Bharatiya Vidya Bhavan's

SARDAR PATEL COLLEGE OF ENGINEERING

(Government Aided Autonomous Institute)

Munshi Nagar, Andheri (W) Mumbai – 400058

F-4 END SEMESTER RE-EXAMINATION 2023

Program: ELECTRICAL/MECHANICAL/CIVIL Sem I — **Duration: 03 Hours**

Course Code: BS-BTE101/BTM101/BTC101 — **Maximum Points: 100**

Course Name: DCCN (R-22,R-23) — **Semester: I**

- **Attempt any five out of seven questions**
- **Use of scientific calculator is allowed**

Dr [illegible] Calculus & Complex mod.

QNO.	QUESTION	POINTS	CO	BL	Module No.
Q1 a	Find the extreme value of $x^3+3xy^2-15x^2-15y^2+72x$	06	1	2	2
Q1 b	If $\lvert z+i\rvert=\lvert z\rvert$ and $\arg\left(\frac{z+i}{z}\right)=\frac{\pi}{4}$ find z.	06	2	3, 5	3
Q1 c	Prove that $\log(1+\sin x)=x-\frac{x^2}{2}+\frac{x^3}{6}+\ldots\ldots\ldots\ldots$	08	1	1	S.S
Q2 a	State and verify Euler's theorem for $u=\frac{x+y+z}{\sqrt{x}+\sqrt{y}+\sqrt{z}}$	06	1	2	1
Q2 b	Using Newton-Raphson method find the root of $2\tan x=5e^{-x}$	06	3	2	5
Q2 c	If $\cos\alpha+\cos\beta+\cos\gamma=0$ and $\sin\alpha+\sin\beta+\sin\gamma=0$, prove that i) $\sin^2\alpha+\sin^2\beta+\sin^2\gamma=\cos^2\alpha+\cos^2\beta+\cos^2\gamma=\frac{3}{2}$ ii) $\cos 2\alpha+\cos 2\beta+\cos 2\gamma=0$ iii) $\cos(\alpha+\beta)+\cos(\beta+\gamma)+\cos(\gamma+\alpha)=0$ iv) $\sin(\alpha+\beta)+\sin(\beta+\gamma)+\sin(\gamma+\alpha)=0$	08	2	3	2
Q3a	If $y=x^3.\sin 3x$ find y_n	06	1	2	S.S
Q3b	Evaluate $\int_4^{5.2}\log_e x$ using Simpson's 3/8th rule with h = 0.2.	06	3	2	5

Q3 c	Separate into real and imaginary parts $\sqrt{i}^{\sqrt{i}}$	08	2	4, 5	2
Q4 a	If $U = \tan^{-1}\left[\frac{x^2+y^2}{x-y}\right]$ prove that $x^2\frac{\partial^2 u}{\partial x^2}+2xy\frac{\partial^2 u}{\partial x\partial y}+y^2\frac{\partial^2 u}{\partial y^2}=-\sin^3 u\cos u$	06	1	3	1
Q4b	Find the root of 2X-$\log_{10}$X=7 using false position method	06	3	2	5
Q4 c	Solve the following system of equations by using Gauss –Jacobi method (correct to 3 decimal places) $28x+4y-z=32$, $x+3y+10z=24$, $2x+17y+4z=35$	08	3	3	5
Q5 a	Solve $x^5=1+i$ and find the continued product of the roots.	06	2	2	4
Q5b	If $\tan\left(\frac{\pi}{6}+i\alpha\right)=x+iy$, prove that $x^2+y^2+\frac{2x}{\sqrt{3}}=1$	06	2	2	3
Q5c	Solve, by Gauss – Seidel method, the following system: $4x+2y+z=14$, $x+5y-z=10$, $x+y+8z=20$ correct upto 2 places of decimal	08	3	2	5
Q6a	Find a root of x^3-x-4=0 using bisection method	06	3	1	5
Q6 b	Show that $\tan\left\{i\log\frac{a-bi}{a+bi}\right\}=\frac{2ab}{a^2-b^2}$	06	2	3	3
Q6 c	Evaluate $\int_0^1 e^{-x^2}dx$ dividing the range into four equal parts using (i) Trapezoidal rule (ii) Simpson's 1/3rd rule	08	3	2	5
Q7 a	Solve by Gauss – Elimination Method: $2x-y+3z+w=9$, $3x+y-4z+3w=3$, $5x-4y+3z-6w=2$, $x-2y-z+2w=-2$	06	3	3	5
Q7b	Separate into real and imaginary parts $\tan^{-1}\left(e^{i\theta}\right)$	06	2	2	4
Q7 c	Find the maximum and minimum distance of the points (3, 4, 12) from the sphere $x^2+y^2+z^2=1$. Use Lagrange's method of multipliers to obtain the solution.	08	1	3, 5	2

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END SEMESTER-EXAMINATION 2023

Program: ELECTRICAL/MECHANICAL/CIVIL F.Y. (E,M,C) Sem I **Duration: 03 Hours**

Course Code: BS-BTE101/BTM101/BTC101 **Maximum Points: 100**

Course Name: DCCN Differential Calculus & Complex No. **Semester: I**

- **Attempt any five out of seven questions**
- **Use of scientific calculator is allowed**

QNO.	QUESTION	POINTS	CO	BL	Module No.
Q1 a	Find the extreme value of $xy(3-x-y)$	06	1	2	2
Q1 b	If $\lvert z+i\rvert=\lvert z\rvert$ and $\arg\left(\frac{z+i}{z}\right)=\frac{\pi}{4}$ find z.	06	2	3, 5	3
Q1 c	Prove that $\frac{\sin^{-1}x}{\sqrt{1-x^2}}=x+\frac{2x^3}{3}+\frac{8x^5}{15}+\ldots\ldots\ldots\ldots$	08	1	1	S.S
Q2 a	Verify Euler's theorem $U=x^4y^2\sin^{-1}\left(\frac{y}{x}\right)$.	06	1	2	1
Q2 b	Using Newton-Raphson method find the root of $2\tan x=5e^{-x}$	06	3	2	5
Q2 c	If $\cos\alpha+\cos\beta+\cos\gamma=0$ and $\sin\alpha+\sin\beta+\sin\gamma=0$, prove that i) $\sin^2\alpha+\sin^2\beta+\sin^2\gamma=\cos^2\alpha+\cos^2\beta+\cos^2\gamma=\frac{3}{2}$ i) $\cos2\alpha+\cos2\beta+\cos2\gamma=0$ ii) $\cos(\alpha+\beta)+\cos(\beta+\gamma)+\cos(\gamma+\alpha)=0$ iii) $\sin(\alpha+\beta)+\sin(\beta+\gamma)+\sin(\gamma+\alpha)=0$	08	2	3	2
Q3a	If $y=x^3.\sin3x$ find y_n	06	1	2	S.S
Q3b	[redacted]	06	3	2	5
3 c	Separate into real and imaginary parts	08	2	4,	2

	$\sqrt{i}^{\sqrt{i}}$			5	
Q4 a	If $u = x^3\left[\tan^{-1}\frac{y}{x}+\frac{y}{x}e^{\frac{y}{x}}\right]+y^{-3}\left[\sin^{-1}\frac{x}{y}+\frac{x}{y}\log\frac{x}{y}\right]$ then show that, $x^2\frac{\partial^2u}{\partial x^2}+2xy\frac{\partial^2u}{\partial x\partial y}+y^2\frac{\partial^2u}{\partial y^2}+x\frac{\partial u}{\partial x}+y\frac{\partial u}{\partial y}=9u$	06	1	3	1
Q4b	Find the root of $2X-\log_{10}X=7$ using false position method	06	3	2	5
Q4 c	Solve the following system of equations by using Gauss –Jacobi method (correct to 3 decimal places) $8x-3y+2z=20$, $4x+11y-z=33$, $6x+3y+12z=35$	08	3	3	5
Q5 a	Solve $x^6-i=0$	06	2	2	4
Q5b	If $\tan\left(\frac{\pi}{6}+i\alpha\right)=x+iy$, prove that $x^2+y^2+\frac{2x}{\sqrt{3}}=1$	06	2	2	3
Q5c	Solve, by Gauss – Seidel method, the following system: $28x+4y-z=32$, $x+3y+10z=24$, $2x+17y+4z=35$ correct upto 2 places of decimal	08	3	2	5
Q6a	Find a root of $x^3-x-4=0$ using bisection method	06	3	1	5
Q6 b	Show that $\tan\left\{i\log\frac{a-bi}{a+bi}\right\}=\frac{2ab}{a^2-b^2}$	06	2	3	3
Q6 c	Compute $\int_{0.2}^{1.4}\sin x-\log_e x+e^x\,dx$ using (i) Trapezoidal rule (ii) Simpson's 1/3rd rule taking $h=0.2$.	08	3	2	5
Q7 a	Solve by Gauss – Elimination Method: $10x-7y+3z+5w=6$, $-6x+8y-z-4w=5$, $5x-9y-2z+4w=7$, $3x+y+4z+11w=2$,	06	3	3	5
Q7b	Separate into real and imaginary parts $\cos^{-1}(3i/4)$	06	2	2	4
Q7 c	A rectangular box, which is open at the top, has a capacity of 256 cubic feet. Determine the dimension of the box such that the least material is required for the construction of the box. Use Lagrange's method of multipliers to obtain the solution.	08	1	3, 5	2

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END SEMESTER-EXAMINATION 2023

Program: ELECTRICAL/MECHANICAL/CIVIL F.Y. sem I **Duration: 03 Hours**

Course Code: BS-BTE101/BTM101/BTC101 **Maximum Points: 100**

Course Name: DCCN **Semester: I**

- **Attempt any five out of seven questions**
- **Use of scientific calculator is allowed**

Differential Calculus & Complex no.

QNO.	QUESTION	POINTS	CO	BL	Module No.
Q1 a	Find the extreme value of $xy(3-x-y)$	06	1	2	2
Q1 b	If $\|z+i\|=\|z\|$ and $\arg\left(\frac{z+i}{z}\right)=\frac{\pi}{4}$ find z.	06	2	3, 5	3
Q1 c	Prove that $\frac{\sin^{-1}x}{\sqrt{1-x^2}}=x+\frac{2x^3}{3}+\frac{8x^5}{15}+\ldots\ldots\ldots\ldots$	08	1	1	S.S
Q2 a	Verify Euler's theorem $U=x^4y^2\sin^{-1}\left(\frac{y}{x}\right)$	06	1	2	1
Q2 b	Using Newton-Raphson method find the root of $2\tan x=5e^{-x}$	06	3	2	5
Q2 c	If $\cos\alpha+\cos\beta+\cos\gamma=0$ and $\sin\alpha+\sin\beta+\sin\gamma=0$, prove that i) $\sin^2\alpha+\sin^2\beta+\sin^2\gamma=\cos^2\alpha+\cos^2\beta+\cos^2\gamma=\frac{3}{2}$ i) $\cos 2\alpha+\cos 2\beta+\cos 2\gamma=0$ ii) $\cos(\alpha+\beta)+\cos(\beta+\gamma)+\cos(\gamma+\alpha)=0$ iii) $\sin(\alpha+\beta)+\sin(\beta+\gamma)+\sin(\gamma+\alpha)=0$	08	2	3	2
3a	If $y=x^3.\sin 3x$ find y_n	06	1	2	S.S
3b	[redacted]	06	3	2	5
3 c	Separate into real and imaginary parts	08	2	4,	2

	$\sqrt{i}^{\sqrt{i}}$			5	
Q4 a	If $u = x^3\left[\tan^{-1}\frac{y}{x}+\frac{y}{x}e^{-\frac{y}{x}}\right]+y^{-3}\left[\sin^{-1}\frac{x}{y}+\frac{x}{y}\log\frac{x}{y}\right]$ then show that, $x^2\frac{\partial^2u}{\partial x^2}+2xy\frac{\partial^2u}{\partial x\partial y}+y^2\frac{\partial^2u}{\partial y^2}+x\frac{\partial u}{\partial x}+y\frac{\partial u}{\partial y}=9u$	06	1	3	1
Q4b	Find the root of $2X-\log_{10}X=7$ using false position method	06	3	2	5
Q4 c	Solve the following system of equations by using Gauss –Jacobi method (correct to 3 decimal places) $8x-3y+2z=20$, $4x+11y-z=33$, $6x+3y+12z=35$	08	3	3	5
Q5 a	Solve $x^6-i=0$	06	2	2	4
Q5b	If $\tan\left(\frac{\pi}{6}+i\alpha\right)=x+iy$, prove that $x^2+y^2+\frac{2x}{\sqrt{3}}=1$	06	2	2	3
Q5c	Solve, by Gauss – Seidel method, the following system: $28x+4y-z=32$, $x+3y+10z=24$ correct upto 2 places of decimal, $2x+17y+4z=35$	08	3	2	5
Q6a	Find a root of $x^3-x-4=0$ using bisection method	06	3	1	5
Q6 b	Show that $\tan\left\{i\log\frac{a-bi}{a+bi}\right\}=\frac{2ab}{a^2-b^2}$	06	2	3	3
Q6 c	Compute $\int_{0.2}^{1.4}\sin x-\log_e x+e^x\,dx$ using (i) Trapezoidal rule (ii) Simpson's 1/3rd rule taking $h=0.2$.	08	3	2	5
Q7 a	Solve by Gauss – Elimination Method: $10x-7y+3z+5w=6$, $-6x+8y-z-4w=5$, $5x-9y-2z+4w=7$, $3x+y+4z+11w=2$,	06	3	3	5
Q7b	Separate into real and imaginary parts $\cos^{-1}(3i/4)$	06	2	2	4
Q7 c	A rectangular box, which is open at the top, has a capacity of 256 cubic feet. Determine the dimension of the box such that the least material is required for the construction of the box. Use Lagrange's method of multipliers to obtain the solution.	08	1	3, 5	2

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a/2/24

END SEMESTER RE-EXAMINATION 2023

Program: ELECTRICAL/MECHANICAL/CIVIL F.Y. Sem I **Duration: 03 Hours**

Course Code: BS-BTE101/BTM101/BTC101 **Maximum Points: 100**

Course Name: DCCN (R-22,R-23) **Semester: I**

- **Attempt any five out of seven questions**
- **Use of scientific calculator is allowed**

Differential Calculus & Complex nos.

QNO.	QUESTION	POINTS	CO	BL	Module No.
Q1 a	Find the extreme value of $x^3+3xy^2-15x^2-15y^2+72x$	06	1	2	2
Q1 b	If $\lvert z+i\rvert=\lvert z\rvert$ and $\arg\left(\frac{z+i}{z}\right)=\frac{\pi}{4}$ find z.	06	2	3, 5	3
Q1 c	Prove that $\log(1+\sin x)=x-\frac{x^2}{2}+\frac{x^3}{6}+\ldots\ldots\ldots\ldots$	08	1	1	S.S
Q2 a	State and verify Euler's theorem for $u=\frac{x+y+z}{\sqrt{x}+\sqrt{y}+\sqrt{z}}$	06	1	2	1
Q2 b	Using Newton-Raphson method find the root of $2\tan x=5e^{-x}$	06	3	2	5
Q2 c	If $\cos\alpha+\cos\beta+\cos\gamma=0$ and $\sin\alpha+\sin\beta+\sin\gamma=0$, prove that i) $\sin^2\alpha+\sin^2\beta+\sin^2\gamma=\cos^2\alpha+\cos^2\beta+\cos^2\gamma=\frac{3}{2}$ ii) $\cos 2\alpha+\cos 2\beta+\cos 2\gamma=0$ iii) $\cos(\alpha+\beta)+\cos(\beta+\gamma)+\cos(\gamma+\alpha)=0$ iv) $\sin(\alpha+\beta)+\sin(\beta+\gamma)+\sin(\gamma+\alpha)=0$	08	2	3	2
Q3a	If $y=x^3.\sin 3x$ find y_n	06	1	2	S.S
Q3b	Evaluate $\int_4^{5.2}\log_e x$ using Simpson's 1/3rd rule with $h=0.2$	06	3	2	5

Q3 c	Separate into real and imaginary parts $\sqrt{i}^{\sqrt{i}}$	08	2	4, 5	2
Q4 a	If $U = \tan^{-1}\left[\frac{x^2+y^2}{x-y}\right]$ prove that $x^2\frac{\partial^2 u}{\partial x^2} + 2xy\frac{\partial^2 u}{\partial x \partial y} + y^2\frac{\partial^2 u}{\partial y^2} = -\sin^3 u \cos u$	06	1	3	1
Q4b	Find the root of $2X-\log_{10}X=7$ using false position method	06	3	2	5
Q4 c	Solve the following system of equations by using Gauss –Jacobi method (correct to 3 decimal places) $28x+4y-z=32$, $x+3y+10z=24$, $2x+17y+4z=35$	08	3	3	5
Q5 a	Solve $x^5 = 1+i$ and find the continued product of the roots.	06	2	2	4
Q5b	If $\tan\left(\frac{\pi}{6}+i\alpha\right) = x+iy$, prove that $x^2+y^2+\frac{2x}{\sqrt{3}}=1$	06	2	2	3
Q5c	Solve, by Gauss – Seidel method, the following system: $4x+2y+z=14$, $x+5y-z=10$, $x+y+8z=20$ correct upto 2 places of decimal	08	3	2	5
Q6a	Find a root of x^3-x-4=0 using bisection method	06	3	1	5
Q6 b	Show that $\tan\left\{i\log\frac{a-bi}{a+bi}\right\} = \frac{2ab}{a^2-b^2}$	06	2	3	3
Q6 c	Evaluate $\int_0^1 e^{-x^2}dx$ dividing the range into four equal parts using (i) Trapezoidal rule (ii) Simpson's 1/3rd rule	08	3	2	5
Q7 a	Solve by Gauss – Elimination Method: $2x-y+3z+w=9$, $3x+y-4z+3w=3$, $5x-4y+3z-6w=2$, $x-2y-z+2w=-2$	06	3	3	5
Q7b	Separate into real and imaginary parts $\tan^{-1}\left(e^{i\theta}\right)$	06	2	2	4
Q7 c	Find the maximum and minimum distance of the points (3, 4, 12) from the sphere $x^2+y^2+z^2=1$. Use Lagrange's method of multipliers to obtain the solution.	08	1	3, 5	2

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END SEMESTER-I RE-EXAMINATION FEBUARY 2024

Program: F.Y. B.Tech Electrical Sem I **Duration:** 180 Min

Course Code: BS-BTE-102 **Maximum Points:** 100

Course Name: Engineering Chemistry **Semester:** I

Instructions:

1 Question No (Q6) is compulsory
2 Attempt any 4 from Q1, Q2,Q3, Q4,Q5
3 Write the chemical reactions wherever necessary

Q.No.	Questions	Points	CO	BL	Mod. No.
Q1					
a	Write note on metallic conductor	5	1	1	4
b	Explain the factor affecting conductance electrolyte in solution	5	1	2	4
c	Explain the working of the lead accumulator with its half and net cell reactions during the charging and discharging of the cell	10	1,4	2	4
Q2					
a	Explain Bimetallic corrosion process	5	1	2	1
b	Write the difference between electrochemical and galvanic series	5	1	1	1
c	Explain wet corrosion with a anodic and cathodic reaction mechanism	10	1,2	2	1
Q3					
a	Explain Sacrificial anode cathodic protection of metal	5	2,4	1	2
b	Write difference between anodic and cathodic coating	5	2,4	2	2
c	Explain organic and inorganic metallic coating of metal	10	1,3	2	2
Q4					
a	Explain properties changes with composite material	5	1,3	2	3
b	Explain cationic polymerization mechanism	5	1,3	2	3
c	Describe the conducting polymer and its different types with suitable example	10	1,4	2	3
Q5					

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END SEMESTER-I RE-EXAMINATION FEBUARY 2024

a	Write applications of composite materials in medical field	5	1,2	3	3
b	Explain cathodic and anodic inhibitors used for protect metal	5	1	1	2
c	Write factors related to metal affecting corrosion process	10	1	1	1
Q6					
a	A conductivity cell dipped in 0.005 M NaCl gives at 25 °C a resistance of 10510. If the electrode of the conductivity cell are 0.9 cm apart and area of cross section 0.9 cm^2 what will be the molar conductivity of the solution at 25 °C.	5	1,	4	4
b	The conductivity of 0.006 M NaI solution at 25 °C is 4.065×10^{-4} ohm^{-1} cm^{-1}. calculate molar conductance of solution	5	1	3	4
c	Explain molar conductance with its formula	5	1	1	4
d	Calculate the EMF of cell. The standard of cathode and anode are given E^0 cathode = +1.585 and E^0 anode = - 0.456	5	1	3	4

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END SEMESTER-I EXAMINATION DECEMBER 2023

Program: F.Y. B.Tech Electrical Sem I

Course Code: BS-BTE-102

Course Name: Engineering Chemistry

Duration: 180 Min

Maximum Points: 100

Semester: I

26/12/23

Instructions:
1 Question No (Q6) is compulsory
2 Attempt any 4 from Q1, Q2,Q3, Q4,Q5
3 Write the chemical reactions wherever necessary

Q.No.	Questions	Points	CO	BL	Mod. No.
Q1					
a	Write the difference between metallic and electrolytic conductor	5	1	1	4
b	Explain specific conductivity and specific resistance with its correlation	5	1	2	4
c	Explain the working of the lead accumulator with its half and net cell reactions during the discharging of the cell	10	1,4	2	4
Q2					
a	Explain differential aeration corrosion	5	1	2	1
b	Write the difference between wet and dry corrosion	5	1	1	1
c	Explain dry corrosion with a suitable reaction, diagram, and mechanism	10	1,2	2	1
Q3					
a	Write difference between anodic and cathodic coating	5	2,4	1	2
b	Explain the impress current cathodic method for the protection of metal from the corrosion process.	5	2,4	2	2
c	Explain different methods for the application of metal coating	10	1,3	2	2
Q4					
a	Explain polymer with suitable examples	5	1,3	2	3
b	Explain polymer composite materials and properties changes with composite material	5	1,3	2	3

END SEMESTER-I EXAMINATION DECEMBER 2023

c	Describe the conducting polymer and its different types with suitable example	10	1,4	2	3
Q5					
a	Write chemical synthesis of silicon nitride	5	1,2	3	3
b	Explain different types of corrosion inhibitors used to protect metal from corrosion	5	1	1	2
c	Write factor affecting rate of the corrosion process	10	1	1	1
Q6					
a	A conductivity cell dipped in 0.007 M NaCl gives at 25 ^{0}C a resistance of 10710. If the electrode of the conductivity cell are 0.8 cm apart and area of cross section 0.82 cm^2 what will be the molar conductivity of the solution at 25 ^{0}C.	5	1	4	4
b	The conductivity of 0.007 M NaI solution at 25 ^{0}C is 5.065x10^{-4} ohm^{-1} cm^{-1}. calculate molar conductance of solution	5	1	3	4
c	Describe the factor affecting conductance electrolyte in solution	5	1	1	4
d	Calculate the EMF of cell. The standard of cathode and anode are given E^0 cathode = +1.685 and E^0 anode = - 0.356	5	1	3	4

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Munshi Nagar, Andheri (W) Mumbai – 400058

END SEMESTER-I RE-EXAMINATION FEBUARY 2024

Program: F.Y. B.Tech Electrical

Duration: 180 Min

Course Code: BS-BTE-102

Maximum Points: 100

Course Name: Engineering Chemistry

Semester: I

Instructions:

1 Question No (Q6) is compulsory
2 Attempt any 4 from Q1, Q2,Q3, Q4,Q5
3 Write the chemical reactions wherever necessary

Q.No.	Questions	Points	CO	BL	Mod. No.
Q1					
a	Write note on metallic conductor	5	1	1	4
b	Explain the factor affecting conductance electrolyte in solution	5	1	2	4
c	Explain the working of the lead accumulator with its half and net cell reactions during the charging and discharging of the cell	10	1,4	2	4
Q2					
a	Explain Bimetallic corrosion process	5	1	2	1
b	Write the difference between electrochemical and galvanic series	5	1	1	1
c	Explain wet corrosion with a anodic and cathodic reaction mechanism	10	1,2	2	1
Q3					
a	Explain Sacrificial anode cathodic protection of metal	5	2,4	1	2
b	Write difference between anodic and cathodic coating	5	2,4	2	2
c	Explain organic and inorganic metallic coating of metal	10	1,3	2	2
Q4					
a	Explain properties changes with composite material	5	1,3	2	3
b	Explain cationic polymerization mechanism	5	1,3	2	3
c	Describe the conducting polymer and its different types with suitable example	10	1,4	2	3
Q5					

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END SEMESTER-I RE-EXAMINATION FEBUARY 2024

a	Write applications of composite materials in medical field	5	1,2	3	3
b	Explain cathodic and anodic inhibitors used for protect metal	5	1	1	2
c	Write factors related to metal affecting corrosion process	10	1	1	1
Q6					
a	A conductivity cell dipped in 0.005 M NaCl gives at 25 ^{0}C a resistance of 10510. If the electrode of the conductivity cell are 0.9 cm apart and area of cross section 0.9 cm^2 what will be the molar conductivity of the solution at 25 ^{0}C.	5	1,	4	4
b	The conductivity of 0.006 M NaI solution at 25 ^{0}C is 4.065x10^{-4} ohm^{-1} cm^{-1}. calculate molar conductance of solution	5	1	3	4
c	Explain molar conductance with its formula	5	1	1	4
d	Calculate the EMF of cell. The standard of cathode and anode are given E^0 cathode = +1.585 and E^0 anode = - 0.456	5	1	3	4

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END SEMESTER-I EXAMINATION DECEMBER 2023

Program: F.Y. B.Tech Civil Sem I

Course Code: BS-BTC-102

Course Name: Engineering Chemistry

Duration: 180 Min

Maximum Points: 100

Semester: I

Instructions:
1 Question No (Q6) is compulsory
2 Attempt any 4 from Q1, Q2,Q3, Q4,Q5
3 Write the chemical reactions wherever necessary

Q.No.	Questions	Points	CO	BL	Mod. No.
Q1					
a	Write note EDTA method for measurement of hardness in a water sample with chemical reaction	5	1	1	3
b	Explain hard water and soft water with a suitable example	5	1	2	3
c	Explain the cation and anion exchange resin with suitable chemical reactions. Explain reverse-osmosis better than cation and anion for purification of water	10	1,2	2	3
Q2					
a	Explain differential aeration corrosion	5	1	2	1
b	Write the difference between wet and dry corrosion	5	1	1	1
c	Explain dry corrosion with a suitable reaction, diagram, and mechanism	10	1,2	2	1
Q3					
a	Write difference between anodic and cathodic coating	5	2,4	1	2
b	Explain the impress current cathodic method for the protection of metal from the corrosion process.	5	2,4	2	2
c	Explain different methods for the application of metal coating	10	1,3	2	2
Q4					
a	Explain polymer with suitable examples	5	1,3	2	4
b	Explain polymer composite materials and properties changes with composite material	5	1,3	2	4

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END SEMESTER-I EXAMINATION DECEMBER 2023

c	Describe the conducting polymer and its different types with suitable example	10	1,4	2	4
Q5					
a	Write chemical synthesis of silicon nitride	5	1,2	3	4
b	Explain different types of corrosion inhibitors used to protect metal from corrosion	5	1	1	3
c	Write factor affecting rate of the corrosion process	10	1	1	1
Q6					
a	Convert the unit 30 PPM in to ^{0}Fr, ^{0}Cl, mg/L 40 ^{0}Cl in to ^{0}Fr , ppm, mg/L	5	1	4	3
b	Calculate the temporary , permanent and total hardness for water sample contain $Mg(HCO_3)_2$=25mg/L, $CaSO_4$= 10mg/L $CaCl_2$= 10mg/L	5	1	3	3
c	Write chemical reactions takes place in soda lime process	5	1	1	3
d	Prove that 1 ppm is equal to 1mg/L	5	1	3	3

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RE Exam – FEB 2024 Examination

Program: FY CIVIL, M, E, Sem I — **Duration:3 hours**

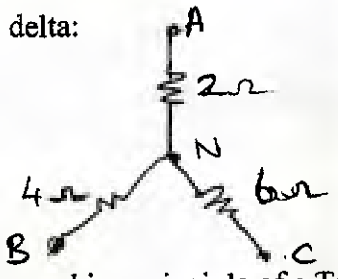
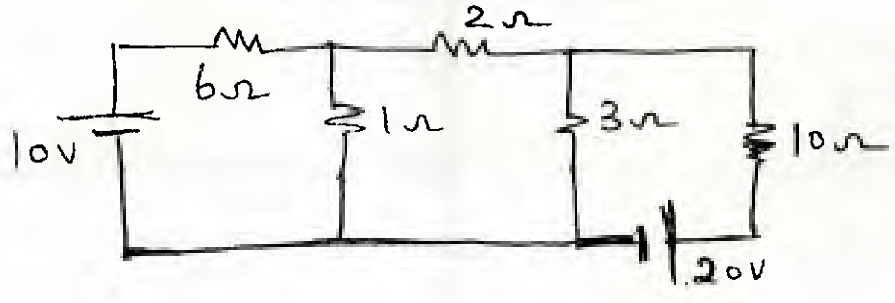
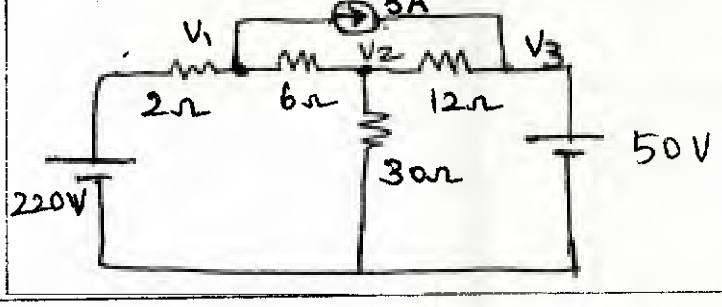
Course Code: ES-BTC101 — **Maximum Points:100**

Course Name:Basic electrical and Electronics Engg — **Semester:I**

Attempt any FIVE questions out of SEVEN questions.

Answers to all sub questions should be grouped together.

Figures to the right indicates full marks.

Q.No	Questions	Points	CO	BL
Q1.(a)	State and prove Maximum power transfer theorem.	4	1	1,4
b)	What is a rectifier?What is the rectification efficiency for Half wave and full wave rectifiers.?	4	2 3	4 4
c)	List the losses of a transformer.	4		
d)	Convert to delta: 	4	3	1,4
e)	Explain the working principle of a Transducers.List 4 of them.	4	3	2
2a)	Find the current through the 2Ω by mesh analysis 	10	1	3
b)	Find the node voltages V_1 and V_2 ,V_3 by nodal analysis. 	10	1	3

Q3a)	A resistor of 10Ω is connected in series with a 10μf capacitor. This circuit is connected to a 230V, 50 supply. Find a) impedance b) current c) power factor d) phase angle e) draw the phasor diagram	10	1	3
3b)	An inductance of 1H is in series with a capacitor of 1μf. Determine the impedance of the circuit when frequency is a) 50 B) 100.	10	1	3
4				
a)	Write the relation between line current and phase current, line voltage and phase voltage, in three phase circuit when load is connected in star and Delta configuration.Draw the circuit diagrams for star and delta connected system showing all line and phase voltages and currents.	10	1	3
b)	Three loads, each of resistance 25 ohm, are connected in delta to a 415 V, 3-phase supply.Determine (a) the system phase voltage, (b) the phase current (c) the line current. d) power consumed.	10	1	3
Q5.(a)	Explain the working principle of a transformer with a neat diagram.Derive the emf equation of a transformer .	10	2	3,4
b)	Explain the two types of single phase induction motors with neat diagrams.	10	2	4
Q6.(a	Explain the working of npn transistor ? What are its applications?	8	3	1,2
b)	i) Explain the working of a bridge rectifier circuit with neat circuit diagrams along with the waveforms for the same. ii) write short notes on filters	8 4	3	4
Q7a)	Explain the construction and working of LVDT with neat diagrams.	10	4	4
b)	List the differences between sensors and transducers.	5	4	2
c)	Explain the Superposition theorem.	5	1	1,2

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ENDSEM EXAMINATION DECEMBER 2023

Program: Electrical Engineering Sem I

Course Code: ES-BTE103

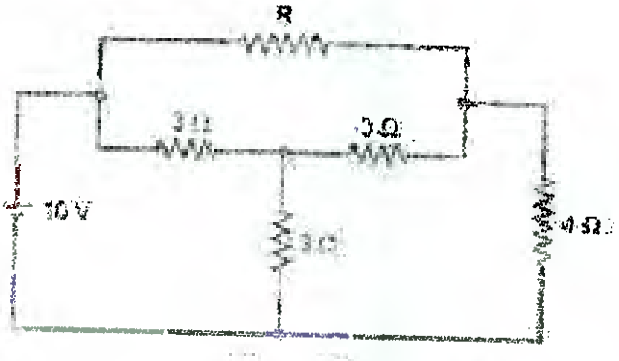
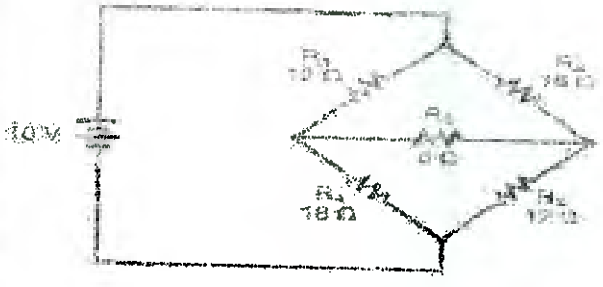
Course Name: Basics of Electrical Engg.-1

Duration: 3 hours

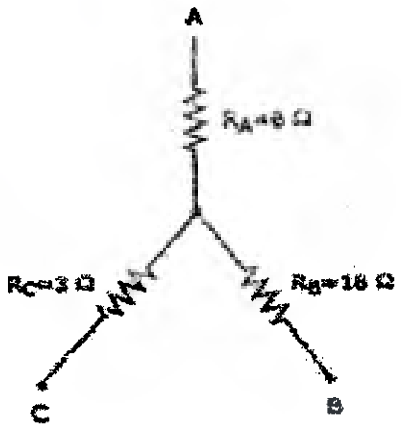
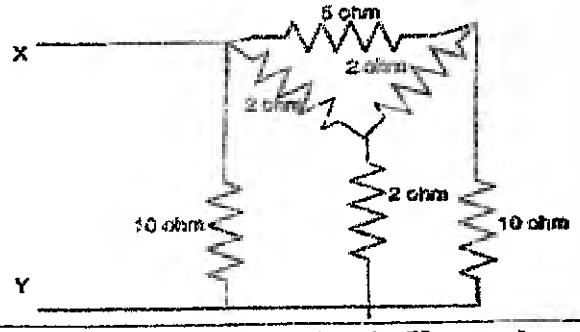
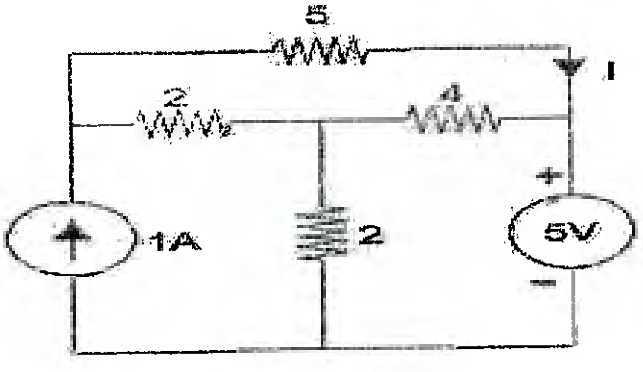
Maximum Points: 100

Semester: I

Notes: Solve any five questions

Q.No.	Questions	marks	CO	BL	Module No.
1A	Using star/delta transformation, determine the value of R for the network shown in fig. such that 4Ω resistor consumes the maximum power. 	10	1	3	2,3
1B	State and prove Maximum power transfer theorem. Hence derive the condition for maximum power to be transfer and its value.	10	1	2	3
2A	Determine current through R3 by Norton's theorem. Verify by Mesh 	12	1	3	2,3

ENDSEM EXAMINATION DECEMBER 2023

3	Convert the given Star to delta equivalent: 	8	1	3	2
A	**Find the equivalent resistance between X and Y.** 	8	1	3	2
B	**Consider the following circuit. Use mesh method to find the value of current I in the 5 Ω resistor in the circuit given in the figure.** 	12	1	3	2

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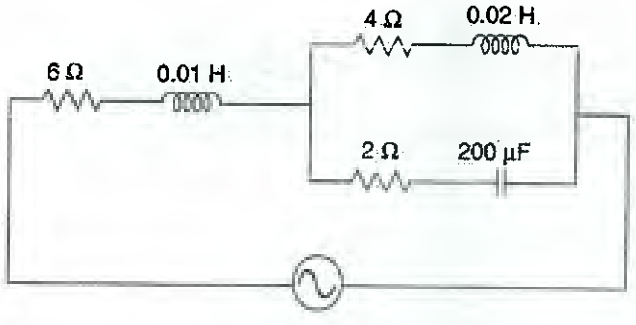
ENDSEM EXAMINATION DECEMBER 2023

4A	**Answer in one sentence** 1. **Internal resistance of ideal voltage source is=……..** 2. **The value of the voltage controlled current source, ia=g*va given g=0.3 and va=9.5mV, equals …..** 3. **The value of the current controlled voltage source, given r=0.8 and ia=9.5mA, equals _____** 4. **Three resistances of two ohms each are connected in star. In the equivalent delta representation each resistance will have a value of _____ Ω.**	**8**	**1,2**	**2**	**1,2**
B	**Draw ideal current and voltage source.** **Draw and explain dependent sources.**	**2** **10**	**1** **1**	**2** **2**	**1** **1**
5. A	**Determine the current in the circuit shown in Fig. Also, find the power consumed as well as power factor.**  Fig.	**8**	**2**	**3**	**4**
5. B	**A single phase motor is connected to 400 V, 50 Hz supply takes 31.7 A at a power factor of 0.7 lagging. Calculate the capacitance required in parallel with the motor to raise the power factor to 0.9 lagging.**	**12**	**2**	**4**	**5**
6. A	**An impedance of R + jX ohms is connected in parallel with another impedance of −j5 ohms as shown in Fig. The combination is then connected in series with a pure resistance of 2 ohm. When connected across a 100 V, 50 Hz ac supply, the total current drawn by the circuit is 20 A and the total power consumed by the circuit is 2 kW. Calculate (a) currents through parallel branches (b) R and L.**	**10**	**2**	**3**	**4**

ENDSEM EXAMINATION DECEMBER 2023

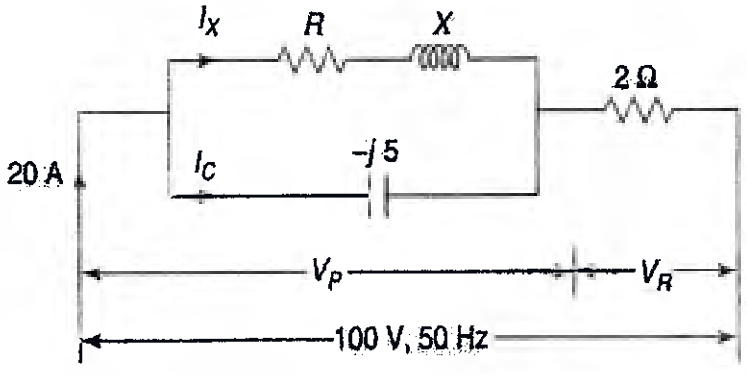
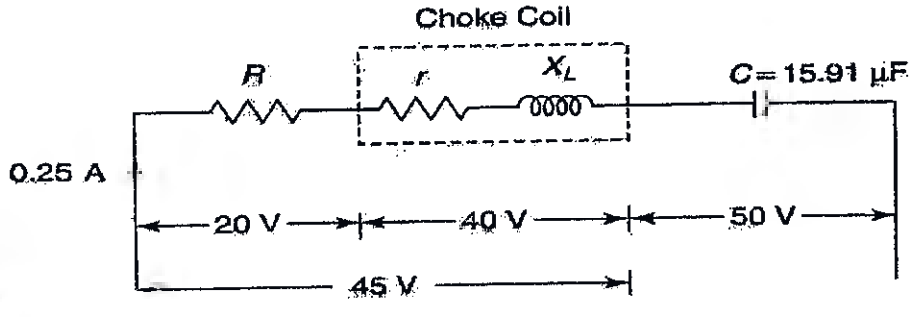


Fig.

B	The load taken from a supply consists of a (a) lamp load of 10 kW at unity power factor, (b) motor load of 80 kVA at 0.8 power factor lagging, and (c) motor load of 40 kVA at 0.7 power factor lagging. Calculate the total load taken from the supply in kW and in kVA and the power factor of the combined load.	10	2	3	5
A	A load of 22 kW operates at 0.8 lagging power factor when connected to a 420 V, single-phase, 50 Hz source. Find (a) current in the load, (h) power factor angle, (c) impedance, (d) resistance of load, (e) reactance of load, (f) voltage and current equations.	8	2	3	4
B	In the circuit of Fig., a pure resistor R, a choke coil and a pure capacitor of 15.91 mF are connected in series across a supply of V volts and carries a current of 0.25 A. The voltage across the choke coil is 40 V, the voltage across the capacitor is 50 V and the voltage across the resistor is 20 V. The voltage across the combination of R and the choke coil is 45 V. Calculate (a) supply voltage, (b) frequency, and (c) power loss in the choke coil	12	2	3	5



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RE-EXAMINATION FEBRUARY 2024

Program: Electrical Engineering F.Y. Sem I

Duration: 3 hours

Course Code: ES-BTE103

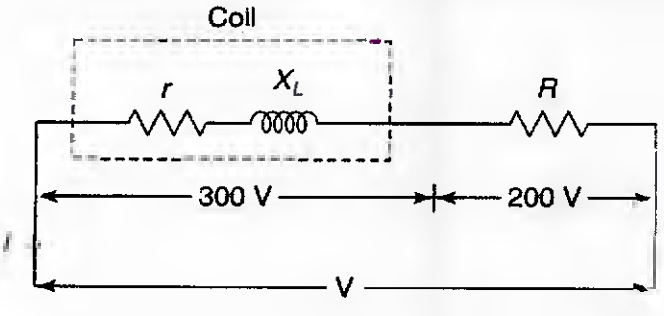
Maximum Points: 100

Course Name: Basics of Electrical Engg.-1

Semester: I

Notes:

Solve any five questions

Q.No.	Questions	Points	CO	BL	Module No.
1A	A circuit consists of a pure resistor and coil in series as shown in Fig. Power dissipated in the resistor and in the coil are 1000 W and 250 W respectively. The voltage drops across the resistor and the coil are 200 V and 300 V respectively. Determine (a) value of pure resistance, (b) resistance and reactance of the coil, (c) combined resistance of the circuit, (d) combined impedance, and (e) supply voltage. 	10	2	3	4

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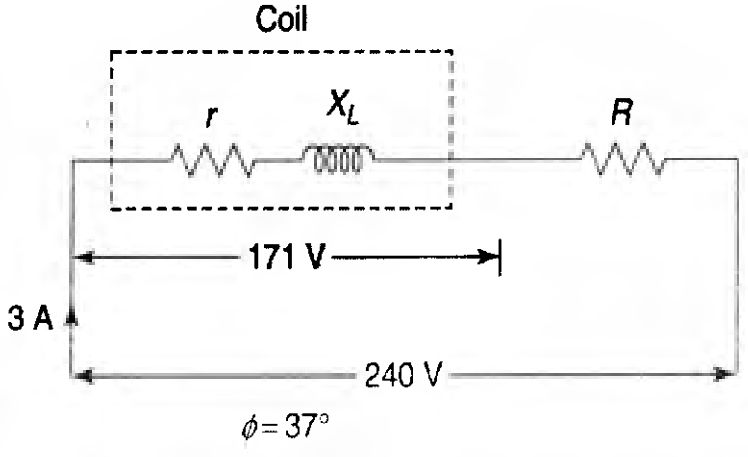
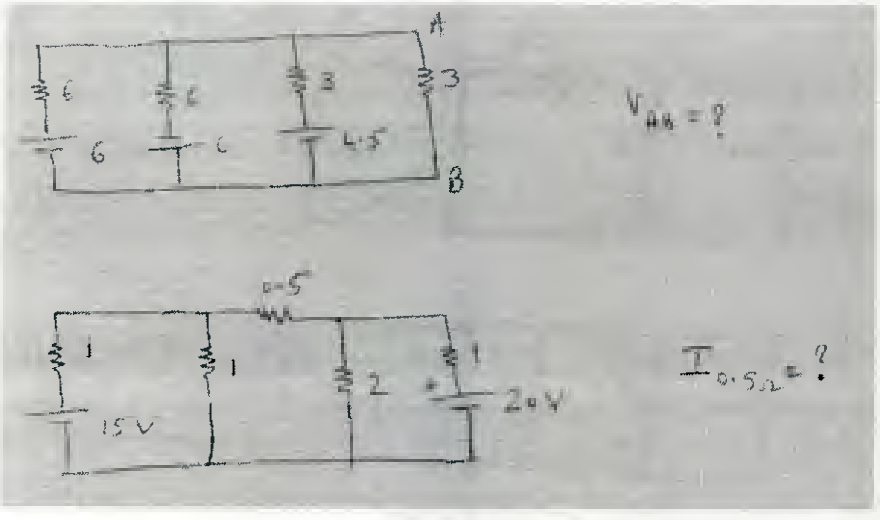
RE-EXAMINATION FEBRUARY 2024

1B	When a resistor and a coil in series are connected to a 240 V supply as shown in attached Fig. a current of 3 A flows, lagging 37° behind the supply voltage. The voltage across the coil is 171 volts. Find the resistance and reactance of the coil, and the resistance of the resistor.  	10	2	3	4
2A	State and explain Norton's theorem	10	1	3	3
2B	A circuit consists of a pure resistor, a pure inductor, and a capacitor connected in series. When the circuit is supplied with 100 V, 50 Hz supply, the voltages across inductor and resistor are 240 V and 90 V respectively. If the circuit takes a 10 A leading current, calculate (a) value of inductance, resistance and capacitance, (b) power factor of the circuit, and (c) voltage across the capacitor.	10	2	3	4
3A	An RLC series circuit has a current which lags the applied voltage by 45°. The voltage across the inductance has a maximum value equal to twice the maximum value of voltage across the capacitor. Voltage across the inductance is 300 sin (1000t) and R = 20 ohm. Find the value of inductance and capacitance.	14	2	3	5
3B	A resistor of 20 ohm, inductor of 0.05 H and a capacitor of 50 micro-F are connected in series. A supply voltage 230 V, 50 Hz is connected across the series combination. Calculate the following: (a) impedance, (b) current drawn by the circuit, (c) phase difference and power factor.	6	2	3	5
4A	An iron-cored coil takes 4 A at a power factor of 0.5 when connected to a 200 V, 50 Hz supply. When the iron core is removed	10	2	3	4

RE-EXAMINATION FEBRUARY 2024

	and the voltage is reduced to 40 V, the current rises to 5 A at a pf of 0.8. Find the iron loss in the core and inductance in each case.				
4B	A voltage of 200 ∠25 ° V is applied to a circuit composed of two parallel branches. If the branch currents are 10 ∠40 ° A 20 ∠ -30° A, determine the kVA, kVAR and kW in each branch. Also, calculate the pf of the combined load.	10	2	3	4
5A	Determine voltage across AB by superposition theorem. Verify by source conversion. 	10	1	3	2,3
	State and explain Superposition theorem.	10	1	3	3
6A	Determine current through RL using Thevenin's theorem. Verify by nodal method	10	1	3	2,3

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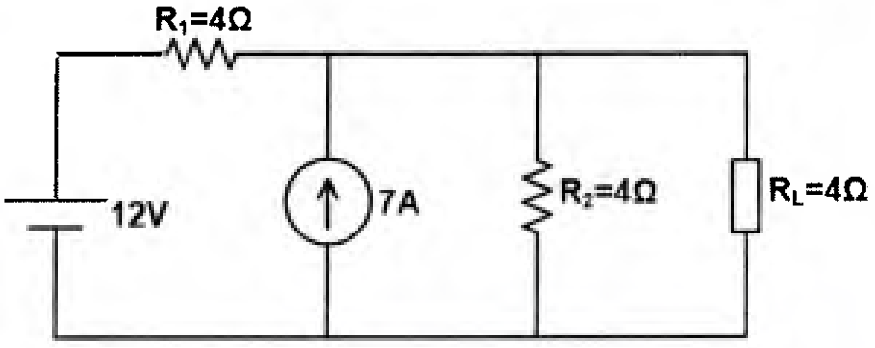
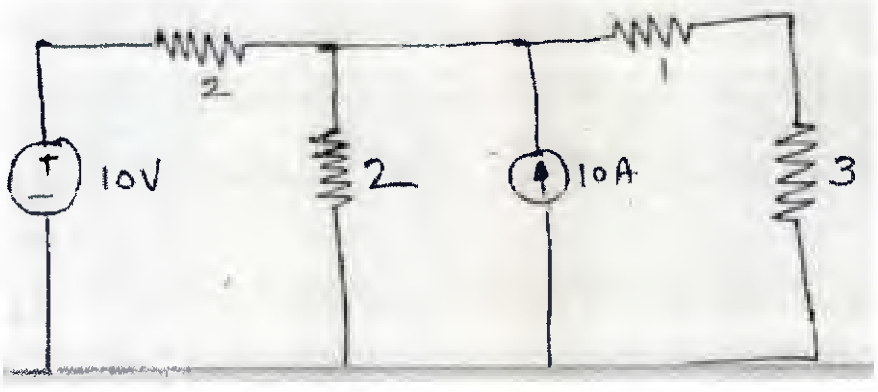
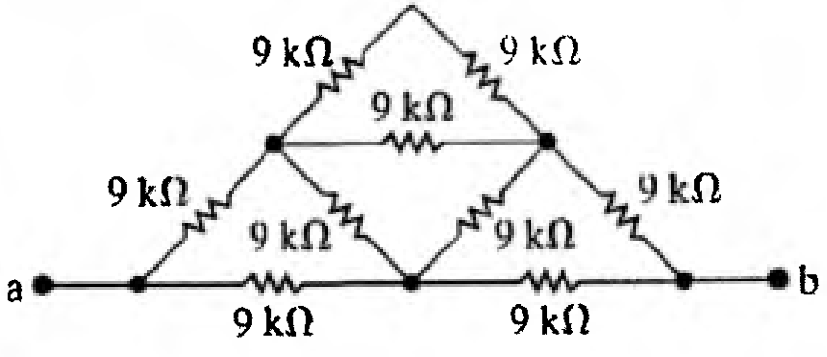
					
6B	 Determine I through 3Ω by Norton's theorem. Verify by Node	10	1	3	2,3
7A	 Determine Rab	10	1	3	2
7B	State and explain Thevenoin's Theorem.	10	1	3	3

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End Semester – December 2023 Examination

Program: FY CIVIL Sem I **Duration:3 hours**

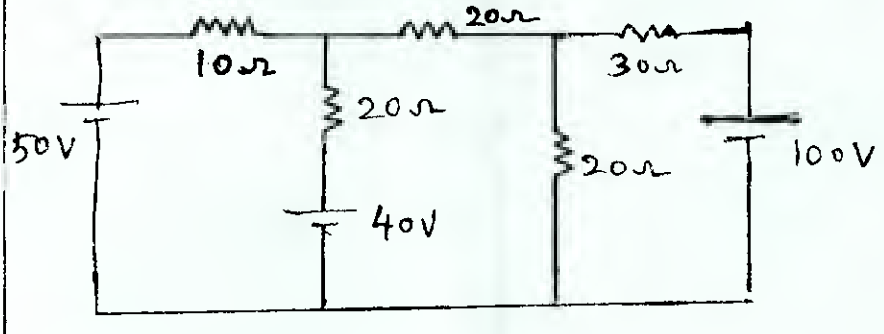
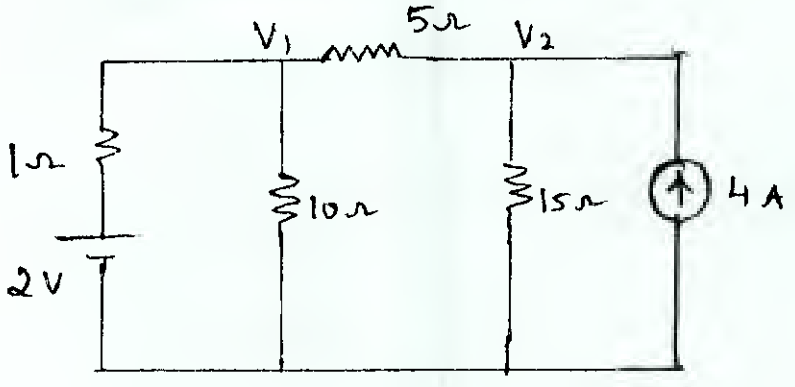
Course Code: ES-BTC101 **Maximum Points:100**

Course Name:Basic electrical and Electronics Engg **Semester:I**

Attempt any FIVE questions out of SEVEN questions.

Answers to all sub questions should be grouped together.

Figures to the right indicates full marks.

Q.No	Questions	Points	CO	BL
Q1.(a)	State and prove Maximum power transfer theorem.	5	1	1,4
b)	Explain the working principle of a transformer with a neat diagram.	5	2	4
c)	Define ripple factor and rectifier efficiency. State their values for half and full wave rectifier..	5	3	4
d)	Explain the working principle of transducers and list any 4 of them.	5	4	1,4
2a)	Find the current through the 10 Ω by Nortons theorem. 	10	1	3
b)	Find the node voltages V_1 and V_2 by nodal analysis. 	10	1	3

Q3a)	A resistor of 100Ω is connected in series with a 50μf capacitor. This circuit is connected to a 200V, 50 supply. Find a) impedance b) current c) power factor d) phase angle e) voltage across resistor and voltage across capacitor.	10	1	3
3b)	An inductive coil draws 10A current and consumes 1 KW power from a 200 V,50 ac supply. Determine a) impedance b) power factor c) reactive and apparent power.d)draw the phasor diagram.	10	1	3
4a)	List the advantages of three phase system over single phase system?	4	1	2
b)	Write the relation between line current and phase current, line voltage and phase voltage, in three phase circuit when load is connected in star and Delta configuration.Draw the circuit diagrams for star and delta connected system showing all line and phase voltages and currents.	8	1	3
c)	Three loads, each of resistance 30 ohm, are connected in star to a 415 V, 3-phase supply.Determine (a) the system phase voltage, (b) the phase current (c) the line current. d) power consumed.	8	1	3
Q5.(a)	Derive the emf equation of a transformer .Explain the losses that takes place in a transformer .	10	2	3,4
b)	Explain the two types of single phase induction motors with neat diagrams.	10	2	4
Q6.(a)	Explain the working of npn transistor ? What are its applications? Mention the different configurations of transistor. .Draw the circuit diagram of common emitter configuration of an npn transistor.	10	3	1,2
b)	i) Explain the working of a center tapped full wave rectifier circuit with neat circuit diagrams along with the waveforms for the same. ii) Draw circuit diagram and the output waveforms if a capacitor is used as a filter for the above circuit.	10	3	4
Q7a)	Explain the construction and working of LVDT with neat diagrams.	10	4	4
b)	List the differences between sensors and transducers.	5	4	2
c)	Draw the power triangle and name its sides along with the units.	5	1	1,2

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Re Examinations of First Year (Semester I)

Program: **F.Y. B.Tech.** C, M, E Sem I **Duration: 2 hrs.**

Course Code: **BS-BTC 103** **Maximum Points: 50**

Course Name: **Biology for Engineers** **Semester: I[st]**

Notes: Q1 is compulsory and answer any 4 from remaining 5.

Q.No.	Questions	Points	CO	BL	Module No.
1.	Explain Biomimicry with an example in your areas- biomimicry in civil engineering.	10	1	1	2
2.	What are characteristics of prokaryotic cells and Eukaryotic cells.	10	2	1	3
3.	What is Geological Time Scale? Discuss in Brief.	10	1	1	1
4.	Explain the structure of any two - Triglycerides, amino acids, and carbohydrates.	10	3	1	2
5.	Explain any two- (i) Bioprinting of food, (ii) Bio-remediation, and (iii) DNA technology	10	1-4	2	5
6.	Explain earlier atmosphere with earlier life theory.	10	1,2	1,2,3	1,2

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END SEM EXAMINATION DECEMBER 2023

Program: F.Y. B.Tech. (C, M, E) Sem I
Duration: 2 hrs.
Course Code: BS-BTC103, BE-BTM103, BS-BTE103
Maximum Points: 50
Course Name: Biology for Engineers
Semester: I[st]

Notes: Total 50 marks to be answered.

Q.No.	Questions	Points	CO	BL	Module No.
1.	Name the stage of cell cycle at which one of the following events occur: (i) Chromosomes are moved to spindle equator. (ii) Centromere splits and chromatids separate. (iii) Pairing between homologous chromosomes takes place. (iv) Crossing over between homologous chromosomes takes place. (v) Division of cell plate.	10	1	1	2
2.	What is DNA transcription and translation?	5	2	1	3
3.	Explain Chemical composition, structure and function of (i) Carbohydrate, (ii) Protein, (iii) Lipids, and (iv) DNA.	10	1	1	1
4.	Using a Punnett Square, explain dihybrid cross with both genotypic and phenotypic ratio.	10	1	1	2
5.	What is bio-print? Give examples.	5	1-4	2	5
6.	What is biomimicry? Explain with some examples.	5	1-4	3	4
7.	Explain- (i) DNA Origami, (ii) Bio-mining, (iii) Lotus leaf effect, and (iv) Electrical tongue/nose	10	1-4	3	4,5
8.	How artificial intelligence is beneficial for disease diagnosis purpose?	5	1-4	3	4,5

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END SEM EXAMINATION DECEMBER 2023

Program: F.Y. B.Tech. C, M, E) Jan 24 **Duration: 2 hrs.**

Course Code: BS-BTC103, BE-BTM103, BS-BTE103 **Maximum Points: 50**

Course Name: Biology for Engineers **Semester: I[st]**

3/11/23

Notes: Total 50 marks to be answered.

Q.No.	Questions	Points	CO	BL	Module No.
1.	Name the stage of cell cycle at which one of the following events occur: (i) Chromosomes are moved to spindle equator. (ii) Centromere splits and chromatids separate. (iii) Pairing between homologous chromosomes takes place. (iv) Crossing over between homologous chromosomes takes place. (v) Division of cell plate.	10	1	1	2
2.	What is DNA transcription and translation?	5	2	1	3
3.	Explain Chemical composition, structure and function of (i) Carbohydrate, (ii) Protein, (iii) Lipids, and (iv) DNA.	10	1	1	1
4.	Using a Punnett Square, explain dihybrid cross with both genotypic and phenotypic ratio.	10	1	1	2
5.	What is bio-print? Give examples.	5	1-4	2	5
6.	What is biomimicry? Explain with some examples.	5	1-4	3	4
7.	Explain- (i) DNA Origami, (ii) Bio-mining, (iii) Lotus leaf effect, and (iv) Electrical tongue/nose	10	1-4	3	4,5
8.	How artificial intelligence is beneficial for disease diagnosis purpose?	5	1-4	3	4,5

Bharatiya Vidya Bhavan's

SARDAR PATEL COLLEGE OF ENGINEERING

(Government Aided Autonomous Institute)

Munshi Nagar, Andheri (W) Mumbai – 400058

Re Examinations of First Year (Semester I)

Program: F.Y. B.Tech. (CM, E) Sem I **Duration: 2 hrs.**

Course Code: BS-BTE 103 **Maximum Points: 50**

Course Name: Biology for Engineers **Semester: I^st^**

Notes: Q1 is compulsory and answer any 4 from remaining 5.

Q.No.	Questions	Points	CO	BL	Module No.
1.	Explain Biomimicry with an example in your areas- biomimicry application in electrical engineering.	10	1	1,2,3, 4	2
2.	Explain geological time scale and how it is divided into different time scale.	10	2	1	3
3.	Differentiate prokaryotic cells and Eukaryotic cells.	10	1	1	1
4.	Explain the structure of amino acids and Carbohydrates.	10	1	2	2
5.	Explain any two- (i) Bio-remediation, (ii) Bio-mining, and (iii) Artificial intelligence.	10	1-4	2	5
6.	Explain Miller theory and earlier atmospheric condition.	10	1,2	1	2

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END SEM EXAMINATION DECEMBER 2023

Program: F.Y. B.Tech. CE, M. E) Sem I **Duration: 2 hrs.**

Course Code: BS-BTC103, BE-BTM103, BS-BTE103 **Maximum Points: 50**

Course Name: Biology for Engineers **Semester: I[st]**

Notes: Total 50 marks to be answered.

Q.No.	Questions	Points	CO	BL	Module No.
1.	Name the stage of cell cycle at which one of the following events occur: (i) Chromosomes are moved to spindle equator. (ii) Centromere splits and chromatids separate. (iii) Pairing between homologous chromosomes takes place. (iv) Crossing over between homologous chromosomes takes place. (v) Division of cell plate.	10	1	1	2
2.	What is DNA transcription and translation?	5	2	1	3
3.	Explain Chemical composition, structure and function of (i) Carbohydrate, (ii) Protein, (iii) Lipids, and (iv) DNA.	10	1	1	1
4.	Using a Punnett Square, explain dihybrid cross with both genotypic and phenotypic ratio.	10	1	1	2
5.	What is bio-print? Give examples.	5	1-4	2	5
6.	What is biomimicry? Explain with some examples.	5	1-4	3	4
7.	Explain- (i) DNA Origami, (ii) Bio-mining, (iii) Lotus leaf effect, and (iv) Electrical tongue/nose	10	1-4	3	4,5
8.	How artificial intelligence is beneficial for disease diagnosis purpose?	5	1-4	3	4,5

Bharatiya Vidya Bhavan's
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Munshi Nagar, Andheri (West), Mumbai – 400058.
Previous Semester Examination Sem I 2021-2022 and 2022--23
February 2024

CLASS/SEM : **F.Y.B Tech (C/M/E) Sem.-I** DURATION: **3 Hrs**
COURSE NAME : **ENGINEERING PHYSICS-I** MAX. MARK: **100**

COURSE CODE: **BSBT105** Date: **15/02/2024**

- **Answer any FIVE questions out of SEVEN.**
- **Marks are given against the questions.**
- **Diagrams have to be drawn wherever necessary.**
- **Assume suitable data (if necessary) and state your assumption/s clearly.**
- **Answers to the sub questions of the same question should be grouped together and written.**
- **Marks will be given on the basis of what will be written in the paper irrespective of your intentions! GOOD LUCK!**

		MN	CO	BL
Q1.	**Answer any four from (a) to (e)**			
a.	**(5 mark)** Ultraviolet light of wavelength 400nm and intensity 1W/m^2 is directed at a potassium surface. Find the maximum kinetic energy of the photoelectrons. Given that the work function of potassium is 2.2eV.	1	1	2
b.	**(5 mark)** Derive uncertainty relation for energy and time from position and momentum uncertainty expression.	2	1	2
c.	**(5 mark)** Deduce wave finctions for a free quantum mechanical particle moving in an infinite potential well,	3	2	1
d	**(5 mark)** Draw the following planes in a cubic unit cell (i)(320) (ii) [104]	4	3	1
e.	**(5 mark)** A pure copper wire has a radius of 0.75mm, a resistance of 1.5MΩ and is 4680km long. Find the resistivity of copper.	5	4	1
Q2.				
a.	**(8 marks)** Derive Bragg's law of X-ray diffraction and also explain Davisson-Germer experiment in detail.	1,2	1	3
b.	**(8 marks)** Explain Heisenberg's uncertainty principle of position and momentum (either using wave-group or single slit diffraction experiment).	2	1	2
c.	**(4 marks)** Zinc has an HCP structure. Base length of the unit cell is 0.494nm. Atomic weight of zinc is 65.37. Calculate density of zinc.	4	3	1
Q3.				
a.	**(8 marks)** Explain de-Broglie's hypothesis using double slit diffraction experiment. (Explain both mathematically and physically)	2	1	2

b	**(8 marks)** Arrive at Schrodinger's one dimensional time dependent equation and reduce it to time independent form.	3	2	1
c.	**(4 marks)** An electric field of 100 V/m is applied to a sample of an n-type semiconductor whose Hall coefficient is -0.0125 m^3/C. Determine the current density in the sample assuming $\mu=0.36m^2/V\text{-}s$.	5	4	2
Q4.				
a.	**(8 marks)** Using Schrödinger's equation, obtain for a particle in a box of infinite height having a width L. Also obtain its Eigen functions (wave functions) and Eigen values (Energy values).	3	2	2
b.	**(8marks)** Explain an FCC structure in detail using (i) Coordination number (diagram compulsory!) and (ii) Atomic Packing Factor.	4	3	1
c.	**(4 marks)** Calculate the de-Broglie wavelength of a ball of mass 500 gms when it is hit with a velocity 40m/s.	2	1	2
Q5.				
a.	**(8 marks)** Sketch and derive inter planar spacing of all the plane orientations in an FCC structure and also derive its planar atomic densities.	4	3	2
b.	**(8 marks)** Define, write the notation, relation and units for the following: (i) Drift velocity (ii) Current Density (iii) Mobility (iv) Conductivity	5	4	2
c.	**(4 marks)** A proton is confined in an infinite square well of width 10 fm. Calculate the energy of the photon emitted when the proton undergoes a transition from the first excited state (n = 3) to the state (n = 2).	2	1	1
Q6.				
a.	**(8 marks)** Define Ferimi energy and hence explain Fermi level with variation of temperature in a P-type semiconductor.	5	4	3,2
b	**(8 marks)** Explain the formation of continuous and characteristic X-rays and sketch the spectra. Also describe the differences between them.	1	1	1
c.	**(4 marks)** The energy of an electron constrained to move in a one dimensional box when it does a transition from n=16 to ground state is 9.664×10^{-17}J. Find out the width of the potential well.	3	2	2
Q7.				
a.	**(8 marks)**Explain how energy bands are formed in solids. Also explain the terms crossover point and equilibrium spacing.	5	4	2
b.	**(8 marks)** Using Heisenberg's uncertainty principle, prove that an electron cannot have a well defined trajectory in an atom. Also derive uncertainty principle of energy and time from uncertainty relation between position and momentum.	2	1	2
c.	**(4 marks)** Find lattice spacing between (111) in a tetragonal lattice having lattice constant a 2A°, b 2A° and c 2.5A°.	3	3	2

Exam

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REEXAM FEBRUARY 2024

12/2/24

Program: BTECH (MECH.ENGG.) F.Y. B.Tech (Comm) Sem I **Duration:** 3 hrs.

Course Code: ES-BT 103 101 **Maximum Points:** 100

Course Name: ENGG. GRAPHICS **Semester:** I

Invigilators Name: Signature with date:	Student Seat Number:

Notes:

- Solve any five questions out of seven
- Use first angle method of projection
- Assume suitable data wherever necessary
- Create the folder in for ex. **D drive** to save the drawings
- Folder name should be Endsem exam followed by students registration number **(For Example: EndSem_M2110023)**
- File name for the respective questions should be the question number itself
- Each drawing should be saved separately mentioning question number as the drawing file name.
- Before leaving the examination hall, verify all drawings are uploaded on the classroom
- Save the work frequently

Q.No. 1	Questions	Points	CO	BL
A	The top view and Front view of a line AB are 70 mm and 80 mm respectively. Its end A is 15 mm above HP and 20 mm in front of the VP. The end B is in 3rd quadrant. Draw the projections of line AB if it is 100 mm long. Also find its inclinations with principle planes.	[10]	1,2	3
B	A semicircular plate of 40 mm diameter has its straight edge in the V.P. and inclined at 45 degree to the H.P. Draw its projections, if the surface of the plate makes an angle 30 degree with V.P.	[10]	2,3	3

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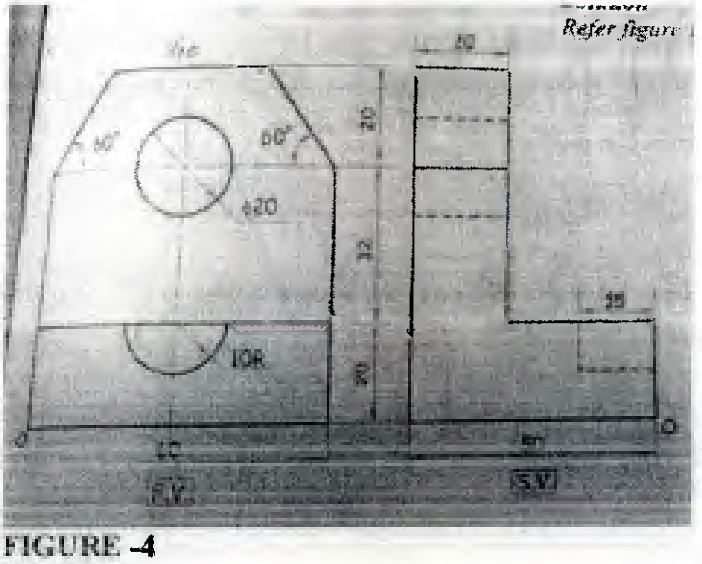
REEXAM FEBRUARY 2024

Q.NO. 2 A	A right circular cone, diameter of the base 60 mm and height of the axis 80 mm is resting on a point of its base circle rim on H.P. with apex 55 mm above H.P. The top view of axis of the cone makes an angle of 45 degree with V.P. Draw the projections of cone, if its apex is in V.P	[10]	2,3	3
B	 FIGURE -4 Draw the isometric projection about origin 'O' for figure - 4	[10]	3,4	3
Q.NO. 3 A	Draw the projections of a regular hexagon of 25 mm sides having one of its sides in the H.P. and inclined at 60 degree to the V.P. and its surface making an angle of 45 degree with the H.P.	[10]	2,3	3
B	A Square Pyramid side of base 40 mm, and axis length 55 mm has one of its corner of its base in the H.P. with its axis inclined at 45 degree to the H.P. and 30 degree to the V.P. Draw the projections, if apex is nearer to V.P.	[10]	2,3	3
Q.NO. 4	A Line AB, 75mm long is in the second quadrant with the end A in the H.P and the end B in the V.P. The line is inclined at 30 degree to the H.P and at 45 degree to the	[10]	1,2	3

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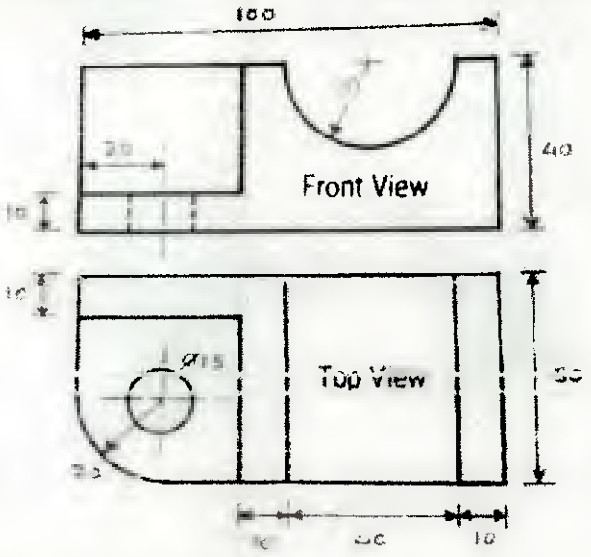
REEXAM FEBRUARY 2024

A	V.P. Draw the projections of line AB.			
B	A circle of 50 mm diameter rolls on the circumference of another circle of 150 mm diameter and outside it. Draw the curve traced by a point P on the circumference of rolling circle for one complete revolution of a circle. Also name the curve	[10]	1	3
Q.NO. 5 A	 **FIGURE -3** Draw the isometric projection about origin 'O' for figure -3	[10]	3,4	3
B	Draw a Hypocycloid of a circle of 40mm diameter which rolls inside another circle of 200mm diameter for one revolution.	[10]	1	
Q.NO. 6	Figure- 1 shows the pictorial view of an object. Draw the following Orthographic projections 1] Front View 2] Top View 3] Left Hand side view	[20]	3,4	3

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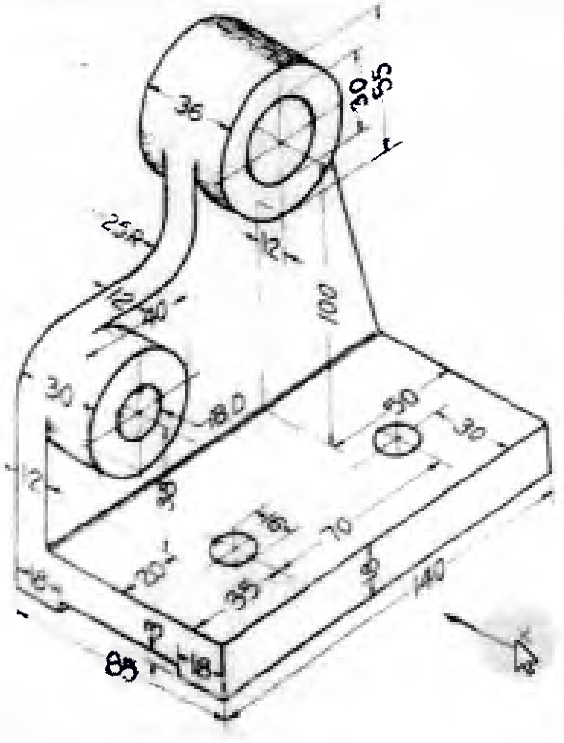
REEXAM FEBRUARY 2024

	 **FIGURE -1**			
Q.NO. 7 A	Below Figure -2 shows the Front view & top view of an object. Draw 1] Front View 2] Top View 3] Missing Left hand side view	[10]	3,4	3

REEXAM FEBRUARY 2024

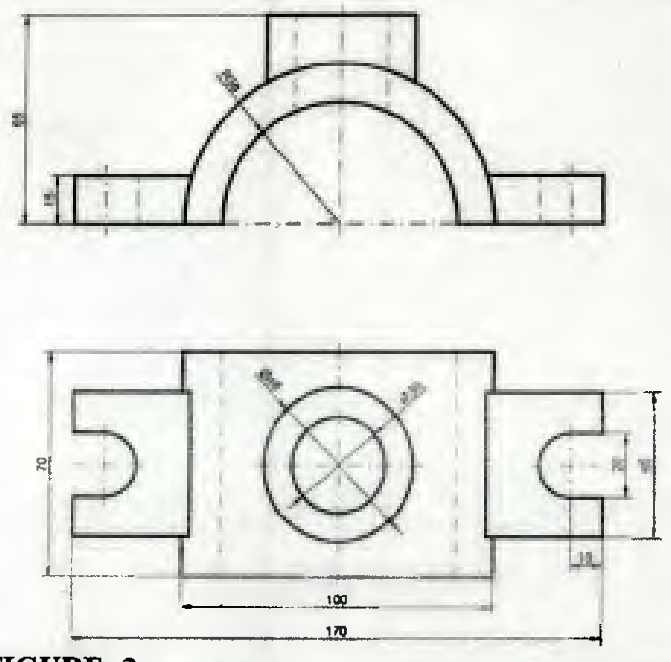
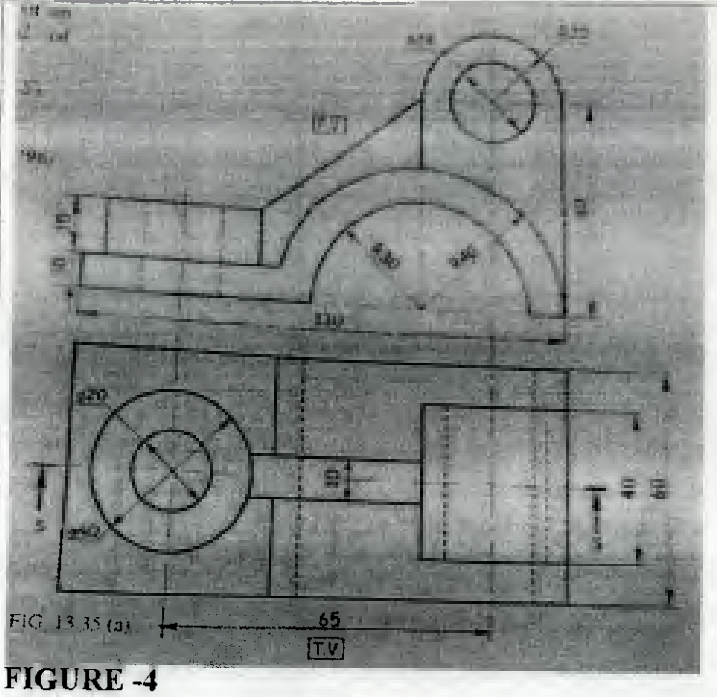


FIGURE -2

B	 **FIGURE -4** **Above figure -4 shows F.V and T.V of an oject. Draw the following** **1] F.V.** **2] T.V and** **3] Missing Left hand side view**	[10]	3,4	3

SARDAR PATEL COLLEGE OF ENGINEERING

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END SEMESTER EXAMINATION DECEMBER 2023

Program: BTECH (MECH.ENGG.) F.Y.B.Tech (Gen. Com. E **Duration:** 3 hrs.

Course Code: ES-BT103 **Maximum Points:** 100

Course Name: ENGG. GRAPHICS **Semester:** I

Invigilators Name: Signature with date:	Student Seat Number:

Notes:

- Solve any five questions out of seven
- Use first angle method of projection
- Assume suitable data wherever necessary
- Create the folder in for ex. **D drive** to save the drawings
- Folder name should be Endsem exam followed by students registration number **(For Example: EndSem_M2110023)**
- File name for the respective questions should be the question number itself
- Each drawing should be saved separately mentioning question number as the drawing file name.
- Before leaving the examination hall, verify all drawings are uploaded on the classroom
- Save the work frequently

Q.No.1	Questions	Points	CO	BL
A	The plan ab of a straight line AB is 140 mm long and it makes an angle of 45 degree with XY. The end A is in V.P. and 85 mm, from H.P. The end B is 20 mm from H.P. and the whole line is in the fourth quadrant. Draw the projection of line determine the true length & inclination of line.	[10]	1,2	3
B	A Pentagonal plate of 30 mm side has one of its side in V.P. and inclined at 30 degree to the H.P. The corner opposite to this side contained by the H.P. is 20 mm infront of V.P. Draw the projections and find the inclination of surface with V.P.	[10]	2,3	3

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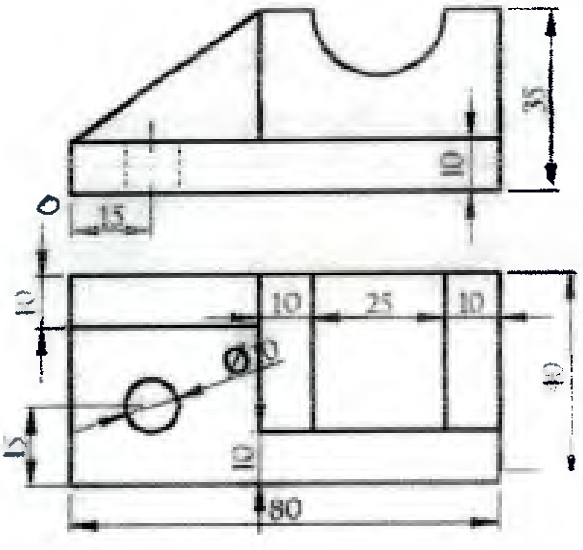
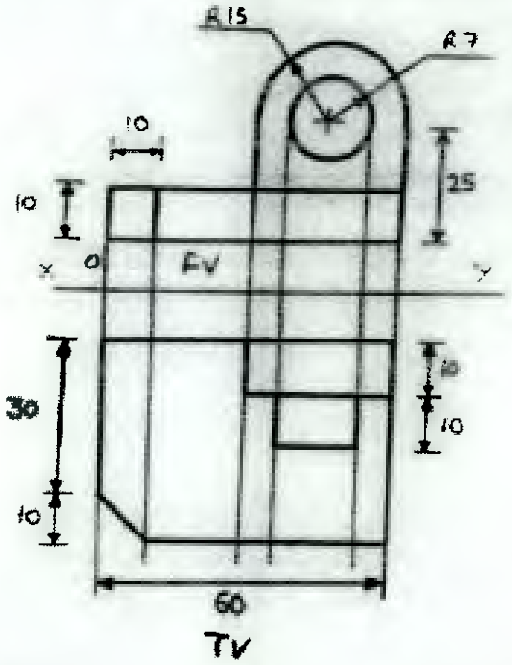
END SEMESTER EXAMINATION DECEMBER 2023

Q.NO.2 A	A hexagonal Pyramid of 30 mm base edges and axis length 70 mm is having one of its base edge in H.P. and parallel to V.P. Draw its projections if its apex is in V.P. and 55 mm above H.P.	[10]	2,3	3
B	 **FIGURE -4** Draw the isometric projection about origin 'O' for figure -4	[10]	3,4	3
Q.NO.3 A	Draw the projections of a circular plate of 50 mm diameter resting in the V.P. on a point A on the circumference. Its surface is inclined at 45 degree to the V.P. and diameter AB making an angle of 30 degree with H.P.	[10]	2,3	3
B	A Right Circular cylinder diameter of base 50 mm & axis height 70 mm has one of the circumference point of base in the H.P. such that its axis is inclined at 30 degree to H.P.	[10]	2,3	3

END SEMESTER EXAMINATION DECEMBER 2023

	and the axis appears to be inclined at 45 degree to V.P. in the T.V. Draw its projections			
Q.NO.4 A	The T.V. of a 75mm long line measures 60 mm. Point A is 15 mm below the H.P. & 50 mm infront of V.P.. The point B is 15 mm infront of V.P. & above H.P.. Draw the projection of line & Determine the inclination with H.P. & V.P.	[10]	1,2	3
B	Construct an Archimedean spiral for one convolution having greatest & least radius of 80 mm & 20 mm respectively.	[10]	1	3
Q.NO.5 A	 **FIGURE -3** Draw the isometric projection about origin 'O' for figure -3	[10]	3,4	3
B	Draw a Hypocycloid of a circle of 40mm diameter which rolls inside another circle of 200mm diameter for one revolution.	[10]	1	

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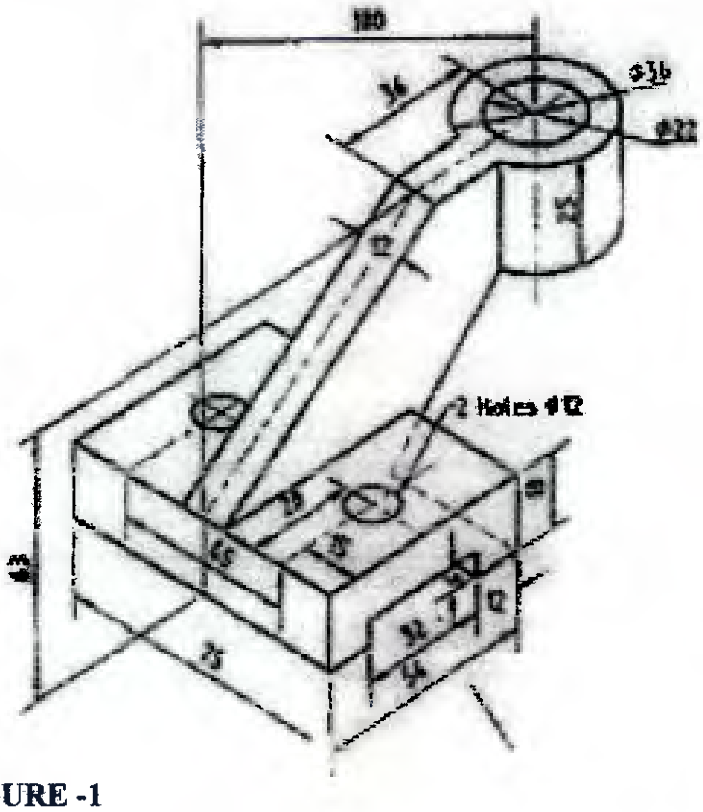
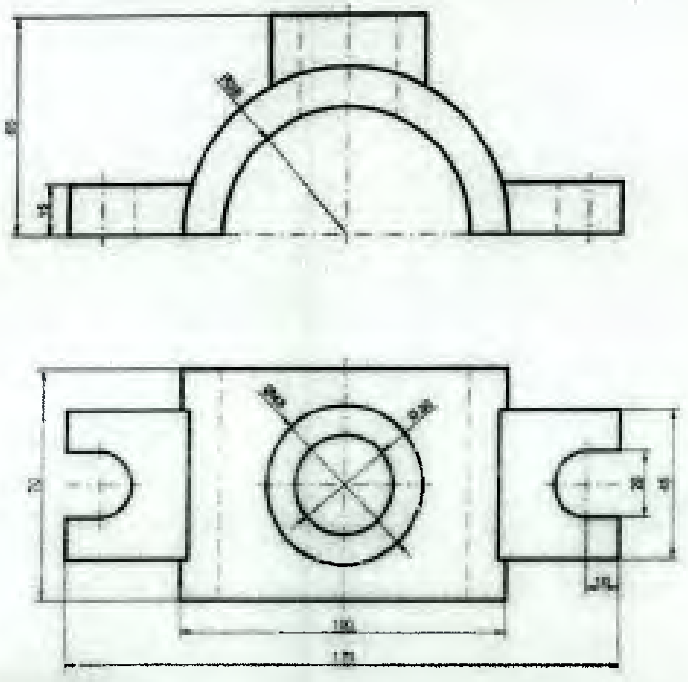
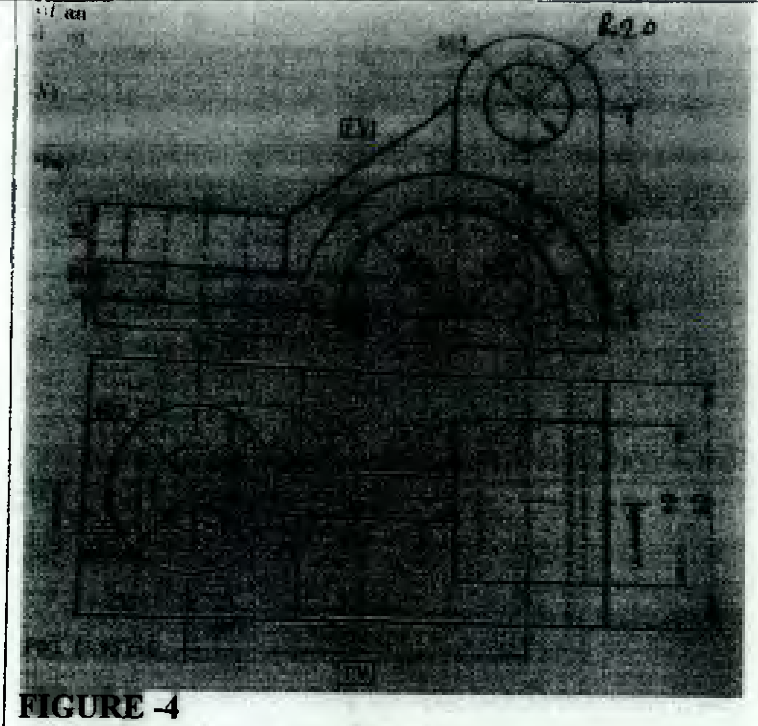
END SEMESTER EXAMINATION DECEMBER 2023

Q.NO.6	Figure- 1 shows the pictorial view of an object. Draw the following Orthographic projections 1] Front View 2] Top View 3] Left Hand side view  **FIGURE -1**	[20]	3,4	3
Q.NO.7 A	Below Figure -2 shows the Front view & top view of an object. Draw 1] Front View 2] Top View 3] Missing Left hand side view	[10]	3,4	3

END SEMESTER EXAMINATION DECEMBER 2023

	 FIGURE -2			
B	 **FIGURE -4** **Above figure -4 shows F.V and T.V of an oject. Draw the following** **1] F.V.** **2] T.V and** **3] Missing Left hand side view**	[10]	3,4	3

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End Semester Examination December2023

SET-A

F.Y. (C, M E) Sem. I

Program:Electrical Engineering

Duration: 03 hour

Course Code: ES-BT103

Maximum Points:100 marks

Course Name:Engineering Graphics

Semester:**I**

Notes: AutoCAD file name for each question should be :
SEATNO_ENDSEM_DEC2023_Q1(Example:E23100XX_ENDSEM_DEC2023_Q1)

1. **Question No 1 is compulsory.**
2. **Attempt any four questions out of the remaining six.**
3. Draw neat schematic diagrams,**highlight** important points.
4. Assume suitable data if necessary and mention it.
5. **Use first angle method of projection only.**
6. **Return question paper** to Invigilator.

Exam Seat No	
Reg.NO.	
Machine NO.	
Sign of Invigilator	

Q. No.	Questions	Marks	CO	BL	PI
Q1 A	Hexagonal pyramid, side of base 30mm and axis 85 mm long has its triangular slant surface on H.P. with its axis at 55^0 to V.P. Draw its projections. Assume the apex of Hexagonal pyramid towards the observer.	10	2	2	1.3 .1

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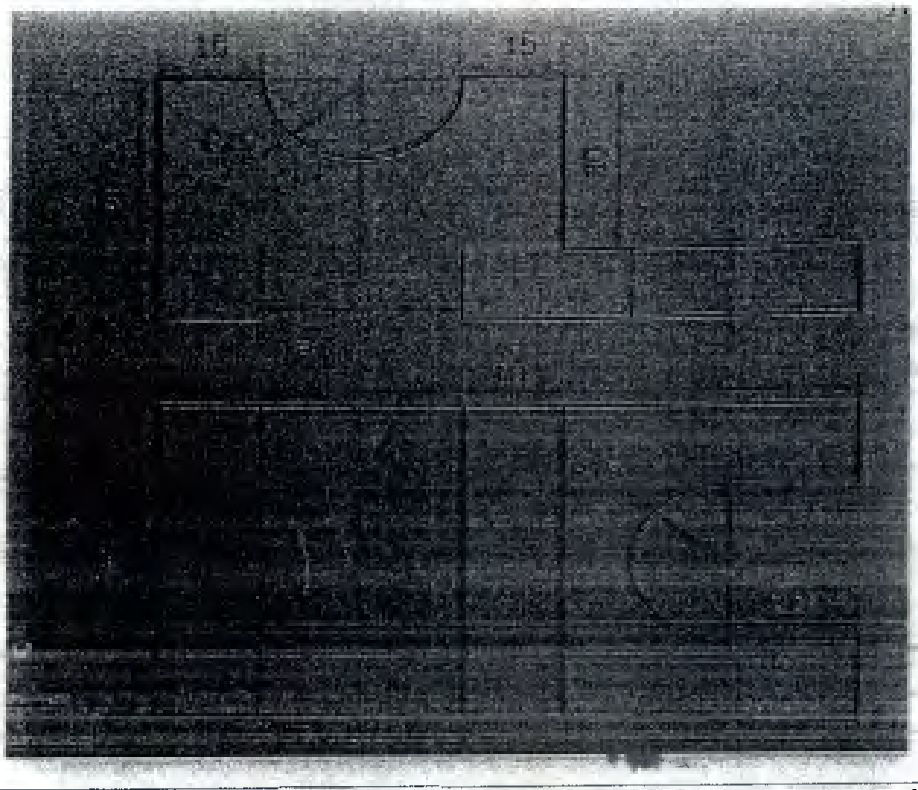
Munshi Nagar, Andheri (W) Mumbai – 400058

End Semester Examination December2023

Q1 B	Draw an isometric view of the following using natural scale. 	10	1, 2	2	1.3.1
Q2 A	The Top view of 110 mm long line AB measures 75mm. While the length of F.V. is 85 mm. It's one end, A is 20mm above HP and 30mm in front of V.P. the other end is in the third quadrant. Draw projections of the line, and find its inclination with HP and V.P.	10	1, 2	2	1.3.1
Q2 B	A rectangular plane PQRS with side QR=50mm and PQ =25mm has its surface inclined at an angle 40^0 to the V.P. one of the shorter side (say PQ) is in the V.P. and one of the longer edge (say QR) makes an angle 45^0 with H.P. Draw its projections.	10	1, 2	2	1.3.1
Q3 A	Distance between the end projectors of line AB are 70mm apart and A is 30mm below the H.P. and 50mm behind the V.P. and B is 20mm above the H.P. and 60mmin front of the V.P. draw the projection of line AB and determine its true length and true inclination with the H.P and V.P.	10	1, 3	2	1.3.1
Q3 B	30-60-90 (all in degree) set square has its shortest edge 50 mm long and is in the H.P. the top view of set the square is an isosceles triangle. draw projection with the hypotenuse of a set square inclined at 45 degree to the V.P. Measure the inclination of a plane with HP	10	2, 3	2	1.3.1

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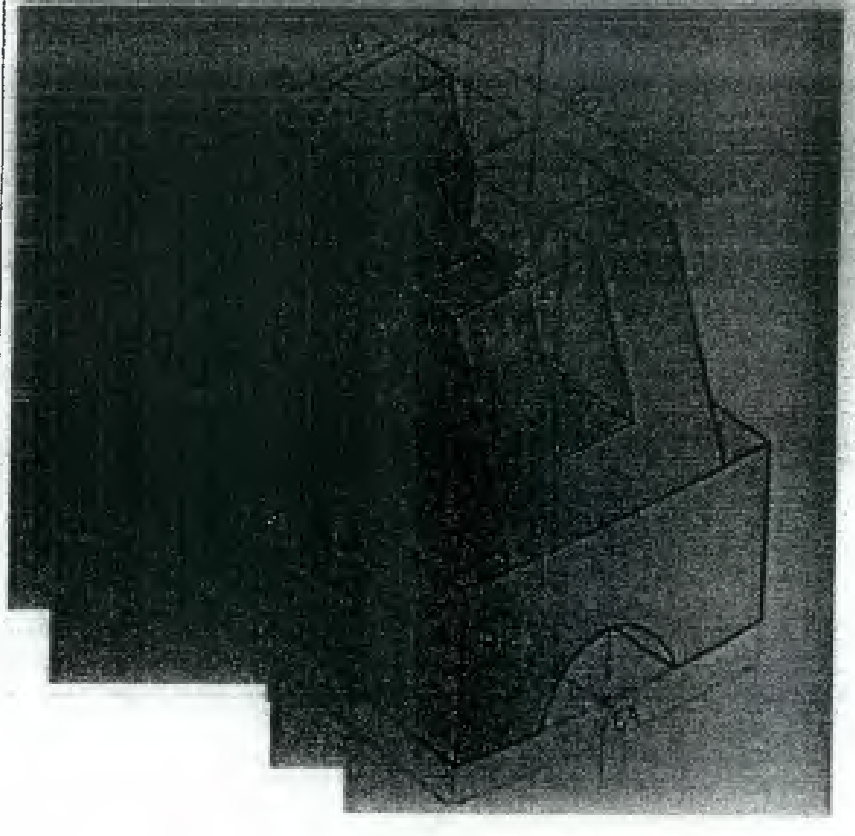
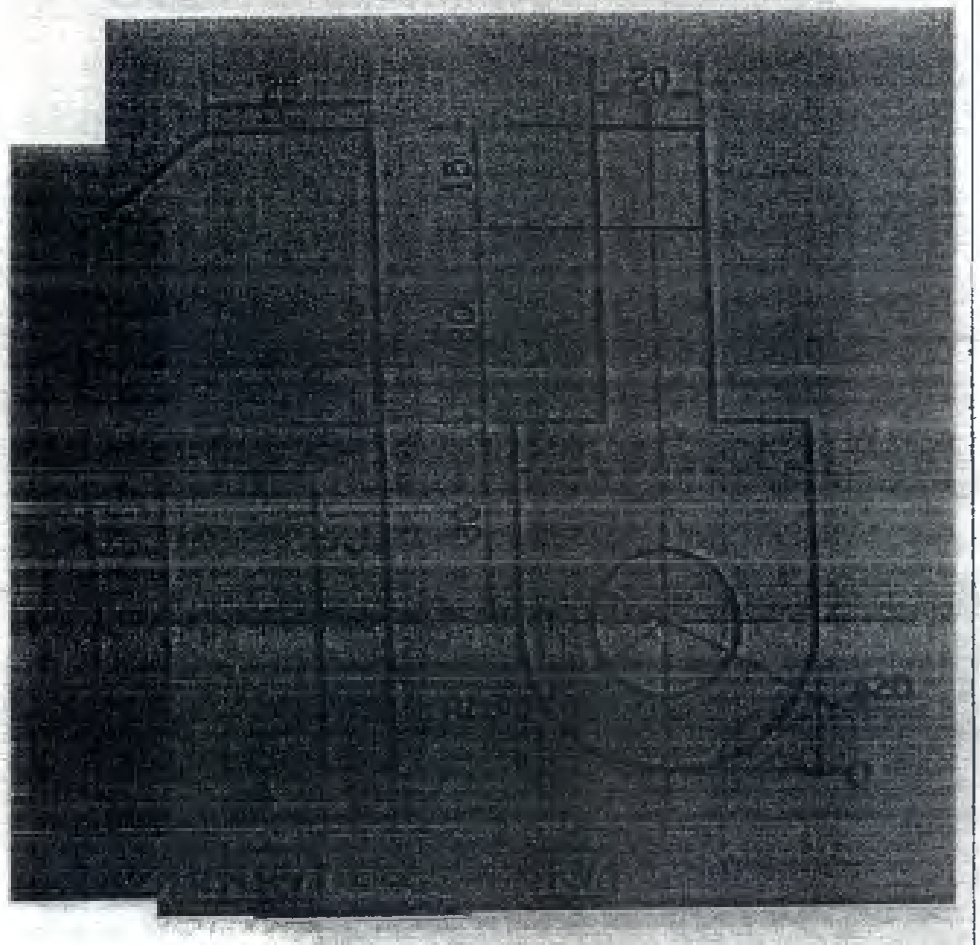
End Semester Examination December2023

Q4 A	Construct a curve generated by a circle of diameter 50 mm, when it rolls inside of base circle of diameter 150mm. name the curve. Draw the tangent and normal at any point on the curve.	10	1	2	1.3.1
Q4 B	A square prism with 40 mm sides of base and 70 mm axis length rests on HP on one of its comers of the base such that the two base edges containing the corner on which it rests make equal inclinations with HP. Draw the projections of the prism when the axis of the prism is inclined to HP at 45° and to VP at 35°.	10	1, 2	2	1.3.1
Q5 A	Draw the locus of a point 'P' moving so that the ratio of the distance from focus 'F' to its directrix DD is 2/3. Distance of focus from directrix is 50mm. also draw tangent and normal to any point on the curve.	10	1, 2	2	1.3.1
Q5 B	Elevation of line CD is 80 mm and inclined XY line at 45 degrees.end C is 30mm above H.P. and end D is 10mm behind V.P. draw its projection, length of line CD is 95mm and end D is in the third quadrant. Find the inclination of line CD with H.P.also locate its Traces.	10	1	2	1.3.1
Q6 A	Draw the following orthographic projection view of figure 1 1) FRONT VIEW 2) TOP VIEW 3) RHSV 	20	1, 2, 3	2	1.3.1

End Semester Examination December2023

Q7 A	A cone of base 90 mm diameter and height 110 mm lies with one of its generators on HP and the axis appears to be inclined to VP at an angle of 40^0 in the top view. Draw its top and front views.	10	3	2	3.2 .3
Q7 B	Draw an isometric view of the following using natural scale. 	10	3	2	1.3 .2

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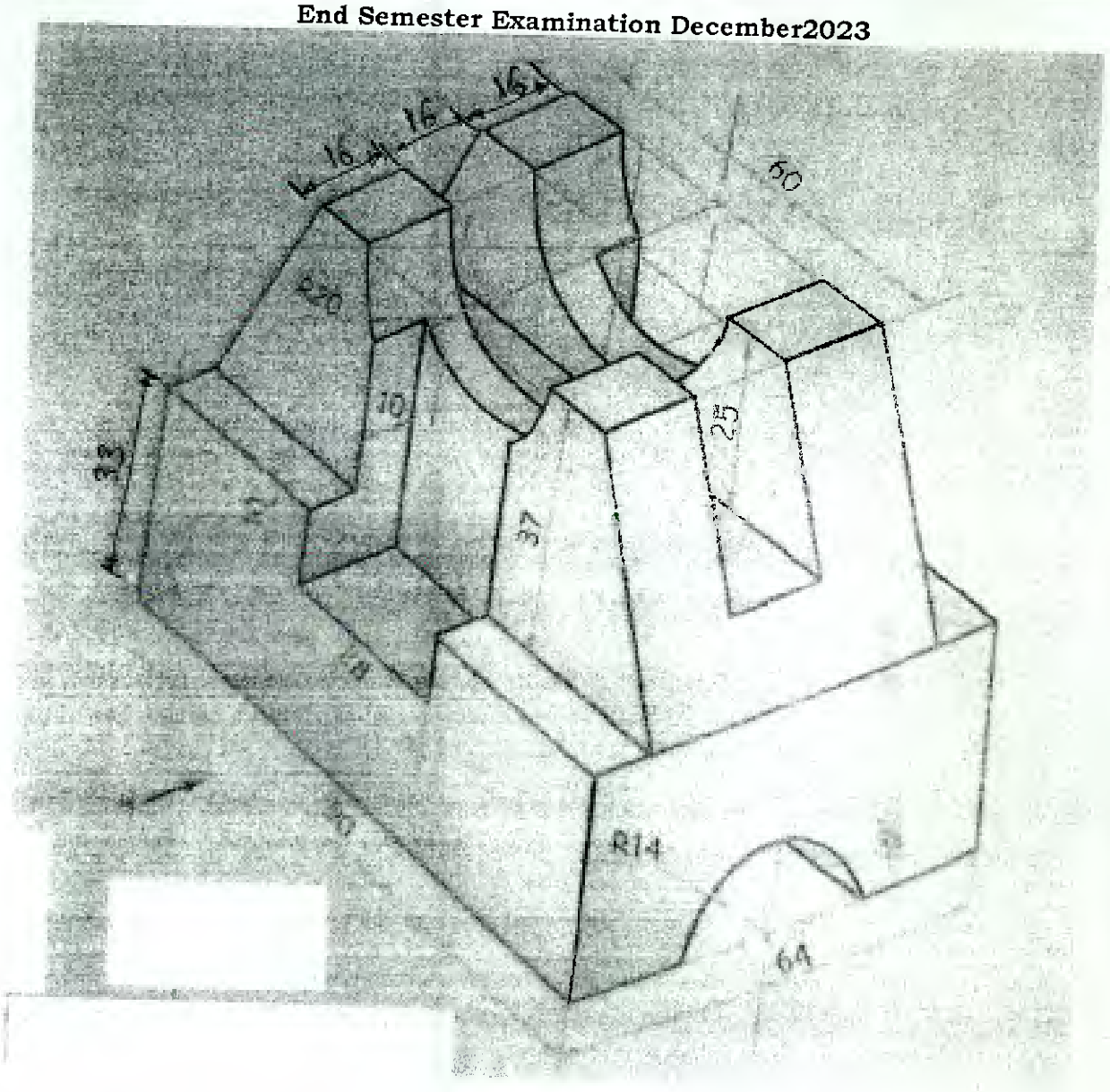
SET- A

End Semester Examination December2023



Bharatiya Vidya Bhavan's

SARDAR PATEL COLLEGE OF ENGINEERING

(Government Aided Autonomous Institute)

Munshi Nagar, Andheri (W) Mumbai – 400058

End Semester Examination December2023

SET-B

Prog. C M

Program:Electrical Engineering Sem I

Duration: 03 hour

Course Code: ES-BT103

Maximum Points:100 marks

Course Name:Engineering Graphics

Semester:**I**

Notes: AutoCAD file name for each question should be :
SEATNO_ENDSEM_DEC2023_Q1(Example:E23100XX_ENDSEM_DEC2023_Q1)

1. **Question No 1 is compulsory.**
2. **Attempt any four questions out of the remaining six.**
3. Draw neat schematic diagrams,**highlight** important points.
4. Assume suitable data if necessary and mention it.
5. **Use first angle method of projection only.**
6. **Return question paper** to Invigilator.

Exam Seat No	
Reg.NO.	
Machine NO.	
Sign of Invigilator	

Q. No.	Questions	Marks	CO	BL	PI
Q1 A	Hexagonal pyramid, side of base 35mm and axis 90 mm long has its triangular slant surface on H.P. with its axis at 55^0 to V.P. Draw its projections. Assume the apex of Hexagonal pyramid away from the observer.	10	2	2	1.3 .1

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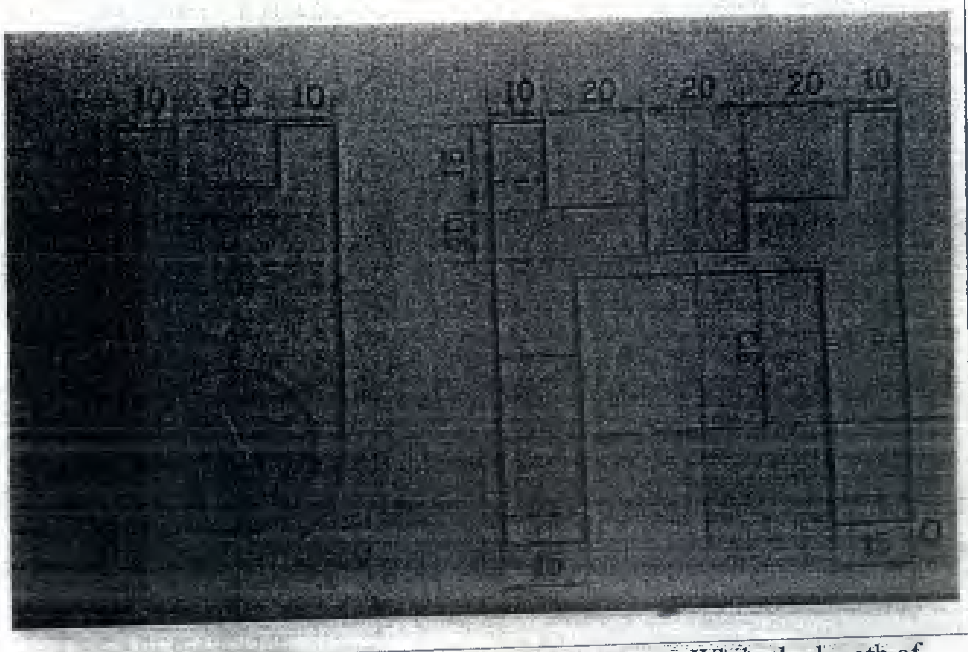
Munshi Nagar, Andheri (W) Mumbai – 400058

End Semester Examination December2023

Q1 B	Draw an isometric view of the following using natural scale. 	10	1, 2	2	1.3.1
Q2 A	The Top view of 115 mm long line AB measures 80mm. While the length of F.V. is 90 mm. It's one end, A is 15mm above HP and 25mm in front of V.P. the other end is in the third quadrant. Draw projections of the line, and find its inclination with HP and V.P.	10	1, 2	2	1.3.1
Q2 B	A rectangular plane PQRS with side QR=50mm and PQ =25mm has its surface inclined at an angle 35^0 to the V.P. one of the shorter side (say PQ) is in the V.P. and one of the longer edge (say QR) makes an angle 40^0 with H.P. Draw its projections.	10	1, 2	2	1.3.1
Q3 A	Distance between the end projectors of line AB are 75mm apart and A is 25mm below the H.P. and 45mm behind the V.P. and B is 15mm above the H.P. and 60mmin front of the V.P. draw the projection of line AB and determine its true length and true inclination with the H.P and V.P.	10	1, 3	2	1.3.1
Q3 B	30-60-90 (all in degree) set square has its shortest edge 45 mm long and is in the H.P. the top view of set the square is an isosceles triangle. draw projection with the hypotenuse of a set square inclined at 40 degree to the V.P. Measure the inclination of a plane with HP	10	2, 3	2	1.3.1
Q4 A	Construct a curve generated by a circle of diameter 60 mm, when it rolls inside of base circle of diameter 160mm. name the curve. Draw the tangent and normal at any point on the curve.	10	1	2	1.3.1

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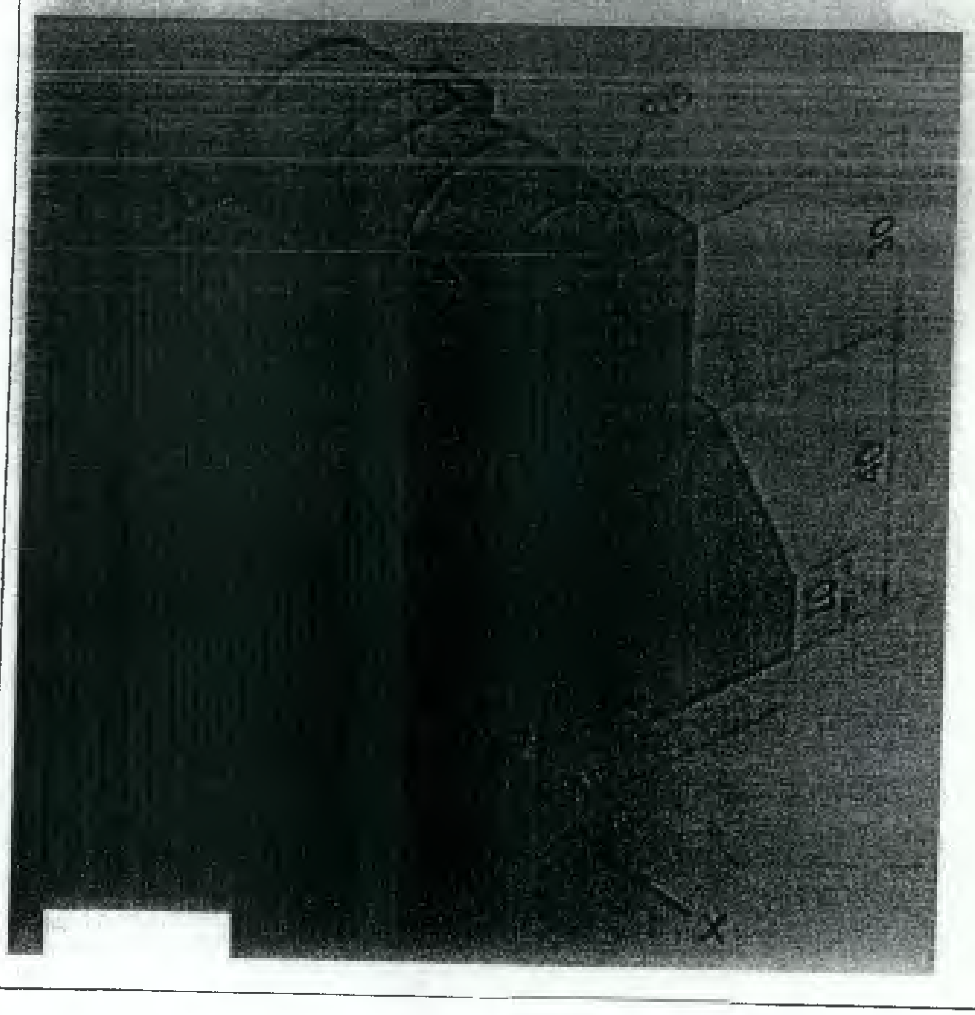
(Government Aided Autonomous Institute)

Munshi Nagar, Andheri (W) Mumbai – 400058

End Semester Examination December2023

Q4 B	A square prism with 45 mm sides of base and 75 mm axis length rests on HP on one of its comers of the base such that the two base edges containing the corner on which it rests make equal inclinations with HP. Draw the projections of the prism when the axis of the prism is inclined to HP at 40° and to VP at 35°.	10	1, 2	2	1.3.1
Q5 A	Draw the locus of a point 'P' moving so that the ratio of the distance from focus 'F' to its directrix DD is 2/3. Distance of focus from directrix is 50mm. also draw tangent and normal to any point on the curve.	10	1, 2	2	1.3.1
Q5 B	Elevation of line CD is 70 mm and inclined XY line at 40 degrees.end C is 35mm above H.P. and end D is 20mm behind V.P. draw its projection, length of line CD is 100mm and end D is in the third quadrant. Find the inclination of line CD with H.P.also locate its Traces.	10	1	2	1.3.1
Q6 A	Draw the following orthographic projection view of figure 1 1) FRONT VIEW 2) TOP VIEW 3) LHSV 	20	1, 2, 3	2	1.3.1

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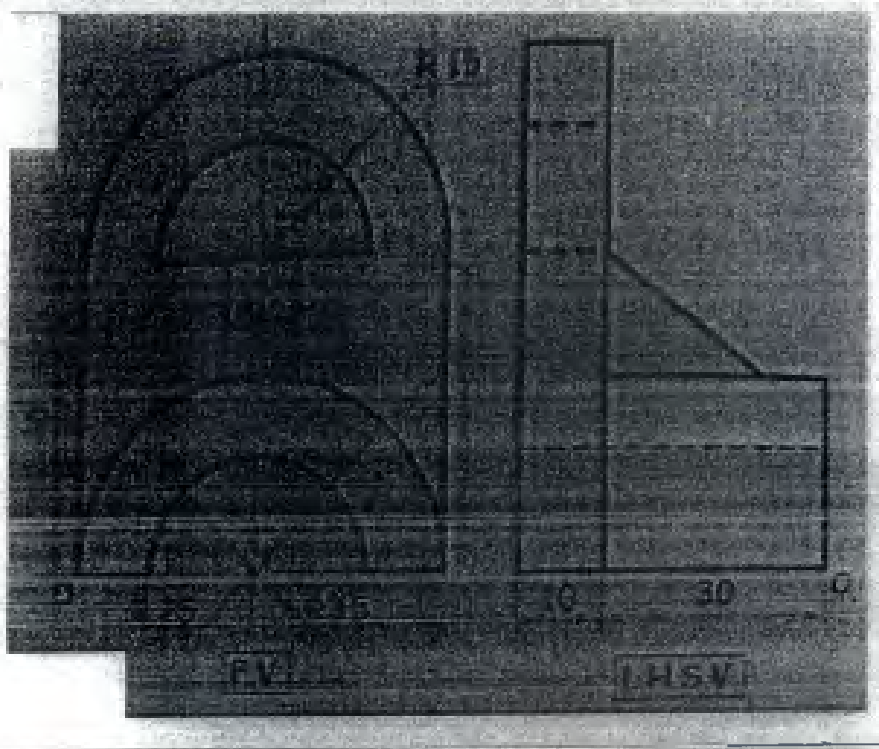
Munshi Nagar, Andheri (W) Mumbai – 400058

End Semester Examination December2023

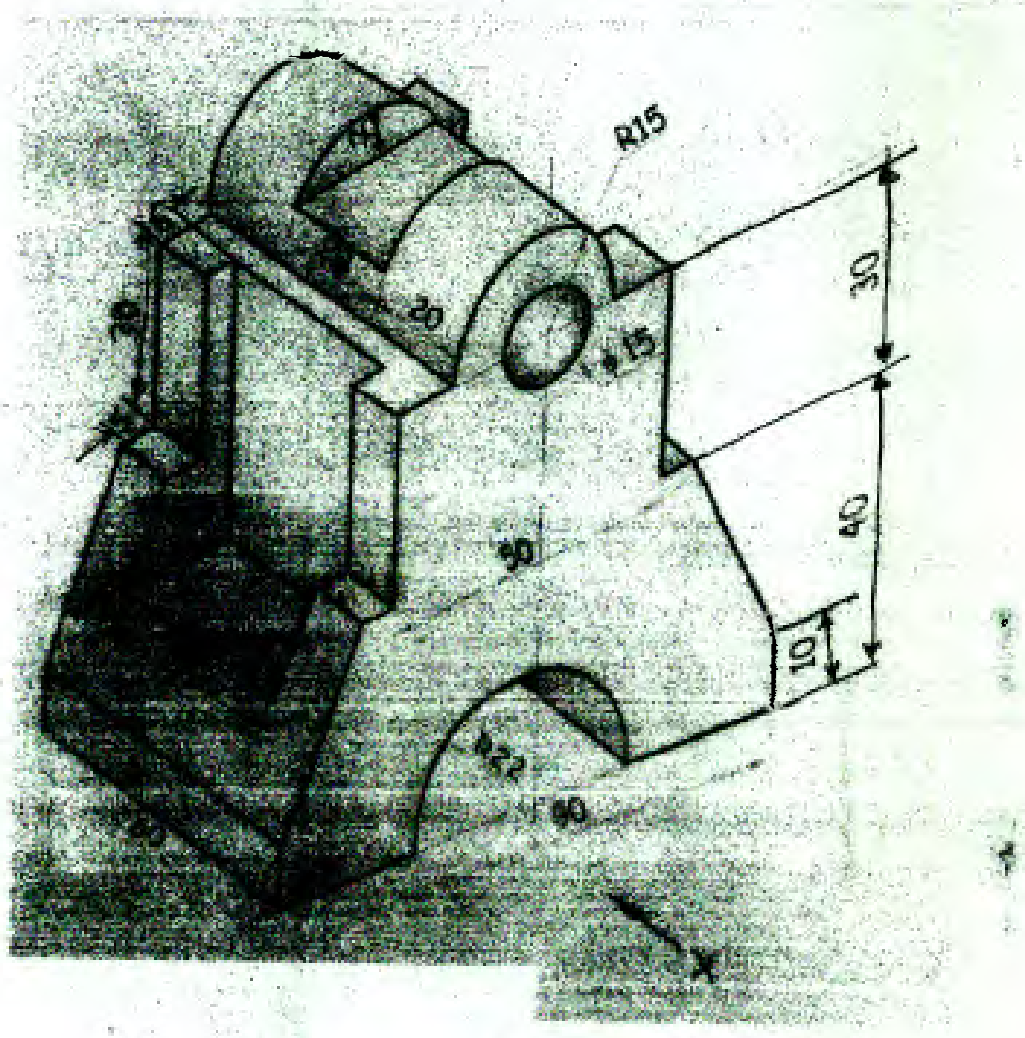
Q7 A	A cone of base 80 mm diameter and height 95 mm lies with one of its generators on HP and the axis appears to be inclined to VP at an angle of 45^0 in the top view. Draw its top and front views.	10	3	2	3.2 .3
Q7 B	Draw an isometric view of the following using natural scale. 	10	3	2	1.3 .2

SARDAR PATEL COLLEGE OF ENGINEERING

(Government Aided Autonomous Institute)
Munshi Nagar, Andheri (W) Mumbai – 400058

SET-B

End Semester Examination December2023



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SARDAR PATEL COLLEGE OF ENGINEERING

(Government Aided Autonomous Institute)

Munshi Nagar, Andheri (W) Mumbai – 400058

RE-Examination February 2024

SET-A

16/2/24

For (C, M, E) Sem I

Program:Electrical Engineering

Course Code: ES-BTE102

Course Name:Engineering Graphics

Duration: 03 hour

Maximum Points:100 marks

Semester:**I**

Notes: **AutoCAD file name** for each question should be :
SEATNO_RE-EXAM_FEB2024_Q1(Example:E23100XX_RE-EXAM_FEB2024_Q1)

1. **Question No 1 is compulsory.**
2. **Attempt any four questions out of the remaining six.**
3. Draw neat schematic diagrams,**highlight** important points.
4. Assume suitable data if necessary and mention it.
5. **Use <u>first angle</u> method of projection only.**
6. **Return question paper** to Invigilator.

Exam Seat No	
Reg.NO.	
Machine NO.	
Sign of Invigilator	

Q. No.	Questions	Marks	CO	BL	PI
Q1 A	The square prism side of the base is 40mm, and the axis length 60mm has one of the sides of base on the ground. the axis of solid is inclined to the ground at an angle 30 degree and T.V. of axis is inclined at angle 45 degree with V.P. draw its projections.when apex near to the observer.	10	2	2	1.3.1

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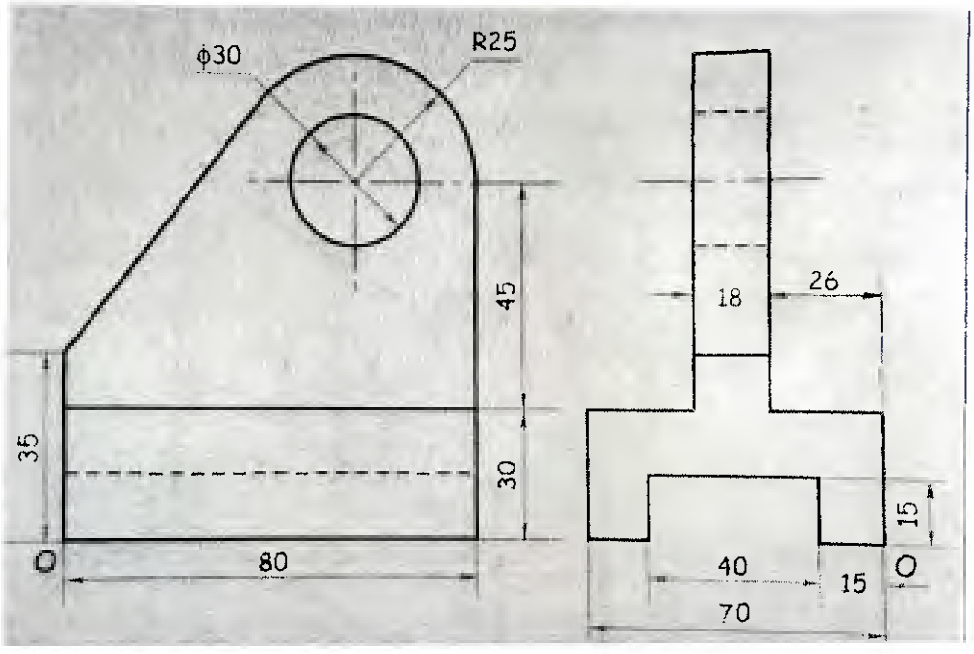
(Government Aided Autonomous Institute)

Munshi Nagar, Andheri (W) Mumbai – 400058

RE-Examination February 2024

Q1 B	Draw an isometric view of the following using natural scale. 	10	1, 2	2	1.3.1
Q2 A	The end projectors of line AB are 55mm apart. point A is 55 mm below the H.P. and 60 mm behind the V.P. point B is 30 mm above the H.P. and 25 mm in front of the V.P. draw the projections of AB and find its true length and its true inclination with the H.P. and V.P.	10	1, 2	2	1.3.1
Q2 B	A rectangular plane PQRS with side QR=50mm and PQ =25mm has its surface inclined at an angle 40^0 to the V.P. one of the shorter side (say PQ) is in the V.P. and one of the longer edge (say QR) makes an angle 45^0 with H.P. Draw its projections	10	1, 2	2	1.3.1
Q3 A	A line PQ , 90mm long, is inclined at 45^0 to the H.P. and its top view makes an angle of 60^0 with the V.P. The end P is in the H.P. and 12mm in front of V.P. Draw its front view and finds its true inclination with the V.P.	10	1, 3	2	1.3.1
Q3 B	Rhombus of the longer diagonal of 60mm and smaller diagonal 40mm is resting on the corner of a larger diagonal on the H.P. such that the top view is a square of 40mm diagonals. Draw its projection if the top view of the larger diagonal makes an angle of 45 degree with the V.P.	10	2, 3	2	1.3.1
Q4 A	Construct a curve generated by a circle of diameter 55 mm, when it rolls over another circle of diameter 155mm. name the curve. Draw the tangent and normal at any point on the curve.	10	1	2	1.3.1

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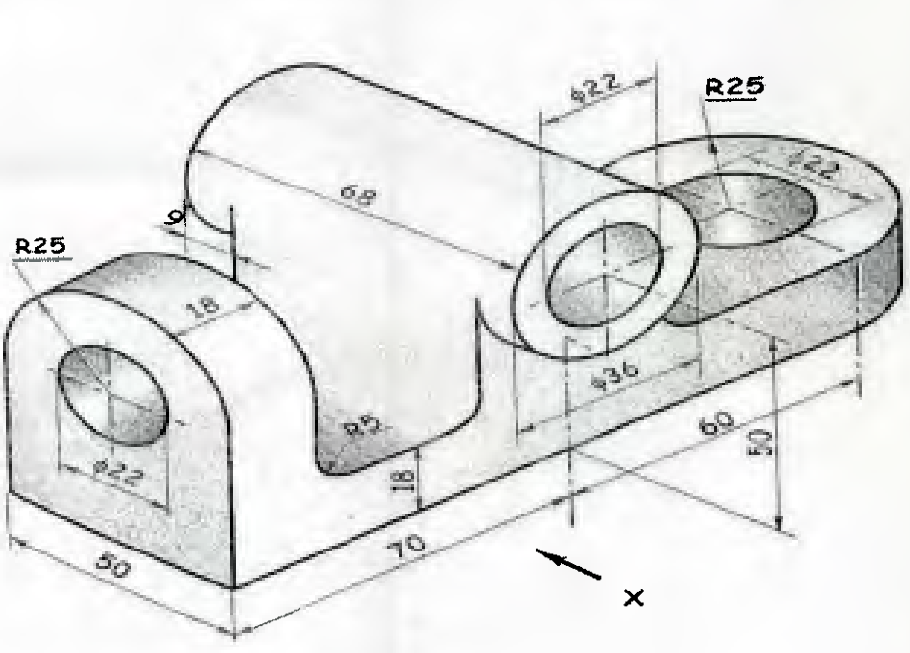
Munshi Nagar, Andheri (W) Mumbai – 400058

RE-Examination February 2024

Q4 B	Hexagonal pyramid, side of base 30mm and axis 85 mm long has its triangular slant surface on H.P. with its axis at 55^0 to V.P. Draw its projections. Assume the apex of Hexagonal pyramid towards the observer.	10	1, 2	2	1.3.1
Q5 A	The foci of an ellipse are 90 mm apart and its minor axis is 65 mm. construct an ellipse by arcs of circle method.	10	1, 2	2	1.3.1
Q5 B	Elevation of line CD is 80 mm and inclined XY line at 45 degrees.end C is 30mm above H.P. and end D is 10mm behind V.P. draw its projection, length of line CD is 95mm and end D is in the third quadrant. Find the inclination of line CD with H.P.also locate its Traces.	10	1	2	1.3.1
Q6 A	Draw the following orthographic projection view of figure 1}FRONT VIEW 2} TOP VIEW 3} LHSV 	20	1, 2, 3	2	1.3.1
Q7 A	A cone of base 90 mm diameter and height 110 mm lies with one of its generators on HP and the axis appears to be inclined to VP at an angle of 40^0 in the top view. Draw its top and front views.	10	3	2	3.2.3

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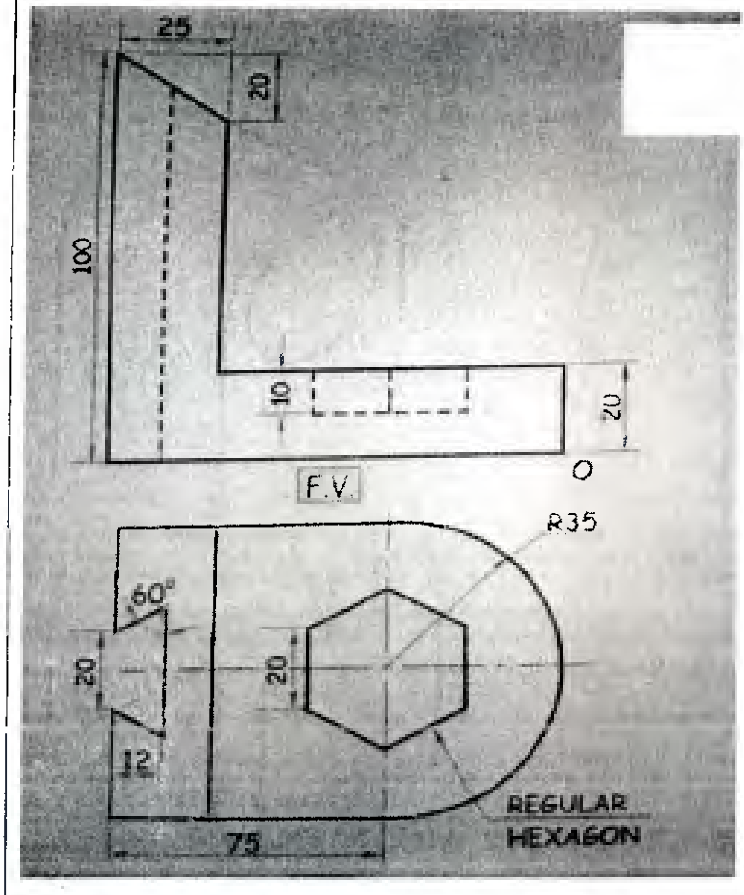
Q7 B	Draw an isometric view of the following using natural scale. 	10	3	2	1.3 .2

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Munshi Nagar, Andheri (W) Mumbai – 400058

RE-Examination February 2024

SET-B

For C, M, E Sem I

Program:Electrical Engineering | Duration: 03 hour

Course Code: ES-BTE102 | Maximum Points:100 marks

Course Name:Engineering Graphics | Semester:**I**

Notes: AutoCAD file name for each question should be **:**
SEATNO_RE-EXAM_FEB2024_Q1(Example:E23100XX_RE-EXAM_FEB2024_Q1)

1. **Question No 1 is compulsory.**
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Exam Seat No	
Reg.NO.	
Machine NO.	
Sign of Invigilator	

Q. No.	Questions	Marks	CO	BL	PI
Q1 A	The square prism side of the base is 40mm, and the axis length 60mm has one of the sides of base on the ground. the axis of solid is inclined to the ground at an angle 30 degree and T.V. of axis is inclined at angle 45 degree with V.P. draw its projections.when apex away from the observer.	10	2	2	1.3.1
Q1	Draw an isometric view of the following using natural scale.	10	1	2	1.3

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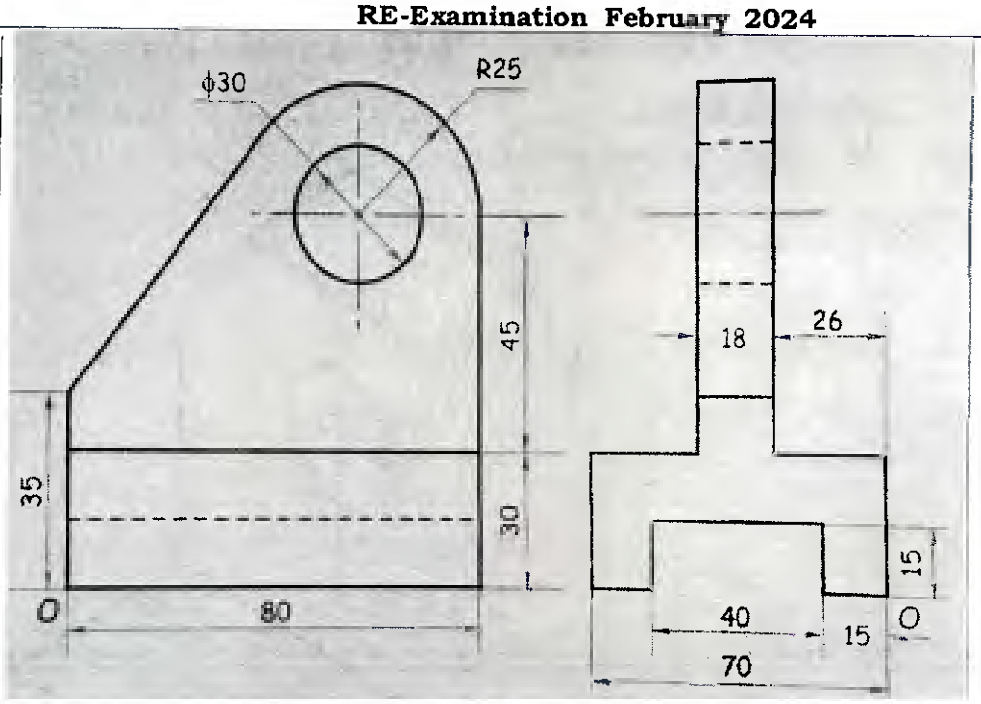
Munshi Nagar, Andheri (W) Mumbai – 400058

RE-Examination February 2024

B			2		.1
Q2 A	The end projectors of line AB are 60mm apart. point A is 50 mm below the H.P. and 55 mm behind the V.P. point B is 30 mm above the H.P. and 25 mm in front of the V.P. draw the projections of AB and find its true length and its true inclination with the H.P. and V.P.	10	1, 2	2	1.3 .1
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RE-Examination February 2024

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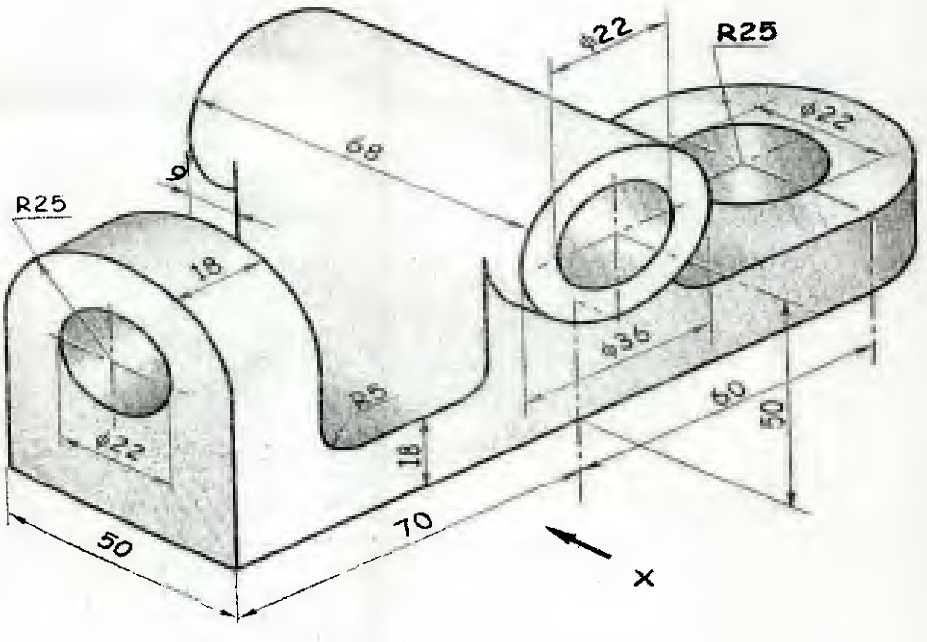
Q6 A	Draw the following orthographic projection view of figure 1 1}FRONT VIEW 2} TOP VIEW 3} LHSV 	20	1, 2, 3	2	1.3.1
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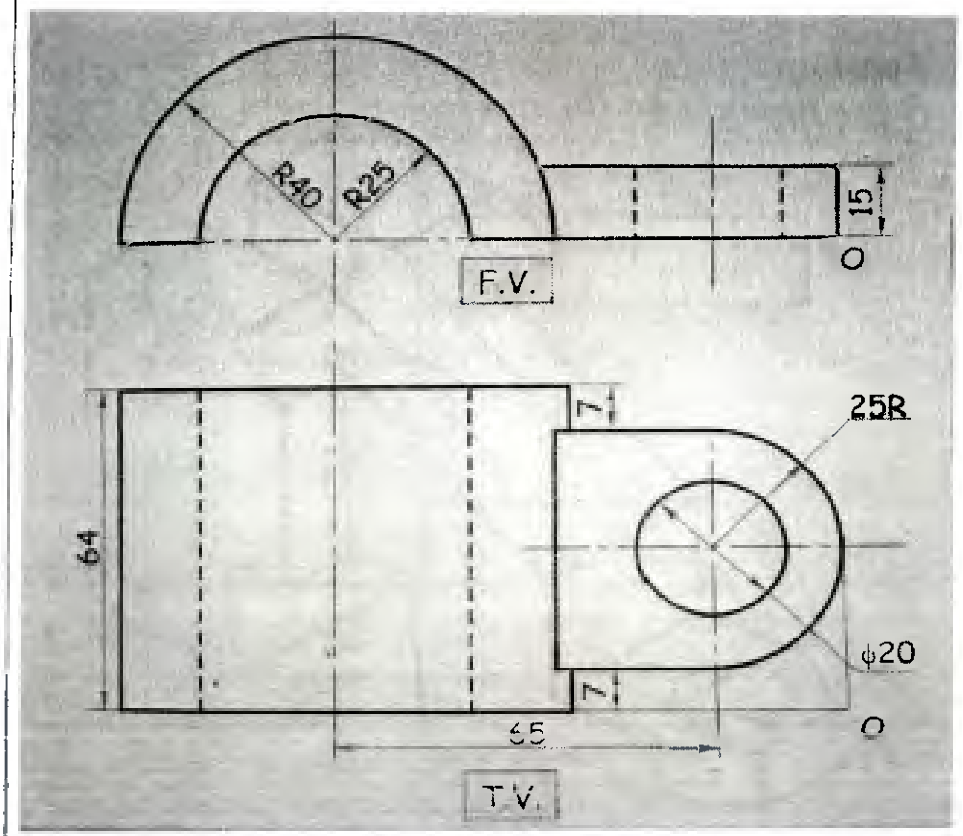
Q7 B	Draw an isometric view of the following using natural scale. 	10	3	2	1.3 .2

Bharatiya Vidya Bhavan's

SARDAR PATEL COLLEGE OF ENGINEERING

(Government Aided Autonomous Institute)
Munshi Nagar, Andheri (W) Mumbai – 400058

End Semester Examination

JANUARY 2024

Program: UG First Year B.Tech (Civil, E) Sem I **Duration: 3 Hours**
Course Code: ES-BTM 102 **Maximum Points: 100**
Course Name: Engineering Mechanics **Semester: I**

Notes:

- Solve any five main questions.
- Start a new question on a new page and group all sub-questions together.
- Assume **suitable data** if necessary and **state it clearly**
- Clearly write units everywhere. Points will be deducted in each place units are missing
- Figure on right indicate **maximum points** for the given question, **course outcomes attained,** and **Bloom's Taxonomy Level**

Q. No.			Points	CO	BL
1	a	A smooth circular cylinder of weight W and radius R rests in a V shape groove whose sides are inclined at angles α and β to the horizontal as shown in figure 1. Find the reactions R_A and R_B at the point of contact	4	1	3
	b	Replace the system of forces and couple shown in Figure 2 by a single force and locate the point on the x –axis through which the line of action of the resultant passes	8	1	2

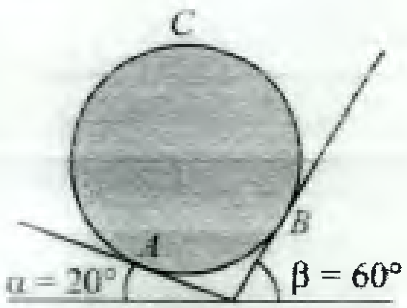


Figure 1

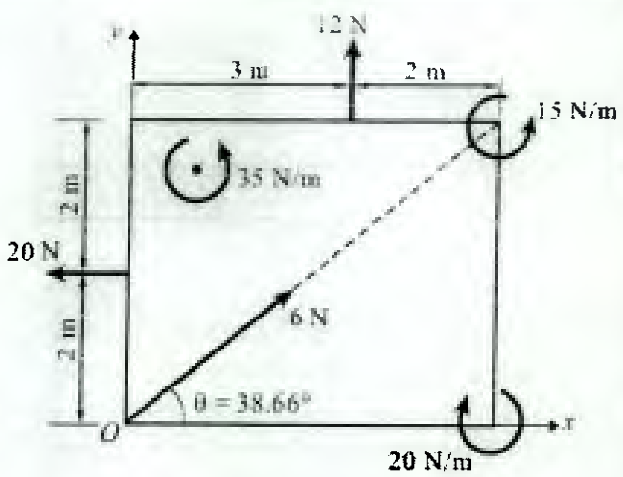
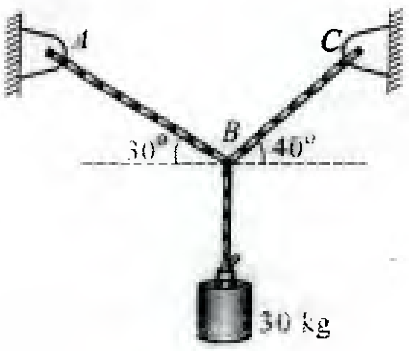
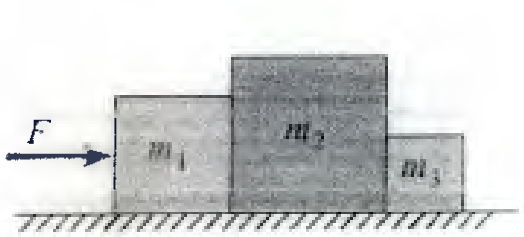
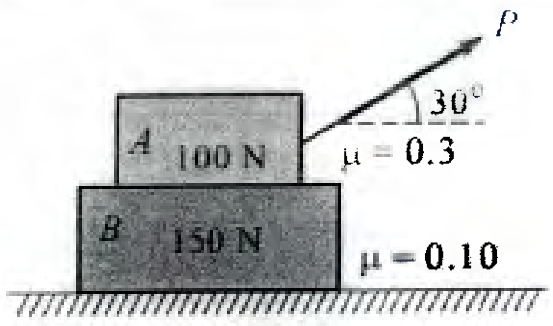
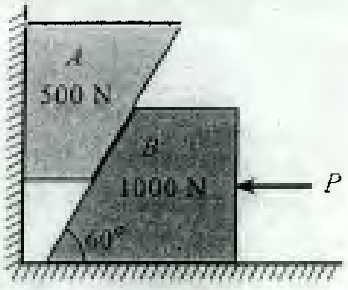
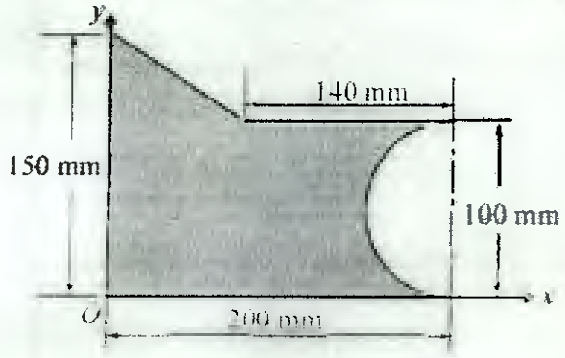
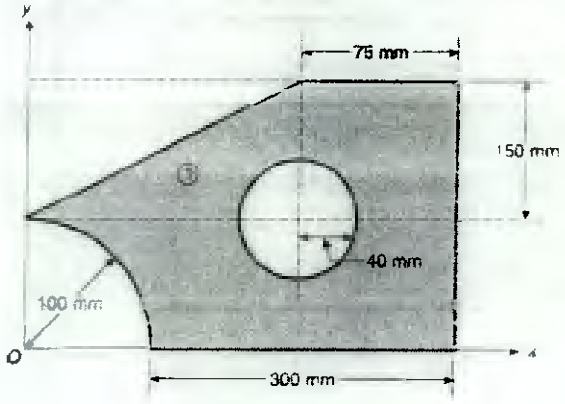
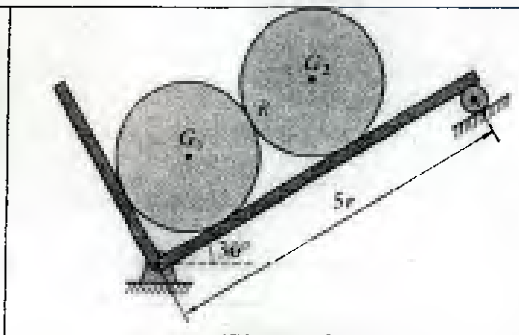
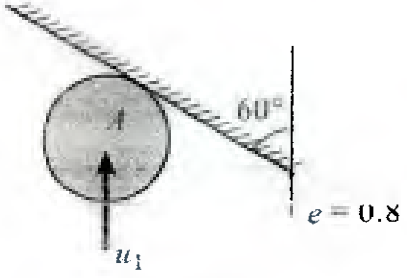
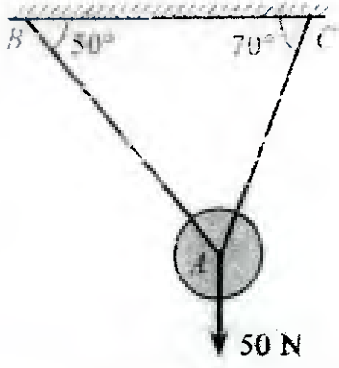


Figure 2

	c	Define Varignon's principle of moments and Parallelogram law of forces.	4	1	1
	d	Determine the tensions in cord AB and BC for equilibrium of 30 kg block shown in Figure 3.  **Figure 3**	4	1	4
2	a	A body of mass 2 kg is projected upwards from the surface of the ground at t = 0 with velocity 20 m/s. At the same time another body of mass 2 kg is dropped along the same line from a height of 25 m. If they collide elastically, find the velocities of body A and B just after collision.	8	4	3
	b	Three blocks m_1, m_2 and m_3 of masses 1.5 kg, 2kg and 1kg respectively are placed on a rough surface with $\mu = 0.2$ as shown in figure 4. If a force F is applied to accelerate the blocks at $3m/s^2$, what will be the force that 1.5 kg block exerts on 2 kg block?  Figure 4	6	2	2
	c	Find the minimum value of P to start the motion  **Figure 5**	6	2	3
3	a	A ladder AB of length 3 m and weight 25 kg is resting against a vertical wall and a horizontal floor. The ladder makes an angle of 50 degree with the floor. A man of weight 60 kg tries to climb the ladder. How much distance along the ladder he will be able to climb if the coefficient of friction between ladder and floor as 0.2 and that between ladder and wall as 0.3. Also find the angle the ladder should make with the horizontal such that the man climb till the top of the ladder.	08	2	4

	b	Assuming the values for μ = 0.25 at the floor and 0.3 at the wall and 0.2 between the blocks as shown in figure 6, find the minimum value of a horizontal force P applied to the lower block that will hold the system in equilibrium.	 **Figure 6**	**8**	**2**	**3**
	c	State the law of frictions		**4**	**2**	**1**
4	**a**	Find centroid of shaded area as shown in figure 7	 **Figure 7**	**8**	**3**	**2**
	b	Find the polar moment of inertia of plane lamina as shown in figure 8 about point O	 **Figure 8**	**12**	**3**	**3**
5	**a**	A particle moves along a track which has a parabolic shape with a constant speed of 10 m/s. The curve is given by $y = 5 + 0.3\ x^2$. Find the components of velocity and normal acceleration when x = 2 m.		**6**	**4**	**4**
	b	A motorist is travelling at 90 kmph, when he observes a traffic signal 250 m ahead of him turns red. The traffic signal is timed to stay red for 12 sec, If the motorist wishes to pass the signal without stopping just as it turns green. Determine (i) The required uniform acceleration of the motor, (ii) The speed of motor as it passes the signal.		**6**	**4**	**5**
	c	In Asian games, for 100 m event an athlete accelerates uniformly from the start to his maximum velocity in a distance of 4 m and runs the remaining distance with		**8**	**4**	**5**

		that velocity. If the athlete finishes the race in 10.4 sec, determine (i) his initial acceleration, (ii) his maximum velocity.			
6	a	Two identical rollers each of weight 500N and radius r are kept on a right angle frame ABC having negligible weight. Assuming smooth surfaces, find the reactions induced at all contact surfaces.  **Figure 9**	8	1	2
	b	A point moves along a path $y = x^2/3$ with a constant speed of 8 m/s. What are the x and y components of its velocity when x = 3? What is the acceleration of the point at this instant?	8	4	3
	c	State D – Alembert's principle with two examples	4	1	1
7	a	A ball of mass m kg hits an inclined smooth surface with a velocity u_1 = 3 m/s. Find out velocity of rebound  **Figure 10**	6	4	2
	b	Sphere A is supported by two wires AB, AC as shown in figure 11. Find out tension in wire AC : (i) Before AB is cut (ii) Just after AB is cut  **Figure 11**	8	1	5
	c	Define Parallel axis theorem, Angle of Repose and Impulse Momentum Principle	6	1,2,4	1

Bharatiya Vidya Bhavan's

SARDAR PATEL COLLEGE OF ENGINEERING

(Government Aided Autonomous Institute)

Munshi Nagar, Andheri (W) Mumbai – 400058

End Semester Examination

JANUARY 2024

Program: UG First Year B.Tech (C, M, E) Sem I **Duration: 3 Hours**

Course Code: ES-BTE 101 **Maximum Points: 100**

Course Name: Engineering Mechanics **Semester: I**

Notes:

- Solve any five main questions.
- Start a new question on a new page and group all sub-questions together.
- Assume **suitable data** if necessary and **state it clearly**
- Clearly write units everywhere. Points will be deducted in each place units are missing
- Figure on right indicate **maximum points** for the given question, **course outcomes attained,** and **Bloom's Taxonomy Level**

Q. No.			Points	CO	BL
1	a	A smooth circular cylinder of weight W and radius R rests in a V shape groove whose sides are inclined at angles α and β to the horizontal as shown in figure 1. Find the reactions R_A and R_B at the point of contact	4	1	3
	b	Replace the system of forces and couple shown in Figure 2 by a single force and locate the point on the x –axis through which the line of action of the resultant passes	8	1	2

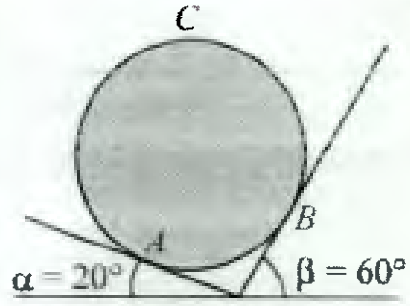


Figure 1

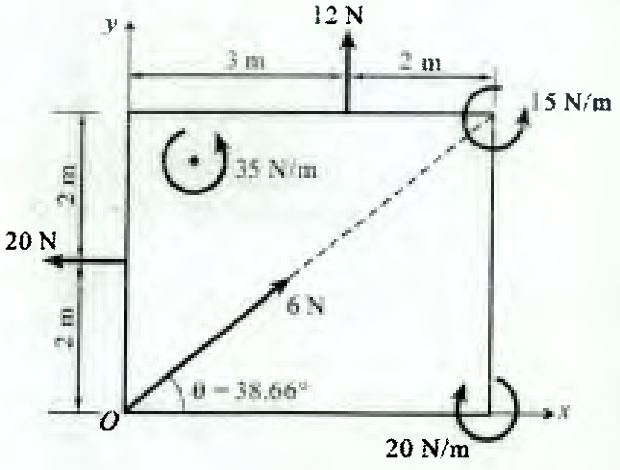
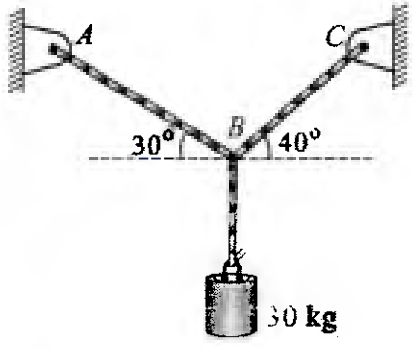
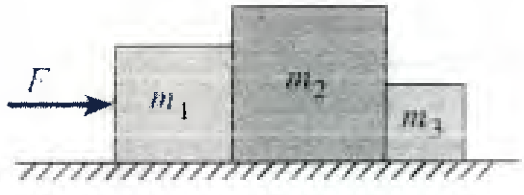
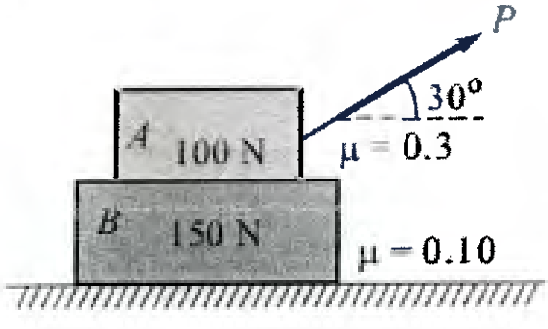
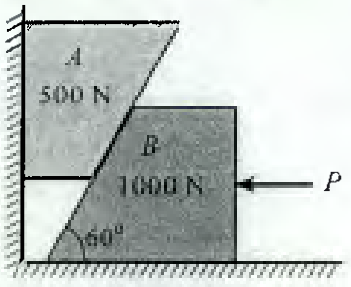
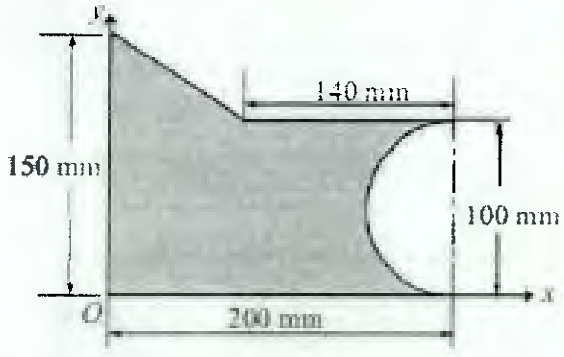
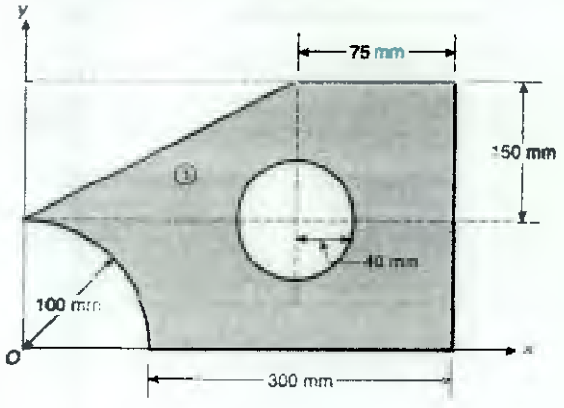
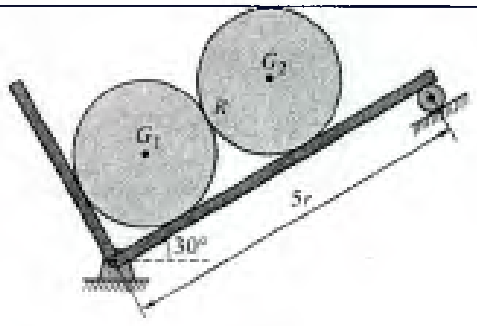
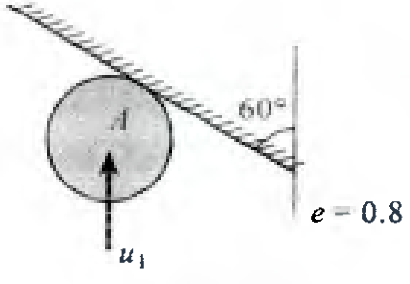
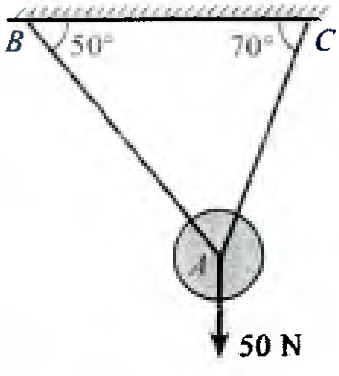


Figure 2

	c	Define Varignon's principle of moments and Parallelogram law of forces.	4	1	1
	d	Determine the tensions in cord AB and BC for equilibrium of 30 kg block shown in Figure 3.  Figure 3	4	1	4
2	a	A body of mass 2 kg is projected upwards from the surface of the ground at t = 0 with velocity 20 m/s. At the same time another body of mass 2 kg is dropped along the same line from a height of 25 m. If they collide elastically, find the velocities of body A and B just after collision.	8	4	3
	b	Three blocks m_1, m_2 and m_3 of masses 1.5 kg, 2kg and 1kg respectively are placed on a rough surface with $\mu = 0.2$ as shown in figure 4. If a force F is applied to accelerate the blocks at $3m/s^2$, what will be the force that 1 5 kg block exerts on 2 kg block?  Figure 4	6	2	2
	c	Find the minimum value of P to start the motion  Figure 5	6	2	3
3	a	A ladder AB of length 3 m and weight 25 kg is resting against a vertical wall and a horizontal floor. The ladder makes an angle of 50 degree with the floor. A man of weight 60 kg tries to climb the ladder. How much distance along the ladder he will be able to climb if the coefficient of friction between ladder and floor as 0.2 and that between ladder and wall as 0.3. Also find the angle the ladder should make with the horizontal such that the man climb till the top of the ladder.	08	2	4

	b	Assuming the values for μ = 0.25 at the floor and 0.3 at the wall and 0.2 between the blocks as shown in figure 6, find the minimum value of a horizontal force P applied to the lower block that will hold the system in equilibrium.	 Figure 6	8	2	3
	c	State the law of frictions		4	2	1
4	a	Find centroid of shaded area as shown in figure 7	 Figure 7	8	3	2
	b	Find the polar moment of inertia of plane lamina as shown in figure 8 about point O	 Figure 8	12	3	3
5	a	A particle moves along a track which has a parabolic shape with a constant speed of 10 m/s. The curve is given by $y = 5 + 0.3 x^2$. Find the components of velocity and normal acceleration when x = 2 m.		6	4	4
	b	A motorist is travelling at 90 kmph, when he observes a traffic signal 250 m ahead of him turns red. The traffic signal is timed to stay red for 12 sec, If the motorist wishes to pass the signal without stopping just as it turns green. Determine (i) The required uniform acceleration of the motor, (ii) The speed of motor as it passes the signal		6	4	5
	c	In Asian games, for 100 m event an athlete accelerates uniformly from the start to his maximum velocity in a distance of 4 m and runs the remaining distance with		8	4	5

		that velocity. If the athlete finishes the race in 10.4 sec, determine (i) his initial acceleration, (ii) his maximum velocity.			
6	a	Two identical rollers each of weight 500N and radius r are kept on a right angle frame ABC having negligible weight. Assuming smooth surfaces, find the reactions induced at all contact surfaces.  **Figure 9**	8	1	2
	b	A point moves along a path $y = x^2/3$ with a constant speed of 8 m/s. What are the x and y components of its velocity when x = 3? What is the acceleration of the point at this instant?	8	4	3
	c	State D – Alembert's principle with two examples	4	1	1
7	a	A ball of mass m kg hits an inclined smooth surface with a velocity u_1 = 3 m/s. Find out velocity of rebound  **Figure 10**	6	4	2
	b	Sphere A is supported by two wires AB, AC as shown in figure 11. Find out tension in wire AC : (i) Before AB is cut (ii) Just after AB is cut  **Figure 11**	8	1	5
	c	Define Parallel axis theorem, Angle of Repose and Impulse Momentum Principle	6	1,2,4	1

Bharatiya Vidya Bhavan's

SARDAR PATEL COLLEGE OF ENGINEERING

(Government Aided Autonomous Institute)

Munshi Nagar, Andheri (W) Mumbai – 400058

END SEMESTER EXAMINATION

1st January 2024

Program: UG First Year Ce, me) Lemt
Course Code: ES-BTC102
Course Name: Engineering Mechanics - I

Duration: 3 Hours
Maximum Points: 100
Semester: I

Notes:

- Solve <u>any five</u> main questions
- Assume suitable data if necessary and state it clearly
- Clearly write units everywhere. Points will be deducted in each place units are missing
- Figure on right indicate **maximum points** for the given question, **course outcomes** attained, and **Bloom's Taxonomy Level**

Q. No			Points	CO	BL
1	a	Explain the following terms and illustrate with neat sketches Coplanar forces, concurrent forces, collinear forces, non-concurrent forces	8	1	1
	b	Determine the support reactions for the beam shown in Figure 1	7	1	3

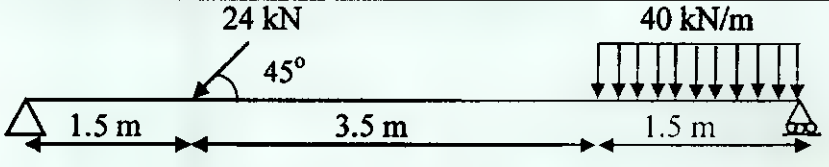


Figure 1

	c	Determine the zero force members in Figure 2. Justify your answers.	2	2	3

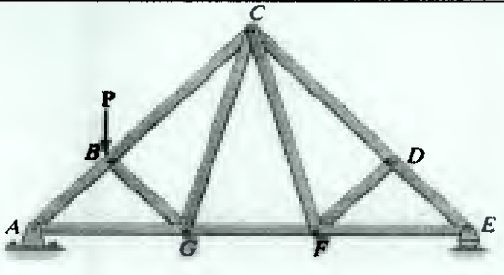


Figure 2

	d	State and explain Lami's theorem.	3	1	1
2	a	For the plate shown in Figure 3, determine the resultant and locate its position with respect to point A.	10	3	3

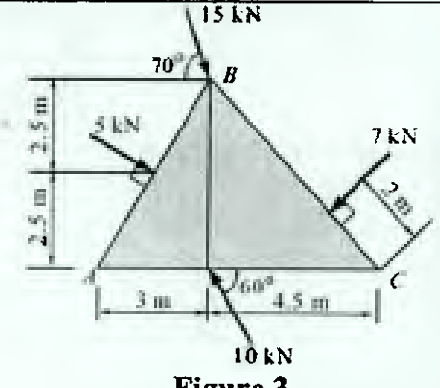
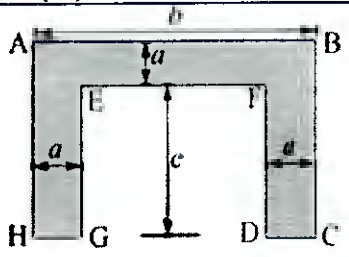


Figure 3

	b	If a = 20 mm and b = 90 mm, determine c such that the centroid of the shaded area lies on EF (see Figure 4).	 Figure 4	10	3	3
3	a	Illustrate with a neat sketch: hinged support, roller support, fixed support. Show the reactions at each support.		6	1	1
	b	For the truss shown in Figure 5, determine the forces in all members		14	2	3

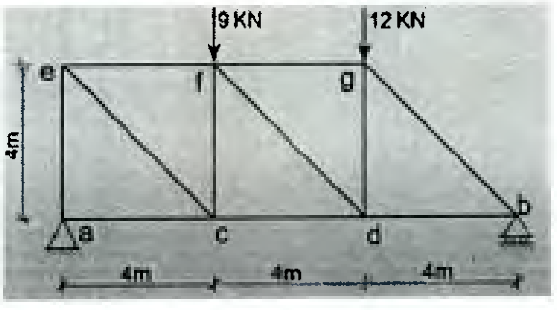
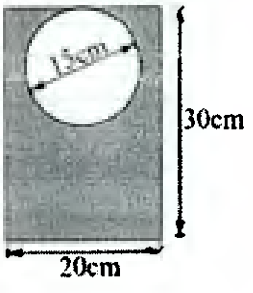


Figure 5

4	a	Determine the moment of inertia of shaded area shown in Figure 6 about the centroidal axis parallel to the base.	 Figure 6	10	3	3
	b	Determine the support reactions for the beam AB shown in Figure 7.		10	1	3

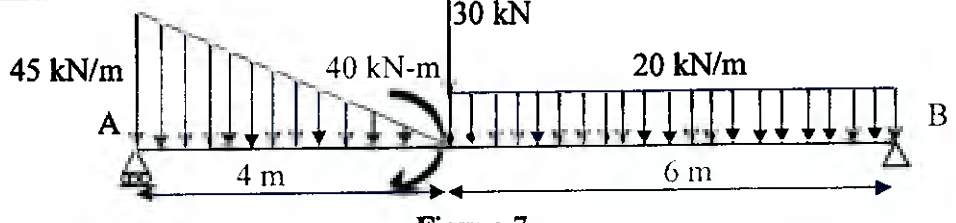
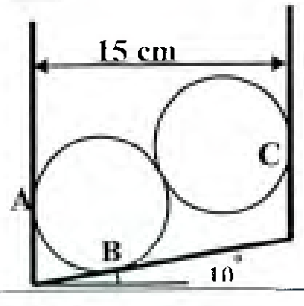
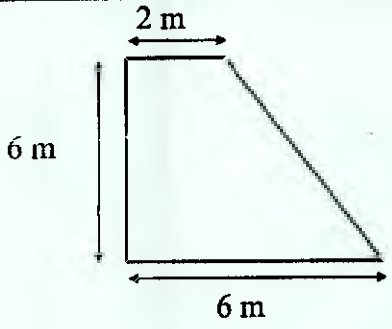
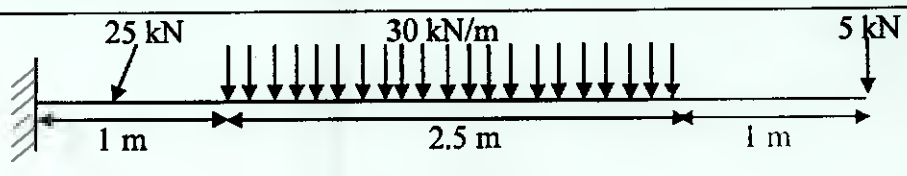
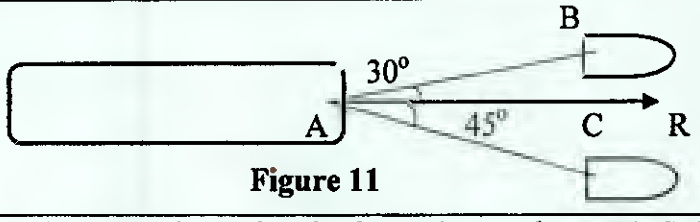
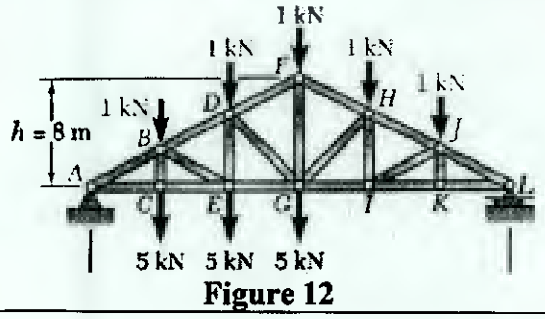


Figure 7

5	a	Two identical cylinders of diameter 10 cm and mass 10 kg are placed as shown in Figure 8. Assuming all contacts are smooth, determine the reactions at C and B.	 Figure 8	10	1	3

	b	For the beam shown in Figure 1 determine the support reactions using the principle of virtual work.	10	4	3
6	a	Determine the moment of inertia of the cross sectional area of the dam shown in Figure 9 about the centroidal axis parallel to the base.	10	3	3
		 **Figure 9**			
	b	Determine the support reactions for the cantilever beam shown in Figure 10.	10	1	3
		 **Figure 10**			(25 kN load acts at 0.5 m from the fixed end at an angle of 50° to the beam)
7	a	State the parallelogram law of forces. A barge is being pulled by two boats as shown in Figure 11. If the resultant of the forces exerted by the boats is 5000 kN, determine the tension in each rope AB and AC using parallelogram law. Also solve the same problem using Lami's theorem.	10	1	1,3
		 **Figure 11**			
	b	For the truss shown in Figure 12, determine the forces in members FH, GH and GI using method of sections if AC, CE, EG, GI, IK, KL are 5 m each.	10	2	3
		 **Figure 12**			