis is inclined at 30^o to the ground and parallel to the VP. Draw its projections.
12. A cone of base diameter 40mm and axis 60mm long axis is resting on HP one one point of base circle such that its axis makes 45^0 inclination with HP and 40^0 inclination with VP. Draw its projections.
13. A cylinder of base diameter 40mm and axis 50mm long axis is resting on HP one one point of base circle in VP while its axis makes 45^0 inclination with VP and 35^0 inclination with HP. Draw its projections.

Unit 4: Sections of Solids & Development of surfaces

4.1: Exercise Problems for Section of Solids

1. A pentagonal pyramid has its base on the H.P. and the edge of the base nearer the V.P. parallel to it. A vertical section plane inclined at 45^0 to the V.P. cuts the pyramid at a distance of 6mm from the axis. Draw the top view and auxiliary front view and sectional front view on an A.V.P. parallel to the section plane. Base of the pyramid 30mm side, axis 50mm long.
2. A cylinder of 40mm diameter, 60mm height and having its axis vertical, is cut by a section plane, perpendicular to the V.P., inclines at 45^0 to the H.P. and intersecting the axis 32mm above the base. Draw its front view, sectional top view, sectional side view and true shape of the section. **[DBATU, Supplementary Examination, May 2017] [10M]**
3. A cone, base 70mm diameter, axis 75mm long and resting on its base on the H.P. is cut by a vertical section plane, the H.T. of which makes an angle of 60^0 with the reference line and is 12mm away from the top view of the axis. (i) Draw the sectional front view and the true shape of the section. (ii) Also draw the sectional front view and the top view when the same section plane is parallel to the V.P.
4. A pentagonal prism, base 28mm side and height 65mm has an edge of its base on the H.P. and the axis is parallel to V.P. and inclined at 60^0 to H.P. A section plane, having its H.T. perpendicular to xy, and the V.T. inclined at 60^0 to xy and passing through the highest corner, cuts the prism. Draw the sectional top view and true shape of section.
5. A hexagonal pyramid side of base 25mm and height of axis 70mm lying on ground on one of its triangular side face is with axis parallel to VP. Draw the projections if it is cut by the horizontal cutting plane by passing through mid-point of its axis. **[DBATU, End Semester Examination, December 2017] [12M]**
6. A hexagonal pyramid, base 30mm side and axis 65mm long, is resting on its base on the H.P. with two edges parallel to V.P. It is cut by a section plane, perpendicular to V.P. inclined at 45^0 to the H.P. and intersecting the axis at a point 25mm above the base. Draw the front view, sectional top view, sectional side view and True shape of the section. **[DBATU, Summer Semester Examination, May 2018] [12M]**
7. A pentagonal pyramid having a base side of 45mm and a slant length of 80mm rests on its base on the HP with a base edge AB perpendicular to the VP. A section plane passing through that corner D and perpendicular to the slant face ABO cuts the solid. Draw FV and sectional TV. The upper part of the solid is removed and kept on its cut surface on

the HP without changing its orientation with respect to the VP. Draw the two views of the part of the pyramid.

8. A square pyramid with a base side of 45mm and slant height of 70mm is resting on the base on the HP with two base sides perpendicular to VP. It is cut by two AIPs, sloping in opposite directions, such that the true shape of the section is
   i) A trapezium with parallel sides of 30mm and 14mm
   ii) A trapezium with smaller sides of 20mm and the distance between the parallel sides being 36mm.

   Locate the cutting planes and draw FV and sectional TV. Also draw the true shape of both the sections. **[DBATU, Supplementary Examination, May 2018] [12M]**

9. A frustum of regular hexagonal pyramid is standing on its larger base on HP with one base side perpendicular to VP. Draw its FV and TV. Project its auxiliary TV on an AIP parallel to one of the slant edges showing TL. Base side is 50mm long, top side is 30mm long and 50mm is height of frustum. **[DBATU, End Semester Examination, August 2022] [6M]**
10. A hexagonal prism, side of the base 30mm and axis 70mm long is resting on one of its bases on the HP with the edge of base perpendicular to the VP. It is cut by section plane inclined to the HP such that the true shape of the section is a trapezium of maximum size. Draw the sectional TOP view and the true shape of the section. What will be the inclination of the cutting plane with the HP? **[DBATU, End Semester Examination, July 2023] [12M]**
11. A cone of base diameter 60mm and axis 80mm long has one of its generators in VP. It is cut by sectional plane perpendicular to HP and parallel to VP. Draw sectional front view and true shape of the section. **[DBATU, End Semester Examination, Jan 2024] [12M]**
12. A horizontal cylinder (axis parallel to the VP) with a 50mm diameter and 90mm length is cut by an axiliary incline plane (AIP) such that the true shape of the section is an ellipse of major axis 80mm. Draw its front view, side view and locate the cutting plane. Also draw the true shape of section **[DBATU, End Semester Examination, Jan 2024] [12M]**

4.2.: Exercise Problems on section of solids with development of surfaces:

1**.** A pentagonal prism , 30 mm base side & 50 mm axis is standing on HP on its base whose one side is perpendicular to VP. It is cut by a section plane 45^0 inclined to HP, through mid-point of

axis. Draw FV, sec.TV & sec. Side view. Also draw true shape of section and Development of surface of remaining solid

2. A cone, 50 mm base diameter and 70 mm axis is standing on its base on Hp. It cut by a section plane 45^0 inclined to Hp through base end of end generator. Draw projections, sectional views, true shape of section and development of surfaces of remaining solid.

3. A cone 40mm diameter and 50 mm axis is resting on one generator on HP (lying on Hp) which is // to Vp.. Draw it's projections. It is cut by a horizontal section plane through it's base center. Draw sectional TV, development of the surface of the remaining part of cone.

4. A hexagonal prism. 30 mm base side & 55 mm axis is lying on HP on it's rectangular face with axis // to VP. It is cut by a section plane normal to HP and 30^0 inclined to VP bisecting axis. Draw sec. Views, true shape & development

5. A solid composed of a half-cone and half- hexagonal pyramid is shown in figure. It is cut by a section plane 45^0 inclined to Hp, passing through mid-point of axis. Draw F.V., sectional T.V., true shape of section and development of remaining part of the solid.(take radius of cone and each side of hexagon 30mm long and axis 70mm.)

Unit 5: Orthographic Projections and Isometric projections

5.1: Exercise Problems on Orthographic Projections :

1. Draw the orthographic projections of given figure 1. (First Angle Method)
    a. Front View (F.V.) Looking in the direction X
    b. Top View (T.V.)
    c. Side View (S.V.)

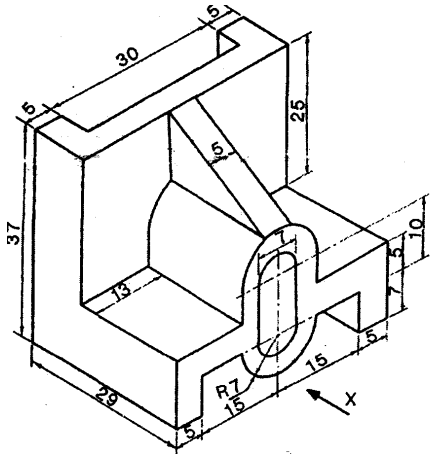
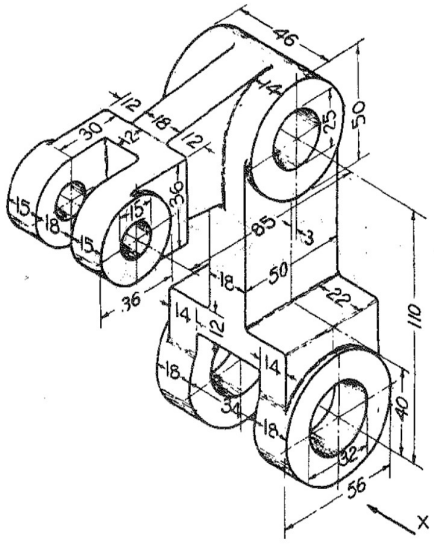


Figure 1

2. Draw the orthographic projections of given figure 2. (First Angle Method)
    a. Front View (F.V.) Looking in the direction X
    b. Top View (T.V.) **[DBATU, End Semester Exam, December 2017]**



3. Draw the orthographic projections of given figure 3. (Third Angle Method)
    a. Front View (F.V.) Looking in the direction X
    b. Side View (S.V.)
    c. Top View (T.V.)

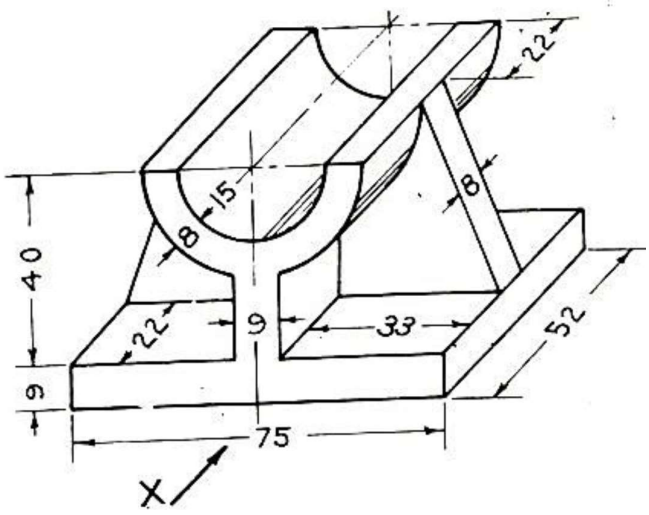


Figure 3

4. Draw an orthographic projection of given figure 4 (First Angle Method)
    a. Front View (F.V.)
    b. Top View (T.V.)

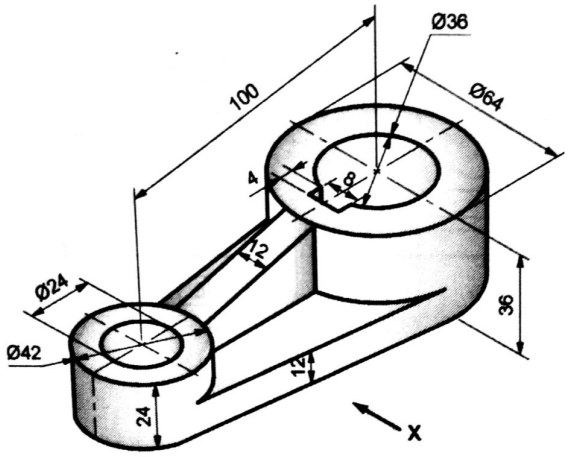


Figure 4

5. Draw an orthographic projection of given figure 5 (First Angle Method)
    a. Front View (F.V.)
    b. Top View (T.V.)

    [DBATU, Supplementary Exam, May 2017]

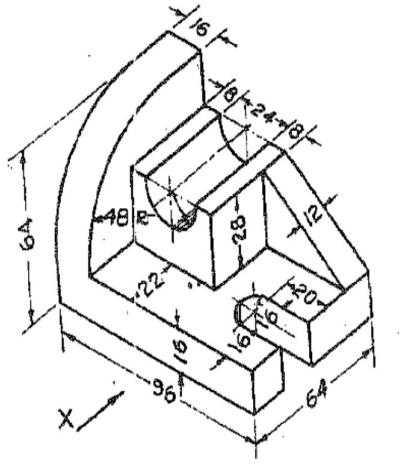


Figure 5

6. Draw an orthographic projection of given figure 6 (First Angle Method)
   a. Front View (F.V.)
   b. Top View (T.V.)

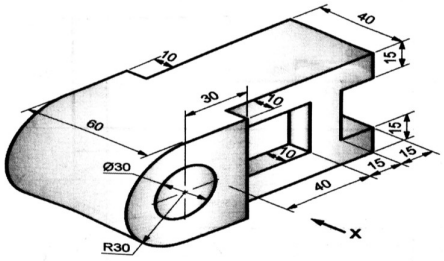


Figure 6

7. Draw an orthographic projection of given figure 7 (Third Angle Method)
   a. Front View (F.V.)
   b. Top View (T.V.)
   c. Side View From Right (RSV)

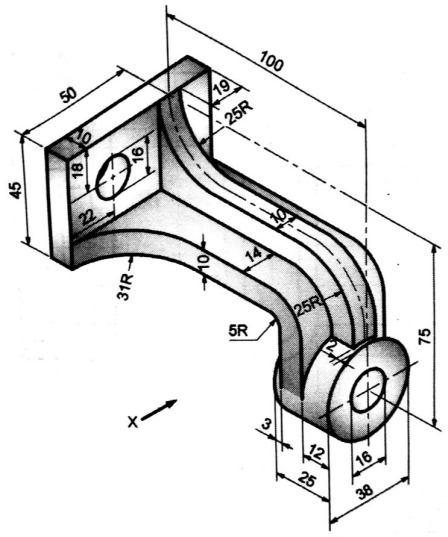
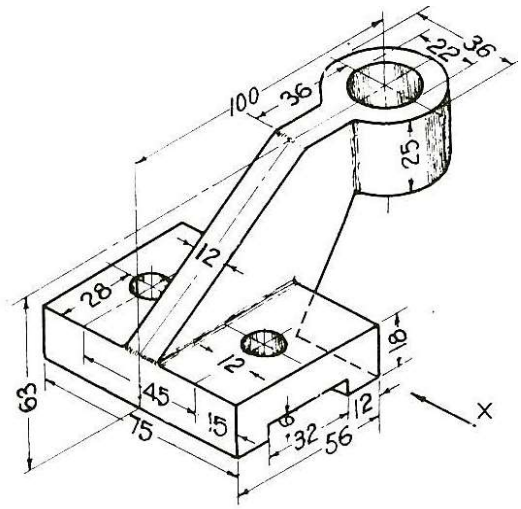


Figure 7

8. Draw the following views of object shown in the following figure in X direction.
   [DBATU Supplementary Examination, May 2018]

a. Front view **(4)**

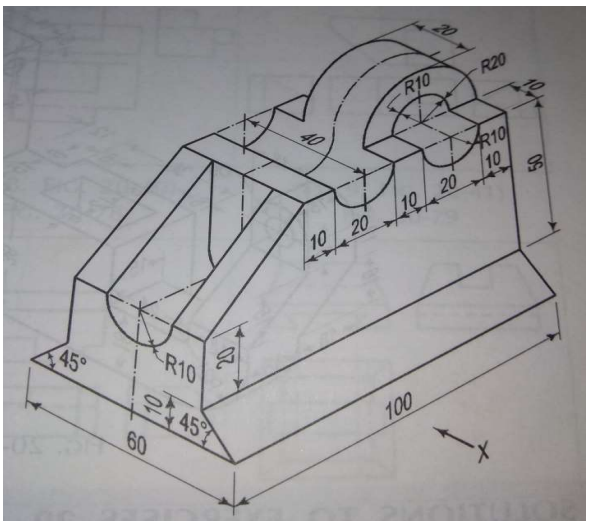
b. Top view **(4)**



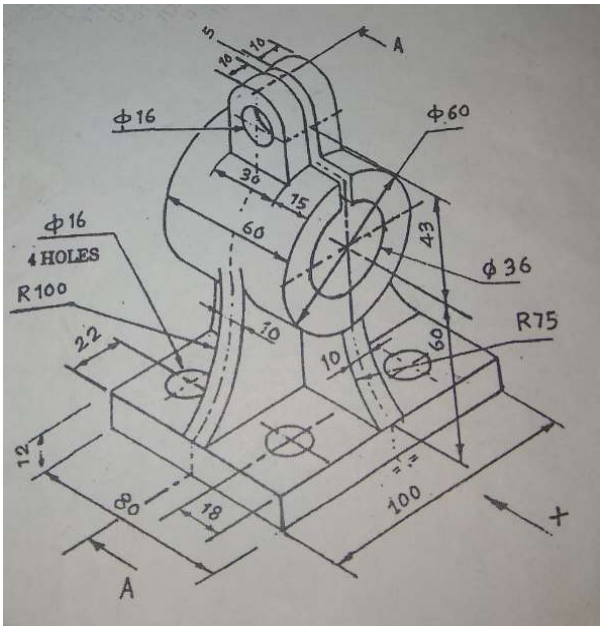
9. Draw the following views of the object (in X direction) shown below, by using first angle projection method. **[DBATU, Summer Semester Examination, May 2018]**

a. Front view **(6)**

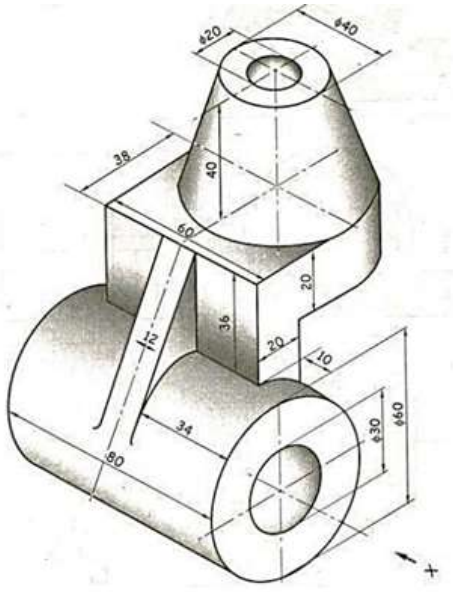
b. Top view **(6)**



10. Draw the front view in the direction of X and left hand side view of given object of following figure. **[DBATU, End Semester Examination, December 2017] [12]**

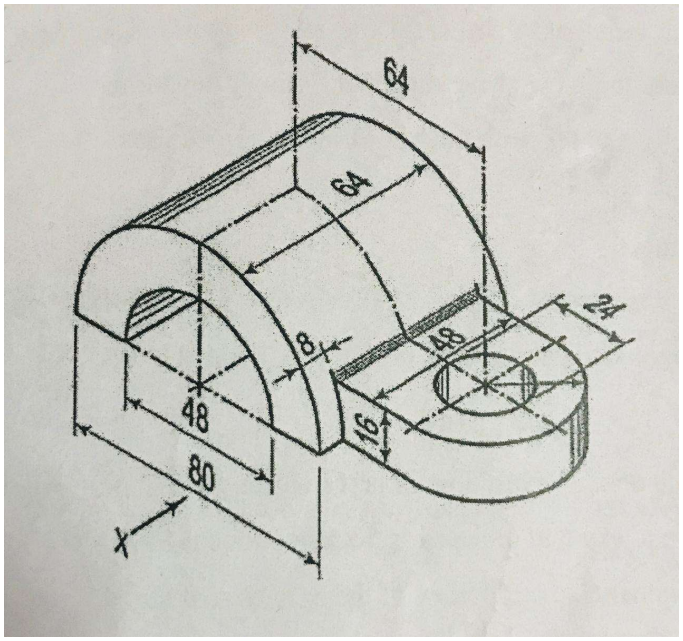


11. Draw Front View in the direction X & Top View of given figure. **[DBATU, Mid Semester Examination, October 2017]** **[10]**



12. Draw an orthographic projection of given figure. (First Angle Method)

a)Front View (F.V.) b)Top View (T.V.) c)Right Hand Side View (R.H.S.V)



13. Draw an orthographic projection of given figure. (First Angle Method)

a)Front View (F.V.) b)Top View (T.V.) c)Left Hand Side View (L.H.S.V)

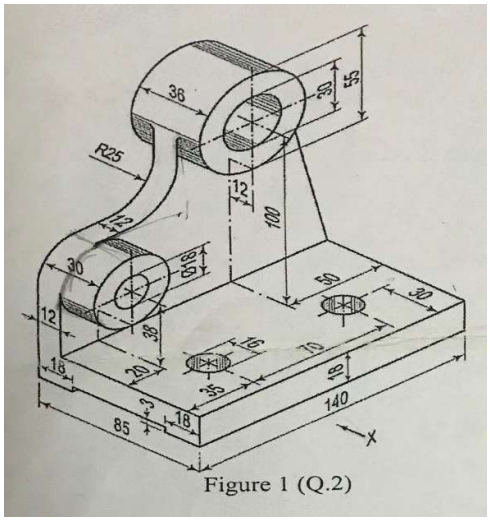


Figure 1 (Q.2)

14. Draw an orthographic projection of given figure. (First Angle Method)

a)Front View (F.V.) b)Top View (T.V.) c)Left Hand Side View (L.H.S.V)

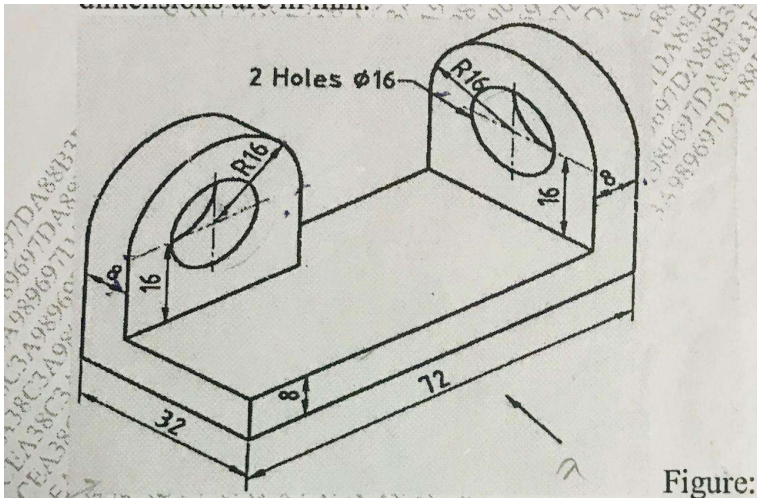
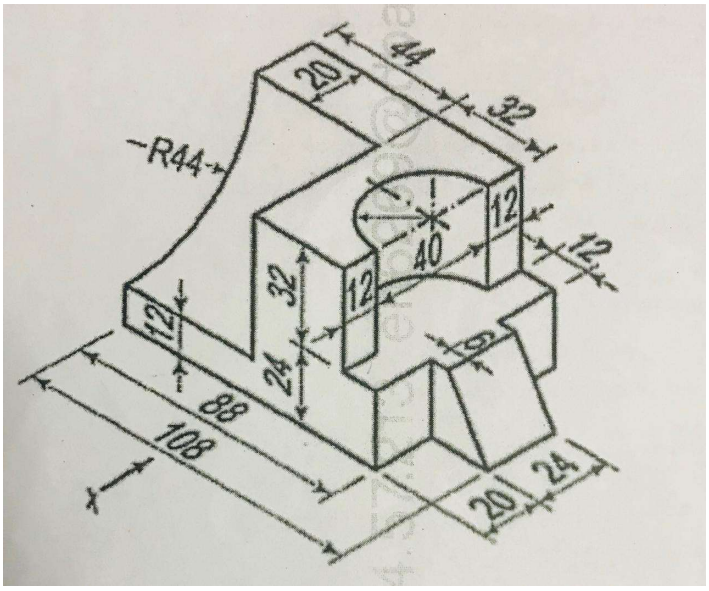


Figure:

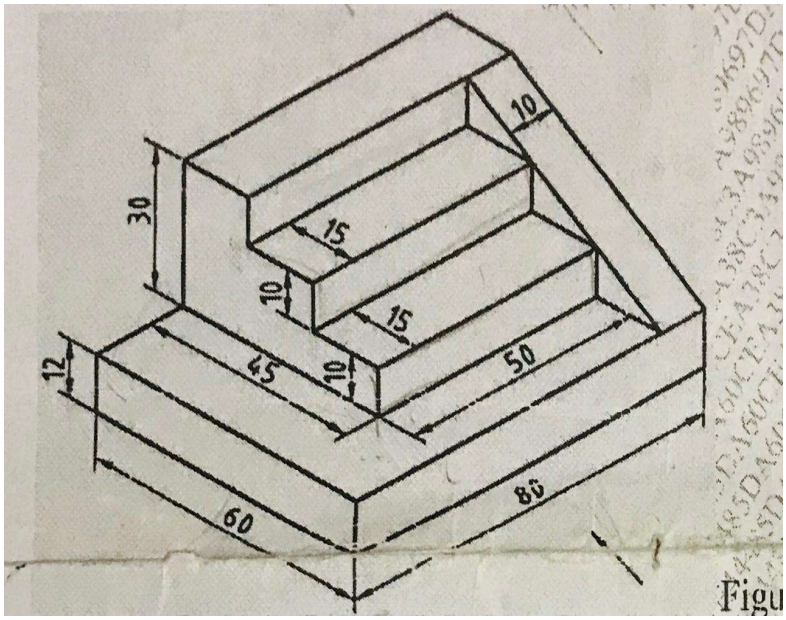
15. Draw an orthographic projection of given figure. (First Angle Method)

a)Front View (F.V.) b)Top View (T.V.) c)Right Hand Side View (R.H.S.V)



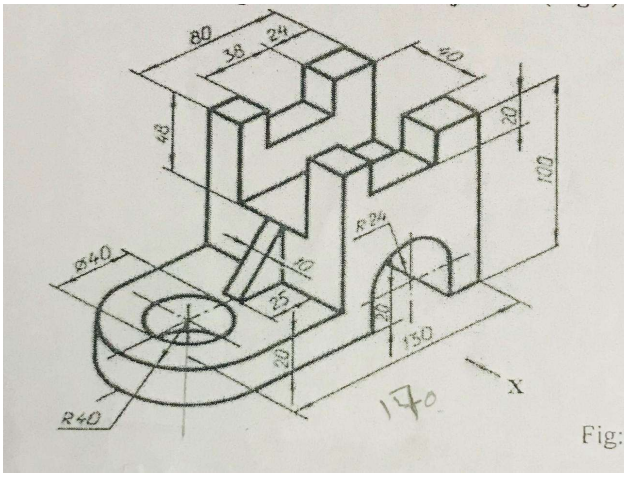
16. Draw an orthographic projection of given figure. (First Angle Method)

a)Front View (F.V.) b)Top View (T.V.) c)Left Hand Side View (L.H.S.V)



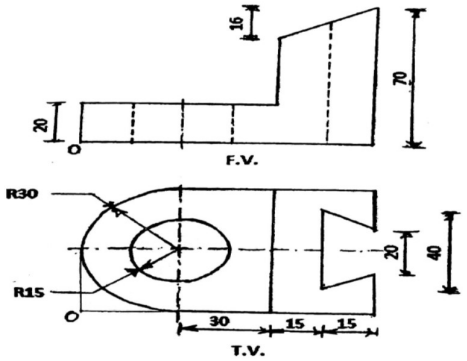
17. Draw an orthographic projection of given figure. (First Angle Method)

    a)Front View (F.V.) b)Top View (T.V.) c)Left Hand Side View (L.H.S.V)



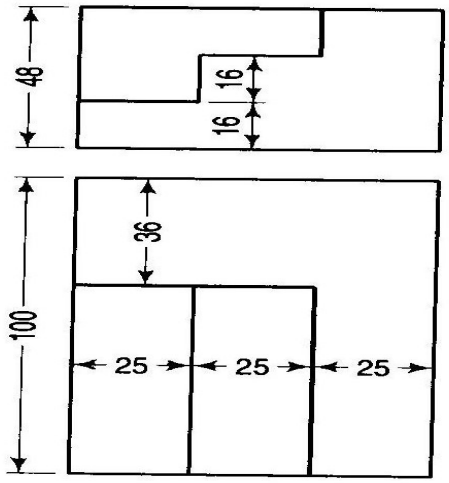
5.2: Exercise Problems for Isometric Projections :

1. Draw the isometric view (first angle projection)



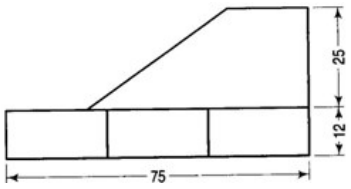
2. Draw the isometric view (first angle projection)

FV

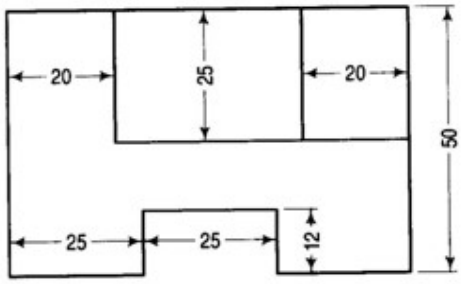


TV

3. Draw the isometric view (first angle projection)

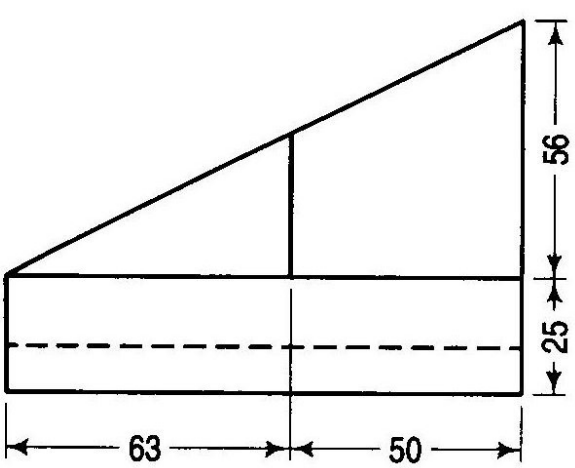


FV

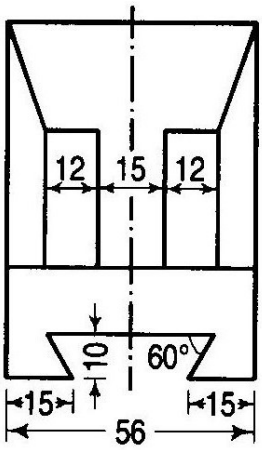


TV

4. Draw the isometric view (first angle projection)

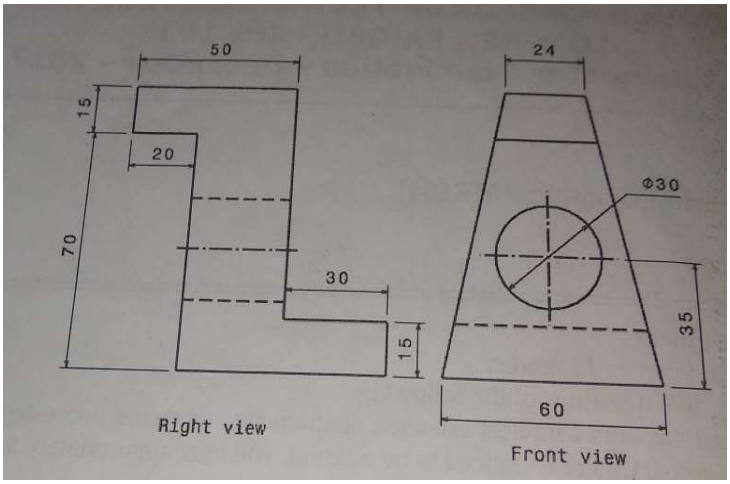


Front View

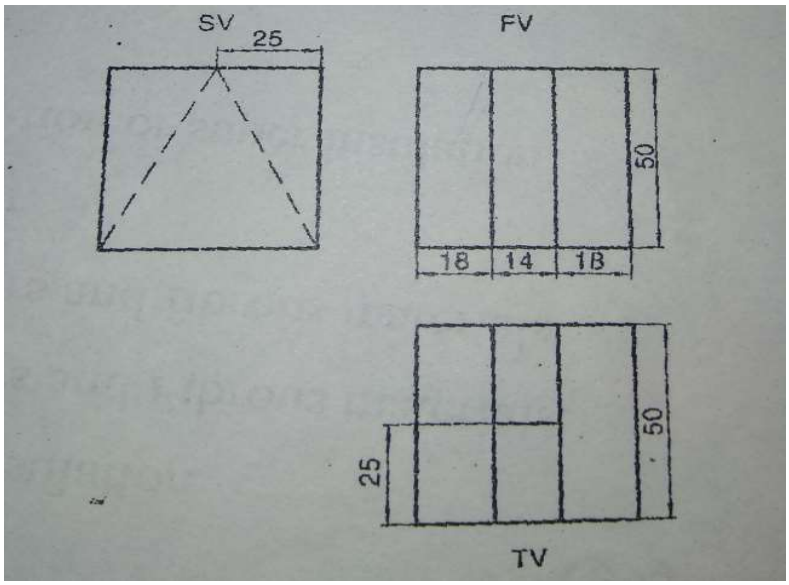


Side View

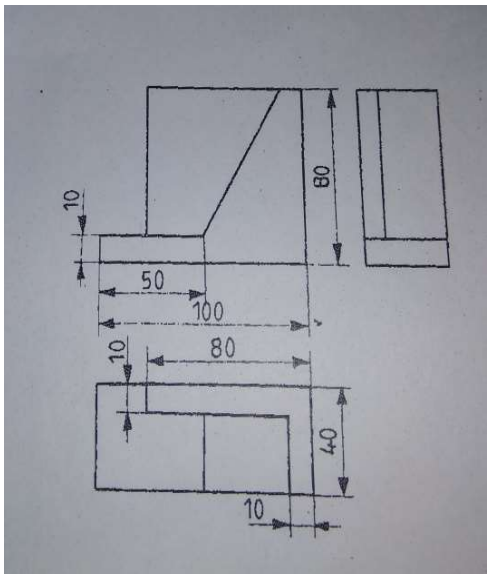
5. Draw the isometric drawing of given object **[DBATU, End Semester Examination, December 2018] [12M]**



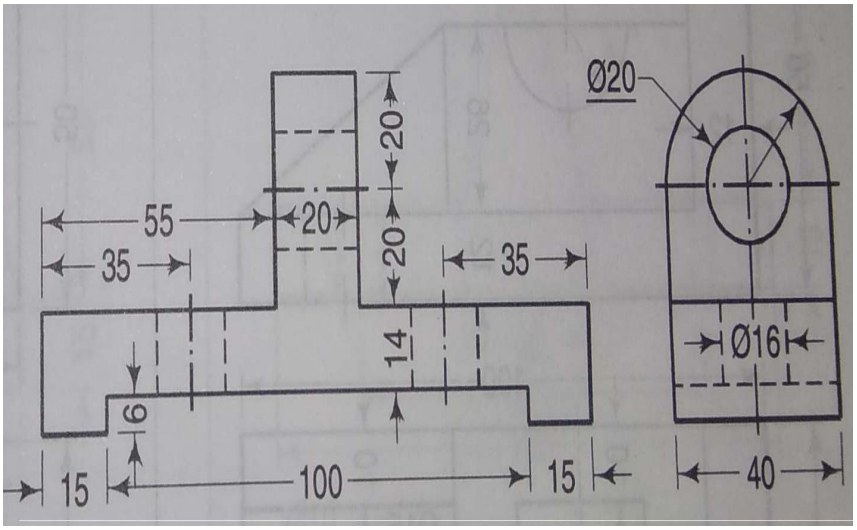
6. Draw the isometric view of given object**. [DBATU, Supplementary Examination, May 2017] [10M]**



7. Draw the isometric view of given object. (First Angle Projection) **[DBATU, Summer Examination, May 2017] [10M]**

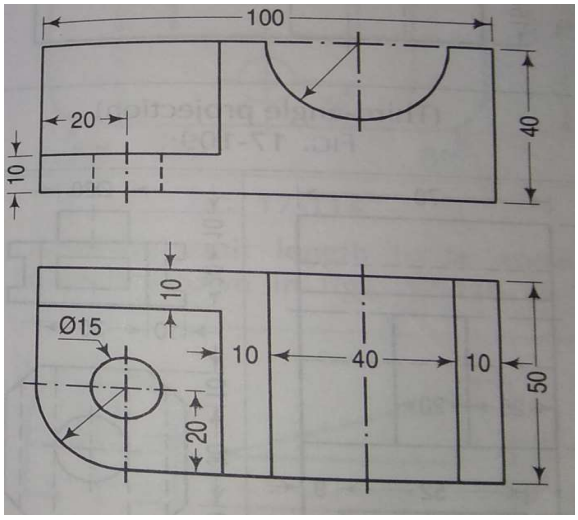


8. Draw the isometric view of the following casting. **[DBATU, Summer Semester Examination, May 2018] [12M]**

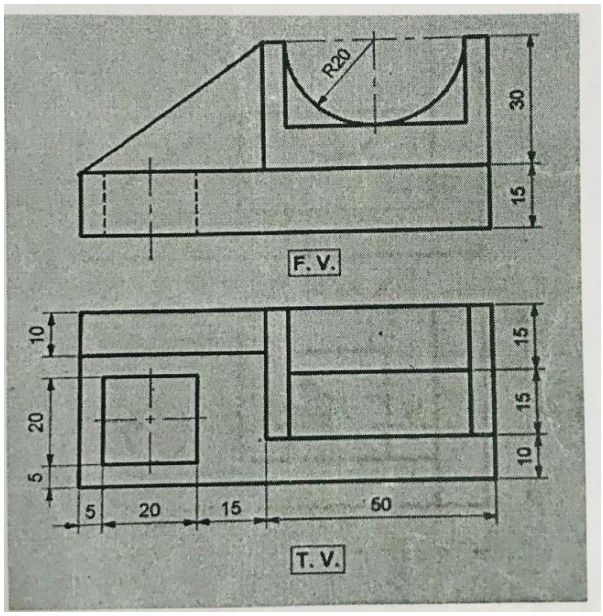


FV SV

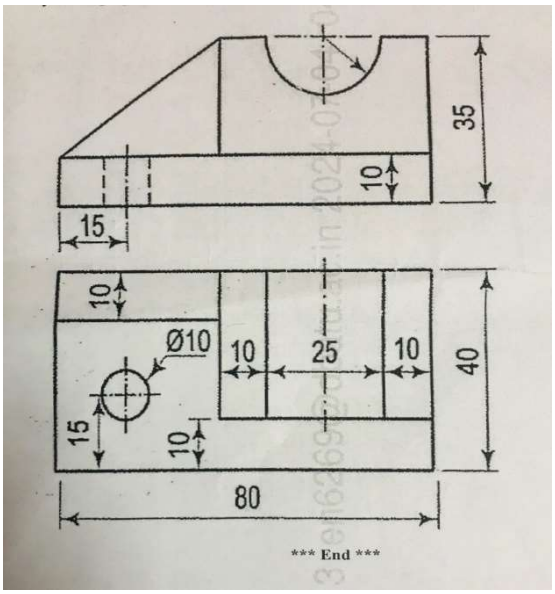
9. Following figure shows the Front View (FV) and Top View (TV) of an object. Draw its isometric view. **[DBATU, Summer Semester supplementary Examination, May 2018] [12M]**



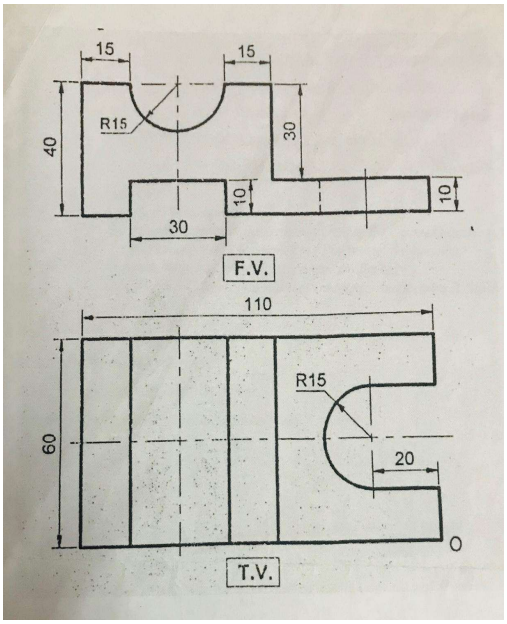
10. Draw the isometric view (first angle projection)



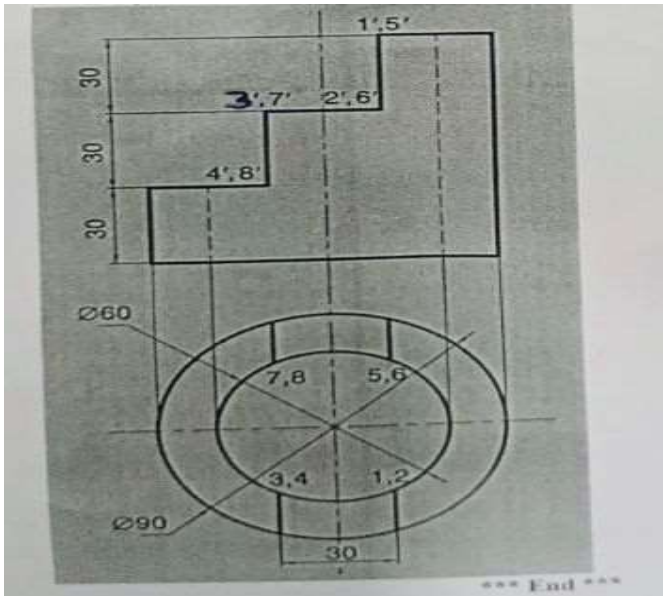
11. Draw the isometric view (first angle projection)



12. Draw the isometric view (first angle projection)



13. Draw the isometric view (first angle projection)



14. Draw the isometric view (first angle projection)

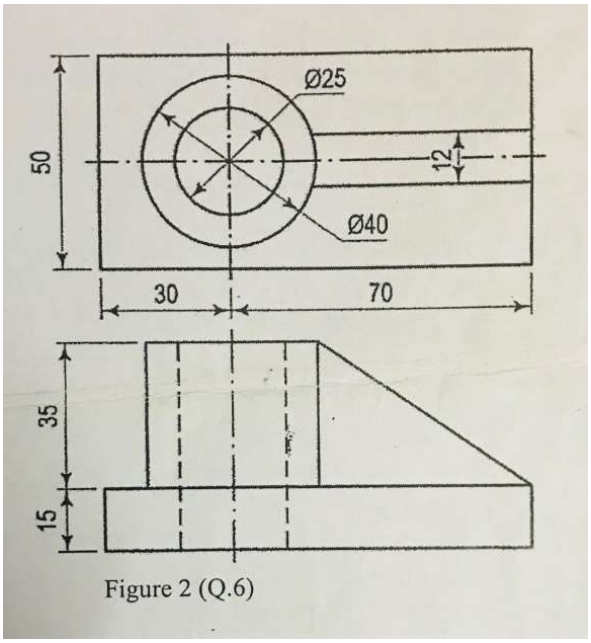


Figure 2 (Q.6)

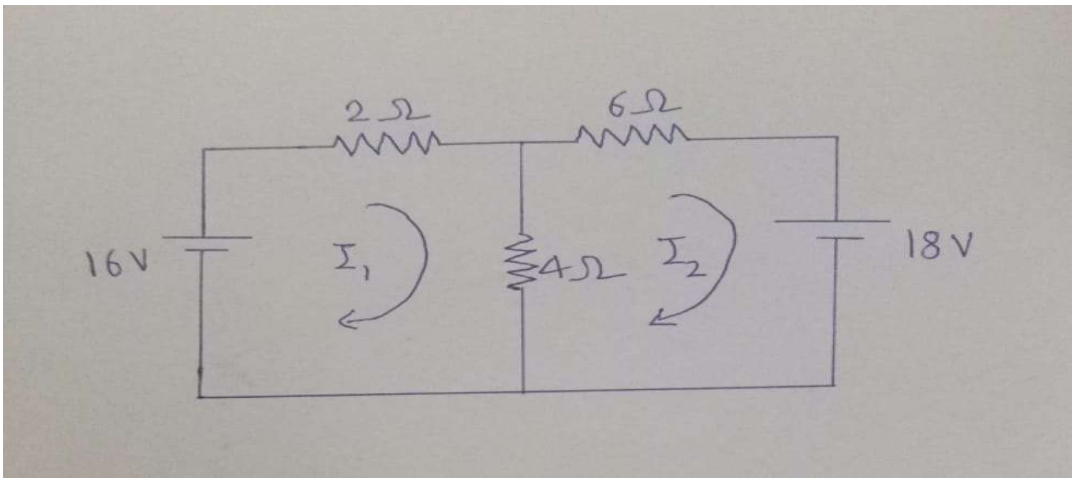
	Dr.Vasantraodada Patil Shetkari shikshan Mandal's **PADMABHOOSHAN VASANTRAODADA PATIL INSTITUTE OF TECHNOLOGY,** Sangli, Maharashtra 416304
	DEPARTMENT OF FIRST YEAR ENGINEERING
	Course Name & Code: Basic Electrical and Electronics Engineering (24AF1000ES206)

Basic Electrical Engineering

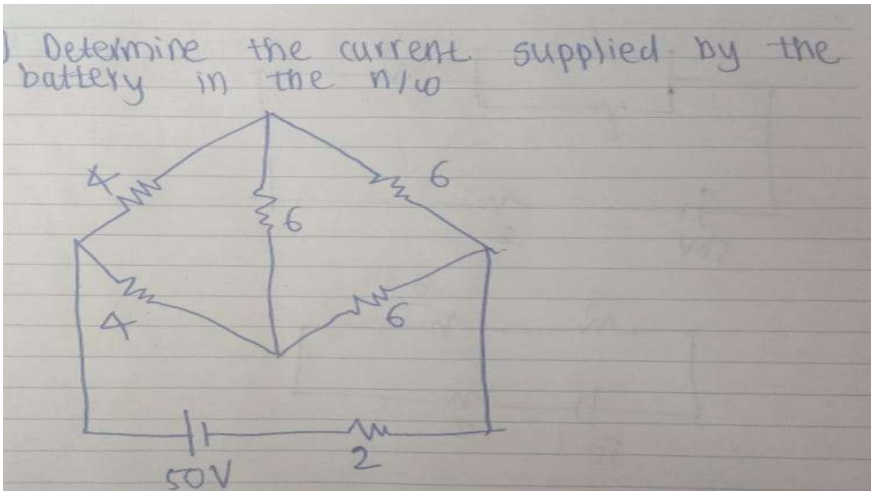
Unit 1:- Electrical Circuits

1. What are the factors affecting resistance
2. Define the terms:
   a) Form Factor
   b) Peak Factor
5. State and explain Kirchhoff's Voltage law
6. State and explain Kirchhoff's Current law
8. Explain in detail steady state analysis of simple RLC circuit

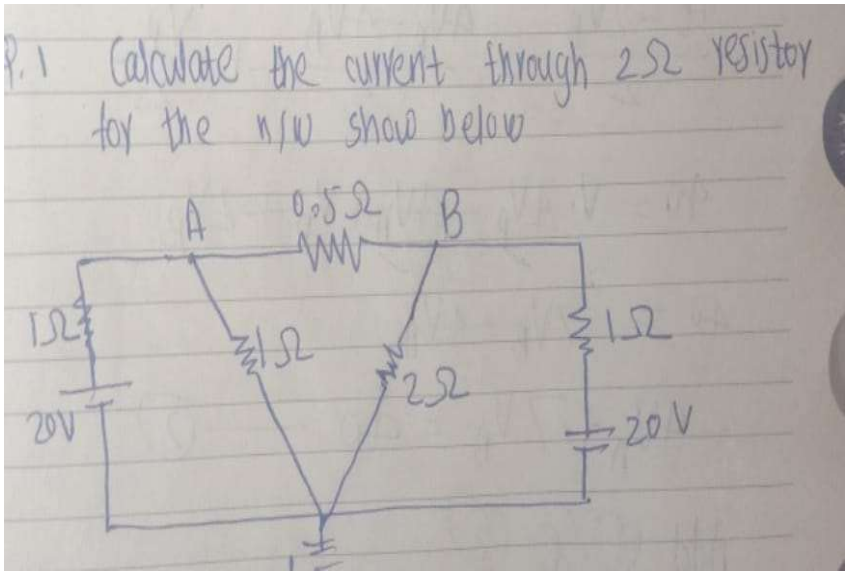
9. Using mesh analysis, find the current in 4 Ohm resistor shown in below fig.



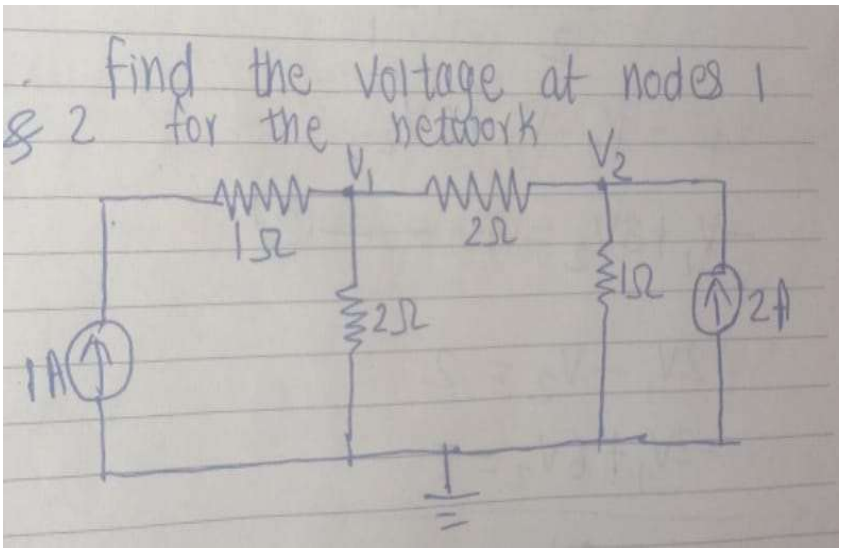
10.



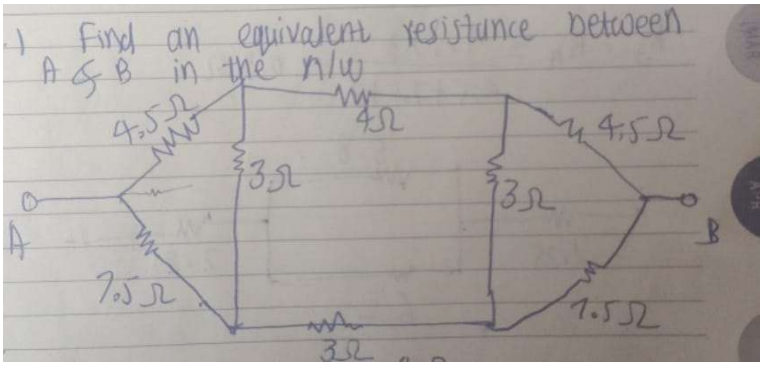
11.


Q.1 Calculate the current through 2Ω resistor for the n/w shown below
A
0.5Ω
B
1Ω
1Ω
2Ω
1Ω
20V
20V

12.


Find the voltage at nodes 1 & 2 for the network
V1
V2
1Ω
2Ω
2Ω
1Ω
1A
2A

13.



14. Explain in detail steady state analysis of simple RLC circuit

15.Write down the expression for active power and reactive power

16. State Ohm's law and mention its limitations

17. Explain types of sources with neat diagram

Unit 2:- Electrical Machines

18. Distinguish between DC Generator and DC motor

19. Formulate the EMF equation for transformer

20. Describe the working principle of DC motor with neat sketch

21. Explain the construction and operation of moving iron attraction type instrument.

22. Explain the working principle of Induction Motor

23. Explain construction and working principle of single phase transformer

24. Explain the types of DC motor characterized by the connection of field winding in relation to the armature

25. Mention the functional elements of measuring system

26. Explain losses & efficiency in a transformer

27. Explain construction & working of Wattmeter, Energy Meter, Ammeter, Voltmeter.

BASIC ELECTRONICS ENGINEERING (ES106L)

UNIT-III: RECTIFIERS AND POWER SUPPLIES

Q.1. Explain the operation of PN junction diode under forward and reverse bias condition

Q.2. What is PN junction diode? With the help of circuit diagram, explain the V-I characteristics of a diode.

Q.3. Define following diode parameters: (i) Diode resistance (ii) Knee voltage (iii) Forward voltage drop (iv) Maximum forward current (v) Reverse saturation current (vi) Reverse breakdown voltage

Q.4. What is diode current equation for forward and reverse bias?

Q.5. Explain the principle of Avalanche breakdown.

Q.6. What is a rectifier? Explain regulated dc power supply with block diagram.

Q.7. Explain with neat circuit diagram and waveforms, half wave rectifier and full wave rectifier.

Q.8. Explain with neat circuit diagram and waveforms the working of full wave bridge rectifier with capacitor filter.

Q.9. What is Zener diode? With neat circuit diagram, explain its principle of operation.

Q.10. Explain V-I characteristics of Zener Diode.

Q.11. Explain Zener breakdown and Avalanche breakdown in Zener diode.

Q.12. What are applications of Zener diode? Explain with neat diagram, use of zener diode as voltage regulator.

Q.13. Explain the working of linear voltage regulators- 78xx and 79xx.

Q.14. The forward current through a silicon diode is 10 mA at room temperature 300∘k. The corresponding forward voltage is 0.75V, calculate the reverse saturate current Io for silicon and germanium diode.

Q.15. Explain the effect of temperature on pn junction diode. Determine the forward current for germanium.

UNIT-IV: BJT and AMPLIFIERS

Q.16. With the help of neat diagram, explain the operation of n-p-n transistor.

Q.17. With the help of neat diagram, explain the operation of p-n-p transistor.

Q.18. What is CB configuration in transistor? Explain current relations in CB configuration.

Q.19. What is CE configuration in transistor? Explain current relations in CE configuration.

Q.20. What is CC configuration in transistor? Explain current relations in CC configuration.

Q.21. Explain with neat diagram, input and output characteristic of CE configuration.

Q.22. What is a transistor? What are the types of BJT transistors?

Q.23. Explain the working principle and operation of transistor.

Q.24. Explain the characteristics of transistor, why is the transistor called as current controlled device.

Q.25. Define DC load line, stability factor, biasing techniques in transistor.

Q.26. What is an amplifier. Explain the classification of amplifier.

Q.27. Explain operation of single stage RC coupled amplifier with its frequency response.

Q.28. Explain transistor as an amplifier.

UNIT –V: Measurements and Instrumentation:

Q.29. Explain the working of multimeter with neat diagram.

Q.30. Explain the working of function generator with block diagram.

Q.31. Explain the working of digital storage oscilloscope with block diagram.

	Dr.Vasantraodada Patil Shetkari Shikshan Mandal's **PADMABHOOSHAN VASANTRAODADA PATIL INSTITUTE OF TECHNOLOGY,** Sangli, Maharashtra 416304
	DEPARTMENT OF FIRST YEAR ENGINEERING
	Course Name & Code: Basic Civil and Mechanical Engineering (24AF2CMEES208)

Basic Civil Engineering

Unit 1: Introduction to Civil Engineering

1. What are the various branches of civil engineering? Explain the specific roles of each branch in the field of construction.
2. Describe the role of a civil engineer in building infrastructure and handling various construction activities.
3. Discuss the basic engineering properties of earth and its uses in foundation and construction

work.

4. Explain the types, properties, and applications of bricks in civil engineering projects.

5. What are the engineering properties of timber? Discuss its uses in modern construction.

6. Describe the properties and uses of stones in construction, and how they contribute to the strength of structures.

7. What are the essential properties of sand, and how is it used as a construction material in concrete and mortar?

8. Define aggregates and explain the difference between coarse and fine aggregates. What role do they play in concrete production?

9. What are the types of cement used in civil engineering? Discuss their properties and specific applications in construction.

10. Define mortar. What are its constituents, and how is it used in masonry and plastering work?

11. Explain the properties and applications of concrete. How does it contribute to the durability of structures?

12. Describe the role of steel in civil engineering structures. What are its mechanical properties and common applications?

13. What is bitumen? Discuss its uses in road construction and waterproofing.

14. Explain the properties and uses of glass in construction, focusing on its role in modern architectural designs.

15. What are composite materials? Discuss their engineering properties and how they are used in advanced construction technic.

Unit 2: Building Components & Building Planning

1. What is the difference between a foundation and a superstructure? Explain their roles in building construction.
2. Discuss the main functions of a foundation and its importance in structural stability.
3. What are the types of shallow foundations? Explain their suitability in various construction situations.
4. Describe deep foundations and their applications. When are they preferred over shallow foundations?
5. What is the role of a plinth in a building? Explain its purpose in the overall structure.
6. Define walls in the context of building construction. What are the different types of walls used?
7. What is the function of lintels in construction, and where are they typically used?
8. Explain the structural role of beams and their importance in load distribution.
9. What are columns, and how do they contribute to the stability of a building?
10. Discuss the different types of slabs used in construction and their applications.
11. Explain the various types of roofs and their suitability in different climatic conditions.
12. What are staircases, and what are the key considerations when designing a staircase?
13. Define the different types of floors used in buildings and their respective purposes.
14. What are the functions of doors and windows in building design? Discuss their placement and types.

Unit 3: Surveying

1. What are the fundamental principles of surveying, and why are they important in civil engineering?

2. Define the elements of distance measurement in surveying. How is distance measured in the field?

3. Explain angular measurements in surveying and their significance in determining the position of points.

4. What is the process of plotting an area in surveying? Describe the steps involved.

5. Define the term "base line" in surveying. How is it used to establish control points?

6. What are offsets in surveying, and how are they used to measure distances from the base line?

7. Provide an introduction to plane table surveying. What are its basic components and uses?

8. Explain the concept of levelling in surveying. What instruments are used for levelling?

9. What is a benchmark in surveying? Discuss its role in determining elevation.

10. Define the term "reduced level" in levelling. How is it calculated and used in fieldwork?

11. What are contours in surveying, and how are they useful in mapping the terrain?

12. Explain the different types of surveys used for measuring distance and angle in civil engineering.

13. Discuss the methods used for distance measurement in surveying, including chaining and taping.

14. What are the common errors in levelling, and how can they be minimized during fieldwork?

15. Describe how angular measurements are taken using a theodolite, and their importance in precise surveying.

Basic Mechanical Engineering

Unit 1: Introduction to Basic Mechanical Engineering

1. Define the term thermodynamics. Write the laws of thermodynamics.
2. Explain the Laws of thermodynamics with its applications?
3. Explain the working of Four stroke petrol engine with neat sketch
4. Explain the working of Two stroke petrol engine with neat sketch
5. Explain construction and working of Four stroke CI engine with help of neat diagram.
6. Differentiate between S.I. & C.I. engines.
7. Differentiate between four stroke & two stroke cycle
8. Write down classification of I.C engine
9. Explain Construction and Working of Thermal Power Plant?
10. Explain Construction & Working of Gas Power Plant?
11. Explain the Construction & Working of Nuclear Power plant?
12. Define the term Automobile & write down its objectives?

Unit 2: Building Components & Building Planning

1. Write Shorts notes on following:
    a. Factor of safety
    b. Machine & Mechanism
    c. Basics of fasteners
2. Explain with neat sketch Lathe Machine?
3. Explain with neat Sketch Drilling Machine?
4. Explain with neat Sketch Milling Machine?
5. Define the term Casting? Explain Sand casting
6. Define the term machining & Machinability?
7. Explain different machining processes such as turning, drilling, and milling?
8. Explain different types of materials & its applications.

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