Bharatiya Vidya Bhavan's

SARDAR PATEL COLLEGE OF ENGINEERING

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

END-SEMESTER/~~RE-EXAMINATION~~ DEC24-JAN25

21/12/24

Program: MECHANICAL S.Y. B.Tech (M) Sem III

Course Code: BS-BTM301 Linear

Course Name: Laplace algebra & vector calculus

Duration: 03 Hours

Maximum Points: 100

Semester: III

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

QNO.	QUESTION	POINTS	CO	BL	Module No.
Q1a)	Prove that $\nabla\left(r^2 e^r\right) = (r+2)e^r \vec{r}$	06	3	2	1
Q1 b)	Obtain the Fourier Series for $f(x) = \lvert\cos x\rvert \qquad -\pi \le x \le \pi$	06	2	3,5	5
Q1 c)	Find the value of k such that the system of equations $2x+3y-2z=0, 3x-y+3z=0, 7x+ky-z=0$ has non – trivial solutions. Find the solutions	08	1	1	6
Q2a)	Test for consistency and solve $x-2y+3t=2$ $2x+y+z+t=-4$ $4x-3y+z+7t=8$	06	1	2	6
Q2b)	Find the values of constants λ and μ so that the surfaces $\lambda x^2 - \mu yz = (\lambda+2)x$ and $4x^2y+z^3=4$ may intersect orthogonally at the point $(1,-1,2)$	06	3	2	2
Q2c)	Evaluate by Green's thm $\oint_c e^{-x}(\sin y\,dx + \cos y\,dy)$ where C is the rectangle with vertices (0, 0), (π/0) (π, π/2) & (0, π/2).	08	3	3	3
Q3 a)	Obtain the Fourier Series for $f(x) = \sqrt{1-\cos x} \qquad 0 \le x \le 2\pi$ & hence show that $\sum_{n=1}^{\infty} \frac{1}{4n^2-1} = \frac{1}{2}$	06	2	2	4

1

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END-SEMESTER/RE-EXAMINATION DEC24-JAN25

Q3 b)	Find a unit vector normal to the surface $x^2y+2xz=4$ at point $(2,-2,3)$	06	3	2	5
Q3c)	Find the eigen values and eigenvectors of the matrix $A=\begin{bmatrix}1 & 2 & 0\\ 2 & 1 & -6\\ 2 & -2 & 3\end{bmatrix}$	08	1	4,5	2
Q4 a)	Show that the matrix $A=\begin{bmatrix}1 & -6 & -4\\ 0 & 4 & 2\\ 0 & -6 & -3\end{bmatrix}$ is similar to a diagonal matrix. Also find the transforming matrix and diagonal matrix.	06	1	3	5
Q4 b)	Prove that $\frac{\bar{a}\times\bar{r}}{r^n}$ is a solenoidal vector.	06	3	2	2
Q4 c)	Find half range cosine series of $f(x)=\sin x, 0<x<\pi$	08	2	3	3
Q5 a)	Obtain the Fourier series for $f(x)=\begin{cases}1+\frac{2x}{\pi} & -\pi<x<0\\ 1-\frac{2x}{\pi} & 0<x<\pi\end{cases}$	06	2	2	4
Q5 b)	If $\bar{F}=(x+2y+az)\hat{i}+(bx-3y-z)\hat{j}+(4x+cy+2z)\hat{k}$ is conservative then find values of a,b,c & hence find its scalar potential Φ.	06	3	2	2
Q5 c)	Find the characteristic equation of the matrix $A=\begin{bmatrix}2 & 1 & 1\\ 0 & 1 & 0\\ 1 & 1 & 2\end{bmatrix}$. Verify Cayley – Hamilton theorem and hence evaluate the matrix equation. $A^8-5A^7+7A^6-3A^5+A^4-5A^3-8A^2+2A-I$	08	1	2	7
Q6a)	Find the fourier expansion of $f(x)=\begin{cases}0, & -c<x<0\\ a, & 0<x<c\end{cases}$ where f(x) is periodic with period 2a.	06	2	4	4
Q6 b)	Find non – singular matrices P and Q such that P A Q is in normal form	06	1	3	6

END-SEMESTER/RE-EXAMINATION DEC24-JAN25

	$A=\begin{bmatrix}1 & 2 & -1 & 2\\ 2 & 5 & -2 & 3\\ 1 & 2 & 1 & 2\end{bmatrix}$ Hence find rank of A.				
Q6 c)	Verify Stoke's theorem for the vector field $\vec{F}=(2x-y)\hat{i}-yz^2\hat{j}-y^2z\hat{k}$ over the upper half surface of $x^2+y^2+z^2=1$ bounded by its projection on the XY-plane.	08	3	3	2
Q7 a)	Determine the value of 'p' such that the rank of matrix is 3 $A=\begin{pmatrix}1 & 1 & -1 & 0\\ 4 & 4 & -3 & 1\\ p & 2 & 2 & 2\\ 9 & 9 & p & 3\end{pmatrix}$	06	1	3	1
Q7 b)	Show that $\int_C \vec{F}.\overline{dR}=3\pi$ given that $\vec{F}=z\hat{i}+x\hat{j}+y\hat{k}$ and C being the arc of curve $\vec{r}=\cos t\hat{i}+\sin t\hat{j}+t\hat{k}$ from $t=0$ to $t=2\pi$	06	3	2	5
Q7c)	Verify Divergence Theorem for $\vec{F}=4x\hat{i}-2y^2\hat{j}+z^2\hat{k}$ taken over the bounded by the cylinder $x^2+y^2=4, z=0, z=3$	08	3	3,5	7

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End Semester/~~Re-examination~~ 2024-25

Program: S.Y.B.Tech_WP (Mechanical) **Duration: 3 Hours**

Course Code: ES-BTM301 **Maximum Points: 100**

Course Name: Linear Algebra and Vector Calculus

Semester: III

Note:

1. **Attempt Any Five Questions**
2. **Answers to the sub questions should be grouped together**

		Questions	Points	CO	BL	Module
1	a	Test the consistency of the following system of linear equations and if possible, solve $2x+3y-z-2=0$ $x+2y+z+3=0$ $3x+y-2z-1=0$	6	4	BL5	4
	b	Find the sum and product of Eigen values of A^{-1}, where $A=\begin{bmatrix}3&1&6&8\\0&2&5&7\\0&0&5&3\\0&0&0&-1\end{bmatrix}$	6	4	BL5	4
	c	Find Fourier Series of $f(x)=\left[\frac{\pi-x}{2}\right]^2$, $x\in[0,2\pi]$	8	1	BL3	1
2	a	Find Eigen Values and Eigen Vectors of the following matrix $A=\begin{bmatrix}3&4\\4&-3\end{bmatrix}$	6	4	BL5	5
	b	Find the unit normal vector to the surface $x^2y+2xz^2=8$ at $(1,0,2)$	6	3	BL2	3
	c	Reduce the following matrix to normal form and hence find its rank.	8	4	BL3	4

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

End Semester/~~Re-examination~~ 2024-25

		$A=\begin{bmatrix}2 & 1 & 4 & -1\\ 1 & 2 & 1 & 3\\ 4 & 5 & -1 & 2\\ 8 & 7 & 7 & 1\end{bmatrix}$				
3	a	Obtain Half Range Fourier Cosine Series of $f(x)=Lx-x^2,\ x\in[0,L]$	6	3	BL4	3
	b	Find the Directional Derivative of $\phi=xy^2+yz^3$ at $(1,-1,1)$ in the direction of normal to the surface $x^2+y^2+z^2=9$ at $(1,2,2)$	6	1	BL5	2
	c	Verify Cayley Hamilton Theorem for the following matrix and find A^{-1}, if it exists $A=\begin{bmatrix}0 & c & -b\\ -c & 0 & a\\ b & -a & 0\end{bmatrix}$	8	4	BL5	5
4	a	Determine constants a,b and c if $A=\frac{1}{3}\begin{bmatrix}1 & 2 & a\\ 2 & 1 & b\\ 2 & -2 & c\end{bmatrix}$ is orthogonal.	6	4	BL5	4
	b	Find the angle between the surfaces $x^2+y^2+z^2=9$ and $z=x^2+y^2-3$ at $(2,1,2)$	6	2	BL3	1
	c	Obtain Fourier Series expansion of $f(x)=4-x^2,\ x\in[0,2]$	8	1	BL3	2
5	a	Find Fourier Series of $f(x)=x+x^2,\ x\in[-\pi,\pi]$	6	1	BL4 ,5	2
	b	Find constants a,b and c if $\overline{f}=(axy+bz^3)\hat{i}+(3x^2-cz)j+(3xz^2-y)k$ is irrotational	6	3	BL4	3
	c	Verify Stoke's Theorem for $\overline{f}=(x^2+y^2)\hat{i}-2xyj$ taken around the rectangle bounded by the lines $x=-a,\ x=a,\ y=0,\ y=b$	8	1	BL2 BL4	1

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SARDAR PATEL COLLEGE OF ENGINEERING

(Government Aided Autonomous Institute)
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End Semester/~~Re-examination~~ 2024-25

6	a	Using Green's Theorem, Evaluate $\oint_C [(3x+4y)dx+(2x-3y)dy]$ where C is the circle $x^2+y^2=9$	6	1	BL5	2
	b	Find Fourier Series of $f(x)=x^2,\ x\in[-L,L]$	6	1	BL3	1
	c	For the following matrix A, find two non-singular matrices P and Q such that PAQ is in the normal form. $A=\begin{bmatrix}1 & 2 & 3 & 4\\ 2 & 1 & 4 & 3\\ 3 & 0 & 5 & -10\end{bmatrix}$	8	4	BL3 BL5	4
7	a	Evaluate $\int_C \bar{f}\cdot d\bar{r}$ where $\bar{f}=x^2\hat{i}+2xy\,j$ and C is he arc of the curve $y=x^2$ from $(0,0)$ to $(1,1)$	5	3	BL2 BL3	3
	b	Obtain Half Range Fourier Sine Series of $f(x)=\cos x,\ x\in[0,\pi]$	5	1	BL5	2
	c	Find Eigen Values and Eigen Vectors of the following matrix $A=\begin{bmatrix}2 & 1 & 1\\ 2 & 3 & 2\\ 3 & 3 & 4\end{bmatrix}$	10	4	BL1 BL3	5

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SARDAR PATEL COLLEGE OF ENGINEERING

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

4/12/24

END SEM / ~~RE-~~EXAMINATION, DEC-JAN 2024-25

S.Y.

Program: B.Tech. Mechanical Sem III
Course Code: PCC-BTM302
Course Name: Thermodynamics

Duration: 3 Hour
Maximum Points: 100
Semester: III

Notes:

1) **Solve: Any FIVE Questions.**
2) Answers must be **SPECIFIC** and in **LEGIBLE** handwriting.
3) Draw **neat system diagram/s and process diagrams** wherever necessary.
4) Use **Steam tables and Mollier Chart provided by Examination section,** if required.
5) illustrate your answers with suitable examples as and where necessary.
6) **Assume suitable data wherever necessary and state the same.**

Q. No.	Question	Points	CO	BL	Modul
1.	a) **Explain:** i) Quasi-static process and ii) Thermodynamic equilibrium. **Draw:** neat system diagrams and process diagrams.	10	1	II, III	1
	b) Explain: PMM-1 and its converse. **Draw:** neat sketches. A closed system contains *2 kg* of air at *3 bar, 150°C*. It is stirred and expands till its pressure reduces to *1 bar*. During the process, the temperature of the system is maintained constant and the stirrer does the work of *120 kJ*. **Evaluate**:-i) Expansion Work done ii) Heat Transfer. Take $R = 287\ J/kg.K$, $c_p = 1.005\ kJ/kg.K$ for air. **Draw:** Neat system diagram.	10	1, 4	i, II, V	1, 2
2.	a) **Derive:** General form of steady flow energy equation for a control volume. **Draw:** Neat system diagram. Hence, using the general from of steady flow energy equation, **Derive:** Steady flow energy equation for i) Boiler and ii) Diffusor. **State:** Assumptions made in each case. **Draw:** neat system diagrams for each case.	10	3	I, IV	2
	b) Air enters an air compressor at 8 m/s velocity,100 kPa pressure and volume of *0.95* m^3/kg. 0.95 m^3/kg. It flows steadily at the rate of *0.6 kg/s* and leaves the compressor at 6 m/s, 700 kPa pressure and volume of *0.19* m^3/kg. The internal energy of the air leaving the compressor is *90 kJ/kg* more than that of the air entering the compressor. The cooling water in the compressor jacket absorbs heat from the air in the compressor at the rate of *60 kW*. **Evaluate**:-	10	4	III, V	2

	i) The ratio of inlet pipe diameter to outlet pipe diameter ii) The rate of shaft work input to air in kW. **Draw:** neat system diagram.				
3.	**a) Explain:** Kelvin-Planck statement and Claussius statement of second law of thermodynamics. **Draw:** Neat block diagrams for each statement and justification of equivalence of both the statements.	**10**	1, 3	II, III,	3
	b) Explain: Working of Refrigerator and heat pump. **Draw:** neat block diagram of each. **Justify:** $CoP_{HP} = CoP_R + 1$.	**10**	1, 3	II, III, VI	3
4.	a) 1 kg of ice at -5 °C is converted to superheated steam at 250°C., at constant pressure of 1 atm. **Explain:** Stages/steps of this entire conversion process. **Draw:** T-s diagram for the entire process showing each stage of the entire process, without the saturated solid, liquid and vapor curves. **Determine:** i) Change in entropy of the system for each stage of the conversion process and ii) Change in entropy of the system during the entire process. Refer the following data: c_p of ice = *2.093 kJ/ kg. K*, latent heat of fusion of ice, h_{sf} = *336.96 kJ/ kg*, c_p of water = *4.187 kJ/ kg. K*, latent heat of vaporization of water, h_{fg} = *2257 kJ/ kg*, c_p of steam = *2.093 kJ/ kg. K*.	**10**	4	II, III, V	4, 5
	b) Explain: i) Working ii) advantages and iii) conditions of an ideal reheat cycle for steam power plant. **Draw:** Neat i) system diagram, ii) T-s and h-s diagrams for the cycle. **Derive:** Expression for efficiency of ideal reheat cycle.	**10**	1, 3	II, III IV	5
5.	a) A steam power plant works on an ideal Rankine cycle. Steam turbine receives the steam at *15 bar* and *350°C* and is exhausted to condenser at *0.06 bar*. **Evaluate:** i) Thermal efficiency ii) Steam rate and Heat rate of the plant. **Draw:** Neat i) system diagram, ii) T-s and h-s diagram for the cycle.	**10**	**4**	III, V	5
	b) Explain: Working of an air standard Otto cycle for petrol engine. **Draw:** Neat p-V and T-s diagrams. **Justify:** Air standard efficiency of an Otto cycle is independent of temperature and pressure in the engine cycle.	**10**	4	II, III, V	6

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END SEM / ~~RE~~-EXAMINATION, DEC-JAN 2024-25

6.	**a) Explain**: Working of a Vapor Compression Refrigeration (VCR) cycle. **Draw:** Neat i) system diagram, ii) T-s and p-h diagram for the cycle. **Derive:** Expression for CoP of the cycle.	**10**	1, 3	II, III, IV	3, 7
	b) Explain: i) Wet steam and ii) Dryness fraction of steam. **Draw:** Neat p-V and T-s diagram. **Prove** For a state of unit mass of wet steam, $v = v_f + X.v_{fg}$,	**10**	1, 3	II, III, VI	5
7.	Write short notes on **ANTY THREE** of the following	**20**	1	II	
	a) Diesel and dual cycle				6
	b) Subcooled liquid and superheated steam				5
	c) Fuel cells				7
	d) Joule's Experiment				2
	e) Open cycle gas turbines				6

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WORKING PROFESSIONALS END SEM / ~~RE-EXAMINATION~~ A.Y. 2024-25

Program: B.Tech. Mechanical | **Duration: 3 Hour**
Course Code: PCC-BTM302 | **Maximum Points: 100**
Course Name: Thermodynamics | **Semester: III**

Notes:

1) **Solve: Any FIVE Questions.**
2) Answers must be **SPECIFIC** and in **LEGIBLE** handwriting.
3) Draw **neat system diagram/s and process diagrams** wherever necessary.
4) Use **Steam tables and Mollier Chart provided by Examination section,** if required.
5) illustrate your answers with suitable examples as and where necessary.
6) **Assume suitable data wherever necessary and state the same.**

Q. No.	Question	Points	CO	BL	Modul
1.	a) **Explain:** the concept of thermodynamic work with an illustrative example. **Derive:** Expression for displacement work transfer in an isentropic process. **Draw:** neat system diagram and process diagram wherever necessary.	10	1	II, III, VI	1
	b) **Explain:** PMM1 and its converse. **Draw:** Neat sketches. A fluid, contained in a horizontal cylinder fitted with a frictionless leakproof piston, is continuously agitated by means of a stirrer passing through the cylinder. The cylinder diameter *is 0.40 m*. During the stirring process lasting 10 minutes, the piston slowly moves out by *0.485 m* against the atmosphere. The net work done by the fluid during the process is *2 kJ*. The speed of the electric motor driving the stirrer is 840 rpm. Evaluate: i) Torque in the shaft and ii) output power of the motor. Draw: Neat system diagram,	10	1, 2	II, III, VI	1, 2
2.	a) **Derive:** General form of steady flow energy equation for a control volume. **Draw:** Neat system diagram. Using the general from of steady flow energy equation, **Derive:** Steady flow energy equation for nozzle. **State:** Assumptions made and **Draw:** neat system diagram.	10	1, 2	I, III, IV,	2
	b) Steam expands isentropically in a nozzle from *1 MPa, 250°C* to *10 kPa*. The mass flow rate of steam is *1 kg/s*. Neglecting the K.E. of	10	1, 2	III, VI	2, 5

WORKING PROFESSIONALS END SEM / ~~RE-EXAMINATION~~ A.Y. 2024-25

	steam at inlet to the nozzle, **Evaluate:** i) Velocity of steam at exit from the nozzle, ii) the exit area of the nozzle. **Draw:** Neat T-s and h-s diagram for the process.				
3.	a) **Explain:** Kelvin-Planck statement and Claussius statement of second law of thermodynamics. **Draw:** Neat block diagrams for each statement. **Illustrate:** One practical example of a device / cycle which operates following each statement.	**10**	1, 2	II,. III	3
	b) Explain: Principles of working of Refrigerator and heat pump. **Draw:** neat block diagram of each. **Justify:** $CoP_{HP} = CoP_R + 1$.	**10**	1, 2	I, VI	3, 7
4.	a) **Explain:** Working of an ideal Reheat cycle for steam power plant. **Draw:** Neat i) system diagram, ii) T-s and h-s diagrams and **Derive:** Expression for efficiency of the cycle.	**10**	2, 3	III, IV	5
	b) 1 kg of ice at -5 °C is converted to superheated steam at 250°C. The pressure during this conversion process is constant at 1 atm. **Identify and Explain:** Stages/steps of this entire conversion process. **Draw:** T-s diagram for the entire process showing each stage of the entire process, **without the saturated solid, liquid and vapor curves**. **Evaluate:** i) Change in entropy for each stage of the conversion process Refer the following data: c_p of ice = *2.093 kJ/ kg. K*, latent heat of fusion of ice, h_{sf} = *336.96 kJ/ kg*, c_p of water = *4.187 kJ/ kg. K*, latent heat of vaporization of water, h_{fg} = *2257 kJ/ kg*, c_p of steam = *2.093 kJ/ kg. K*.	**10**	2, 3	II, VI	4, 5
5.	a) **Explain:** I) Subcooled liquid ii) Wet steam and dryness fraction iii) Superheated steam. **Illustrate:** Each state on a p-V and T-s diagram. **Justify:** For wet steam of unit mass with dryness fraction x, $v = v_f + X.v_{fg}$,	8	2, 3	II, III, VI	5
	b) A steam power plant works on an ideal Rankine cycle. Steam turbine receives the steam at *15 bar* and *350°C* and is exhausted to condenser at *0.06 bar*. **Evaluate:** Thermal efficiency of the plant. **Draw:** Neat i) system diagram, ii) T-s and h-s diagram for the cycle.	**12**	4	I, V.	5
6.	a) **Explain:** Working of an air standard Otto cycle for petrol engine. **Draw:** Neat p-V and T-s diagrams. **Justify:** Air standard efficiency	8	2, 3	II, III, V	6

	of an Otto cycle is independent of temperature and pressure in the engine cycle with necessary derivation.				
	b) An engine is operating on the air standard Otto cycle. The conditions at the start of the compression are 27°C and 100 kPa. The heat added is 1840 kJ/kg. The compression ratio is 8. **Determine: i)** The temperature and pressure at each point in the cycle, ii) Thermal efficiency and iii) mean effective pressure.	**12**	4	VI	6
7.	Write short notes on **ANTY THREE** of the following. **Draw:** Neat system and process diagrams wherever necessary.	**20**	1, 2	II	
	a) Joule's Experiment				2
	b) Thermodynamic systems and thermodynamic equilibrium				1
	c) Diesel and dual cycle				6
	d) Vapor Compression Refrigeration cycle				7
	e) Fuel cells				7

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7/12/24

END-SEM/~~MSE~~/ EXAMINATIONS Dec 2024/~~Jan 2025~~

Program :BTech Mechanical engg S.Y.B.Tech Sem III **Duration** :3 hr

Course Code :PC-BTM304 **Maximum Points** :100

Course Name :Strength of Materials.

Semester :III

Instruction : Refer below

1. Question No. 1 is compulsory
2. Solve any four out of remaining six.
3. ~~Answers to each~~ sub-questions are ~~grouped~~ together
4. Use of scientific calculator is allowed
5. Begin answer to each question on new page.
6. Keep some margin on left side of answer paper
7. **Candidates should write the answer legibly**

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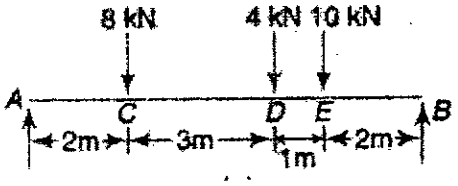
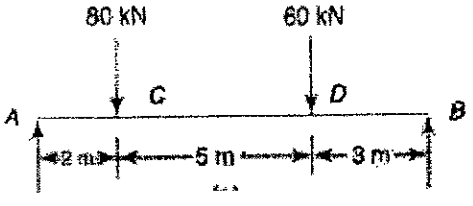
Q. no.	Description	Pts	CO	BL
1	a) If the steel rod is secured strongly between the supports as shown in the figure below is heated, determine the stress induced in it due to 25°C rise in temperature. Take the coefficient of thermal expansion and Young's modulus of elasticity of steel as $\alpha = 17\times10^{-6}$ /°C and $E = 200$ GPa, respectively; 'When there is temperature rise, there is always thermal strain developed in the material; however, thermal stress may not induce'. Comment in support of the above statement.	5	1,2 ,3	2,3
	b) Derive the relationship between the bending moment, shearing force, and intensity of loading of a laterally loaded beam.	5		
	c) The ratio of maximum shear stress to average shear stress in beams of rectangular cross section is 1.5; prove it.	5		
	d) What do you meant by thin and thick cylinder? Derive expression for hoop and longitudinal stresses in thin cylinder.	5		
2	a) The state of a stress on two mutually perpendicular planes is, σxx =35 MPa, σyy = –12 MPa, τxy=25 MPa. Determine the magnitudes of the principal stresses and their orientations, maximum shear stress, normal stress on the plane of max. shear stress. Also find the state of a stress on plane making 40^0 with 'x' plane in clock-wise direction.	15	3	2,3
	b) What do you mean by state of pure shear? Explain with the help of Mohr's circle.	5		
3	A 6 meter long simply supported beam carries a point load of 25 kN load at the right end and uniformly distributed load of 15 kN/m over the entire span. The two supports are 4 meter apart, the left hand support being at the left end. Calculate and draw the SFD, BMD and key points on it.	20	2	

4	An I-section beam of 300 mm x 100 mm having flange thickness 12 mm and web thickness of 6 mm is subjected to shear force of 250 kN. Determine the maximum and minimum shear stress in the web. Calculate percentage of shear load carried by web.	20	2	3,4
5	a) Calculate the maximum bending stress induced for beam (as shown in figure) having cross section 80mm deep and 35 mm wide.  b) What is section modulus? How does it influence bending stress?	15 5	2	3,4
6	a) A cylindrical shell, 1100 mm in diameter, thickness of metal 15 mm and 3.2 m long, is subjected to internal pressure of 1.8 MPa. Calculate the change in diameter, length and volume of shell under pressure. Use thin cylinder theory. E = 210 GPa, Poisson's ratio = 0.27. b) A circular shaft transmits 30 kW at 400 rpm. It is supported in bearings 6 meters apart and at 2 meters from one bearing, it carries a rotor exerting a transverse load of 15 kN on the shaft. Determine a suitable diameter for the shaft taking into account both bending and torsional stresses if the maximum shear stress is not to exceed 40 MPa.	10	2	3,4
7	Find the slope and deflection under each load and maximum deflection. E =200 GPa, I = 150 x 10^6 mm^4 	20	4	3

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WP_END-SEM/Re/ EXAMINATIONS Jan 2025/Feb 2025

Program :**BTech Mechanical engg** **Duration** :**3 hr**

Course Code :**PC-BTM304** **Maximum Points** :**100**

Course Name :**Strength of Materials.**

Semester :**III**

Instruction : Refer below

1. Question No. 1 is compulsory
2. Solve any four out of remaining six.
3. Answers to each sub-questions are grouped together
4. Use of scientific calculator is allowed
5. Begin answer to each question on new page.
6. Keep some margin on left side of answer paper
7. **Candidates should write the answer legibly**

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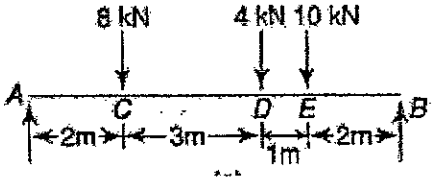
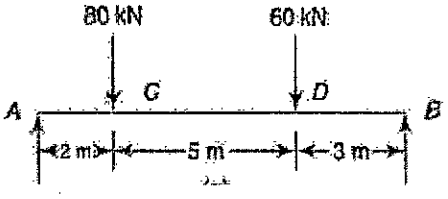
Q. no.	Description	Pts	CO	BL
1	a) What do you mean by pure bending? Explain the concept with suitable diagram. b) Derive the relationship between the bending moment, shearing force, and intensity of loading of a laterally loaded beam. c) The ratio of maximum shear stress to average shear stress in beams of rectangular cross section is 1.5; prove it. d) What do you meant by thin and thick cylinder? Derive expression for hoop and longitudinal stresses in thin cylinder.	5 5 5 5	1,2,3	2,3
2	a) The state of a stress on two mutually perpendicular planes is, $\sigma xx = -60$ MPa, $\sigma yy = 90$ MPa, $\tau xy = 30$ MPa. Determine the magnitudes of the principal stresses and their orientations, maximum shear stress, normal stress on the plane of max. shear stress. Also find the state of a stress on plane making 25^0 with 'x' plane in clock-wise direction. b) Represent the state of a stress above with the help of Mohr's circle.	15 5	3	2,3
3	A 6 meter long simply supported beam carries a point load of 15 kN load at the right end and uniformly distributed load of 15 kN/m over the entire span. The two supports are 4 meter apart, the left hand support being at the left end. Calculate and draw the SFD, BMD and key points on it.	20	2	
4	An I-section beam of 280 mm x 120 mm having flange thickness 8 mm and web thickness of 4 mm is subjected to shear force of 150 kN. Determine the maximum and minimum shear stress in the web. Also calculate shear stress in the flange.	20	2	3,4

5	a) Calculate the maximum bending stress induced for beam (as shown in figure) having cross section 80mm deep and 35 mm wide.  b) What is section modulus? How does it influence bending stress?	15 5	2	3,4
6	a) A cylindrical shell, 1000 mm in diameter, thickness of metal 10 mm and 3.0 m long, is subjected to internal pressure of 1.8 MPa. Calculate the change in diameter, length and volume of shell under pressure. Use thin cylinder theory. E = 210 GPa, Poisson's ratio = 0.25. b) A circular shaft transmits 36 kW at 600 rpm. It is supported in bearings 6 meters apart and at 2 meters from one bearing, it carries a rotor exerting a transverse load of 12 kN on the shaft. Determine a suitable diameter for the shaft taking into account both bending and torsional stresses if the maximum shear stress is not to exceed 48 MPa.	10	2	3,4
7	Find the slope and deflection under each load and maximum deflection. E =200 GPa, I = 150 x 10^6 mm^4  	20	4	3

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END SEM/~~RE-EXAM~~ EXAMINATION DEC/~~JAN~~ 2024-25

11/12/24

S.Y. B. Tech (M) Sem III

Program: Mechanical Engineering **Duration: 03 Hrs.**

Course Code: PC-BTM303 **Maximum Points: 100**

Course Name: **Material and Manufacturing Science** **Semester: III**

Notes:

1. **Question no 1 is compulsory**
2. Attempt any **four questions** from the remaining six questions.
3. If necessary **assume suitable** data with justification
4. Draw **neatly labeled sketches** wherever required.

Q. No.	Questions	Points	CO	BL	Module No.
1A	Derive an equation for the critical radius of a solid ball essential for solidification growth, supported by a labeled diagram. Analyze the role of Gibbs free energy in the phase transformation from liquid to solid, and explain its significance during the nucleation process.	10	3	4	1
1B	The following data from an orthogonal cutting test is available Rake angle = 15^{o} ,Chip thickness ratio(cutting ratio) = 0.383, Uncut chip thickness = 0.8 mm ,Width of cut= 4 mm, Yield stress of material in shear = 295 N/mm^2, Average coefficient of friction on the tool face = 0.8. Determine the normal and tangential forces on the tool face.	10	1,3	4,5	6
2A	Classify the mechanical methods of powder production. Explain the principle of powder formation in water atomization, including the physics of atomization, with a suitable diagram.	06	4	2	5
2B	A cylindrical workpiece is subjected to a cold upset forging operation. The starting piece is 85 mm in height and 50 mm in diameter. It is reduced in the operation to a height of 40mm. The work material has a flow curve defined by K 350 MPa and n 0.17. Assume a coefficient of friction of 0.1. Determine the force as the process begins, at intermediate heights of 62 mm, 49 mm, and at the final height of 40mm.	06	1,2	3	7
2C	Draw the Fe-C equilibrium diagram and accurately label the compositions, critical temperatures, and phases. Identify and write the equations for the three key invariant reactions observed in the Fe-C equilibrium diagram. Evaluate the amount of product phases for each of these reactions at equilibrium using the lever rule.	08	3	4,5	1

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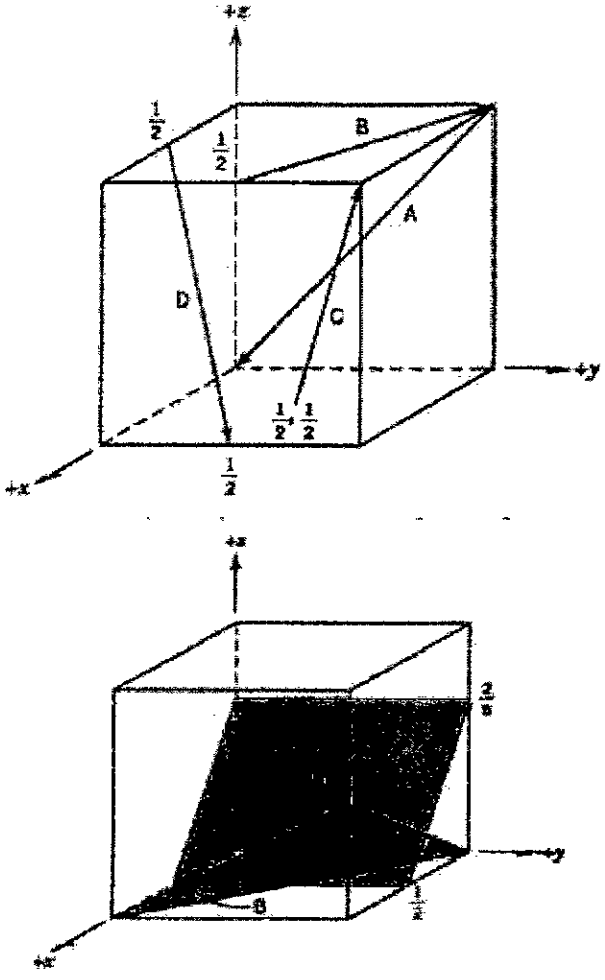
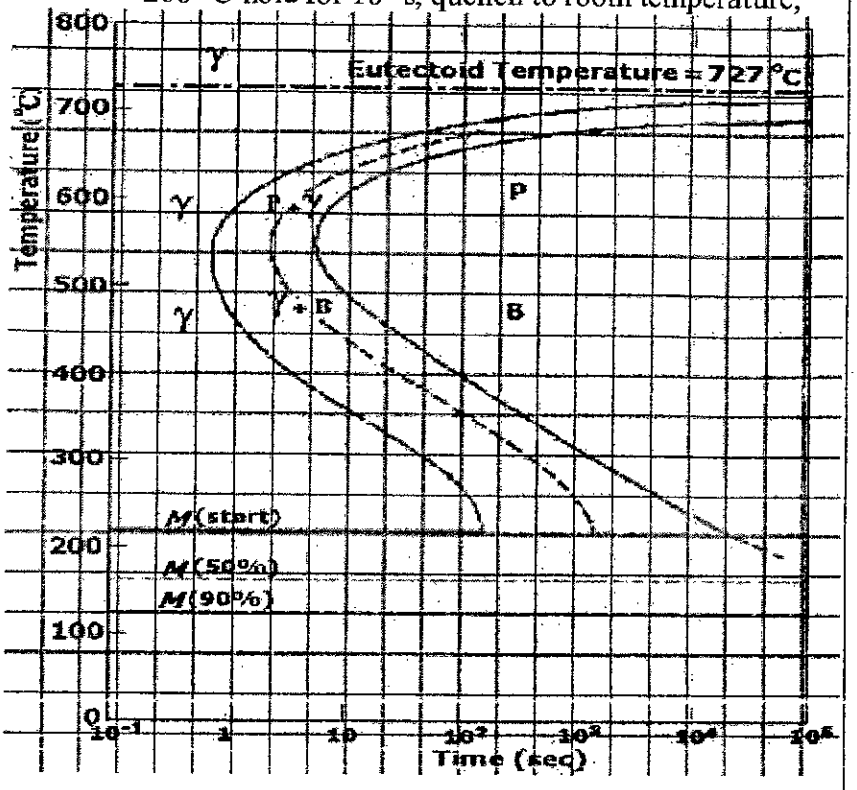
(Government Aided Autonomous Institute) Munshi Nagar, Andheri (W) Mumbai – 4

END SEM/~~RE-EXAM~~ EXAMINATION DEC/~~JAN~~ 2024-25

3 A	Determine the Miller indices for the directions and the planes shown in the following unit cell:[Note: provide the stepwise calculations for the given problem] 	10(6 +4)	3	5	1
3B	Classify copper alloys. Describe the key properties of bearing materials that make them suitable for mechanical systems.	05	1	4	3
3C	Given a material that is cold worked with initial properties of low ductility and high tensile strength, explain how these properties can be modified to achieve high ductility and low tensile strength through the process of recrystallization. Analyze the resulting microstructure and mechanical properties. Finally, illustrate and label the recrystallization process on a relevant diagram, and draw the ductility and tensile strength curves before and after recrystallization.	05	4,3	4	2
4A	Discuss each case of the heat treatment process of Fe-0.65% C eutectoid steel rapidly cooled from a preheated temperature of 860^0C (>727^0C) as follows [**NOTE:** Analyze the resulting microstructures, evaluate the properties of the final product, and justify the suitability of each process.] 1. Rapidly cool to 600^0 C and hold for 10^2 s and quench to room temperature	10	4	4	2

	2. Rapidly cool to 500°C, hold for 10^3 s and quench to room temperature; 3. Rapidly cool to 490 °C, hold for 8s, rapidly cool to 280 °C hold for 10^4 s, quench to room temperature; 				
4B	The tool life equation for HSS tool is $VT^{0.14} f^{0.7} d^{0.4}$ = Constant. The tool life (T) of 40 min is obtained using the following cutting conditions: V = 50 m/min, f = 0.35 mm, d = 2.0 mm If speed (V), feed (f) and depth of cut (d) are increased individually by 35%, find the tool life (in min).	05	4	3	6
4C	Using a schematic diagram, demonstrate the working of the Directed Energy Deposition (DED) method in additive manufacturing, focusing on the energy source and material feed system.	05	2	3	5
5A	Different alloy steel compositions are provided below. Analyze the given compositions, and based on the presence of the alloying elements, write the expected properties of each alloy steel. 1. **C: 0.6%, Cr: 14.5%, Mo: 0.8%, V: 0.2%** 2. **C: 0.35%, Ni: 2.5%, Mn: 1%, Pb: 0.3%** 3. **C: 1.85%, Co: 1%, Mo: 0.3%, Cr: 1.5%**	06	4	4	03
5B	Define nanomaterials and elaborate on the top-down and bottom-up approaches used in their synthesis. Write any two applications of nanomaterials.	06	4	4	4

5C	Apply your understanding of case hardening to explain its purpose and process. Analyze the following case hardening techniques by describing the elements added, their characterization, and applications: 1. Carbonitriding 2. Boronizing 3. Flame Hardening	08	3,4	4,5	2
6A	Classify composites based on fiber reinforcement and explain the characteristics of each category. Provide the operating temperature range for each type of fiber-reinforced composite and suggest which fiber material is best suited for space applications.	08	4	4	4
6B	Apply your knowledge of material compositions to write the chemical composition of the following materials. Analyze their properties and suggest suitable engineering applications for each: 1. Gilding Metal 2. Muntz Metal 3. Nickel Gun Metal.	06	3,4	3	3
6C	Classify the basic sheet forming processes and briefly explain any three processes belonging to this classification.	06	4	3	7
7A	Mild steel is being machined at a cutting speed of 200 m/min with a tool rake angle of 10^0. The width of cut and uncut chip thickness are 2 mm and 0.2mm, respectively. If the average value of coefficient of friction between the tool and chip is 0.5 and the shear stress of the work material is 400N/mm2. Determine: cutting and thrust components of machining force. Assume $2\Phi + \lambda - \alpha = (\pi/2)$.	06	2,3	4	6
7B	Explain powder flowability and density measurements in the additive manufacturing process, focusing on their role in ensuring consistent material deposition and final part quality. Discuss how powder flowability directly influences the density of the final product.	07	1,4	3	5
7C	A 330-mm-wide strip 30 mm thick is fed through a rolling mill with two powered rolls each of radius 250 mm. The work thickness is to be reduced to 27 mm in one pass at a roll speed of 50 rev/min. The work material has a flow curve defined by K 275 MPa and n 0.15, and the coefficient of friction between the rolls and the work is assumed to be 0.12. Determine if the friction is sufficient to permit the rolling operation to be accomplished. If so, calculate the roll force, torque, and horsepower.	07	2	3	7

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End Sem/~~Re- Exam~~ Examination December/ ~~Jan~~ 2024 -25

13/12/24

Program: S.Y. Mechanical Engineering (S.Y. B.Tech (M) Sem III)

Duration: 3 Hour

Course Code: **VE-BTM001**

Maximum Points: 50

Course Name: **Health Safety and Environment**

Semester: III

Notes: 1. All Questions are compulsory
2. Choose any one sub question from Question 1 to Question 5.
3. Draw neat schematic diagrams wherever is necessary, highlight important points.
4. Assume suitable data if necessary and mention it.

Q.No.	Questions	Points	CO	BL	Module No.
Q1 A	Give important elements involved in "Framework for implementation of Ramsar Convention". Explain pointwise how conservation of wetland can be done to implement this convention?	10	3	2	6
Q1 B	A gas oven system consist of Gas cylinder which is regulated by manual valve C, Rubber pipe and gas oven system with burner A and B which controlled by manual valve A and B. In the initial event of leakage of gas, there are 3 possible accident scenarios are fire, small release and safe release. i) Construct fault tree ii) Obtain formulae for probability of accident scenarios	10	2	4	4
Q2 A	Illustrate "Hierarchy of hazard control" with an example? Explain the PHL (Preliminary Hazard List) methodology with a neat and labelled sketch.	10	2	2	3
Q2 B	Explain using definition and with an example, what is hazard, accident and risk? Draw neat sketch of Peterson model of Accident Causation or any other model?	10	1	3	2
Q3 A	Define the following (any 3) : a) Incident b) Safety c) Accident d) Mishap e) Hazard What is integrity of a system in OHS scenario, also clearly define the 3 factors affecting the integrity of the system	10	1,2	5	1,2
Q3 B	Write short notes on the magnitude of waste problem in world and India. Also define Nuclear waste and types of nuclear waste.	10	4	2	5
Q4 A	Write short notes on a) Bhopal Gas Tragedy	10	2	2	2

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(Government Aided Autonomous Institute)

Munshi Nagar, Andheri (W) Mumbai – 400058

End Sem/Re-Exam Examination December/ Jan 2024 -25

	b) Flixborough & Piper Alpha Case Study c) Heinrich Triangle				
Q4 B	Define Air Pollution, types of pollutants, sources of Air Pollution and their associated effects?	10	4	2	7
Q5 A	Give notes on the following a) Classification of wetlands b) Convention on Biological Diversity c) Convention on Conservation of Migratory Species of Wild Animals.	10	3	3	6
Q5 B	List down the step by step procedure of HAZOP. Also, List down guide words and their meanings with reference to HAZOP	10	2	3	4

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END SEM/~~RE-EXAM~~ EXAMINATION DEC/JAN 2024-25

Program: Mechanical Engineering Working professional **Duration: 03 Hrs.**

Course Code: PC-BTM303 **Maximum Points: 100**

Course Name: **Material and Manufacturing Science** **Semester: III**

Notes:

1. **Question no 1 is compulsory**
2. Attempt any **four questions** from the remaining six questions.
3. If necessary **assume suitable** data with justification
4. Draw **neatly labeled sketches** wherever required.

Q. No.	Questions	Points	CO	BL	Module No.
1A	A 320-mm-wide strip 35 mm thick is fed through a rolling mill with two powered rolls each of radius 250 mm. The work thickness is to be reduced to 32 mm in one pass at a roll speed of 50 rev/min. The work material has a flow curve defined by K 272 MPa and n 0.14, and the coefficient of friction between the rolls and the work is assumed to be 0.12. Determine if the friction is sufficient to permit the rolling operation to be accomplished. If so, calculate the roll force, torque, and horsepower.	10	2	3	7
1B	Draw the Fe-C equilibrium diagram and accurately label the compositions, critical temperatures, and phases. Identify and write the equations for the three key invariant reactions observed in the Fe-C equilibrium diagram. Evaluate the amount of product phases for each of these reactions at equilibrium using the lever rule.	10	3	4,5	1
2A	Explain the gas atomization process used in powder metallurgy. Analyze the key factors affecting the particle size and shape of the powders produced, and discuss their influence on the properties of the final product.	06	4	2	5
2B	A cylindrical workpiece is subjected to a cold upset forging operation. The starting piece is 88 mm in height and 50 mm in diameter. It is reduced in the operation to a height of 42mm. The work material has a flow curve defined by K 350 MPa and n 0.17. Assume a coefficient of friction of 0.1. Determine the force as the process begins, at intermediate heights of 68 mm, 52 mm, and at the final height of 42mm. (initial strain is 0.002)	06	1,2	3	7
2C	Derive an equation for the critical radius of a solid ball essential for solidification growth, supported by a labeled diagram. Analyze the role of Gibbs free energy in the phase transformation from liquid to solid, and explain its significance during the nucleation process.	8	3	4	1

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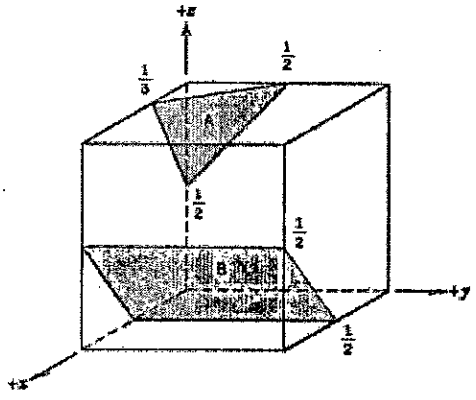
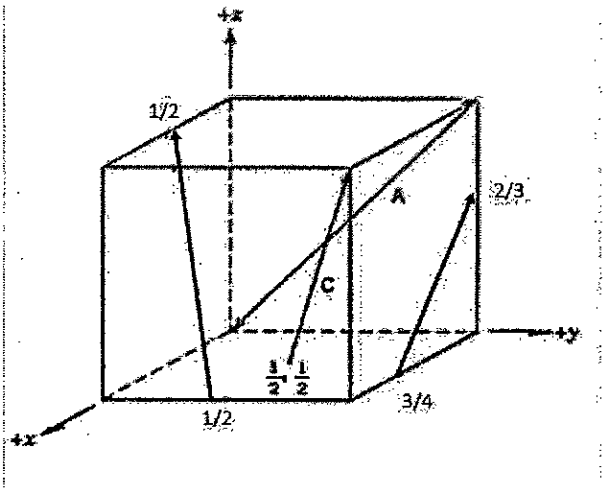
END SEM/~~RE-EXAM~~ EXAMINATION ~~DEC~~/JAN 2024-25

3 A	Determine the Miller indices for the directions and the planes shown in the following unit cell:[Note: provide the stepwise calculations for the given problem]  	10(6 +4)	3	5	1
3B	What is stainless steel? Classify the different types of stainless steel. Analyze the characteristics of martensitic stainless steel.	05	1	4	3
3C	Explain the austempering process in detail. Identify and describe the product formed during the austempering process. Illustrate your explanation with a labeled TTT diagram.	05	4,3	4	2
4A	Discuss each case of the heat treatment process of Fe-0.65% C eutectoid steel rapidly cooled from a preheated temperature of 860^{0}C (>727^{0}C) as follows [**NOTE:** Analyze the resulting microstructures, evaluate the properties of the final product, and justify the suitability of each process.] 1. Rapidly cool to 500^0 C and hold for 10^3 s, quench to room temperature. 2. Rapidly cool to 190°C, hold for 10^3 s and quench to room temperature; 3. Rapidly cool to 450 °C, hold for 10s, rapidly cool to 180 °C hold for 10^4 s, quench to room temperature;	10	4	4	2

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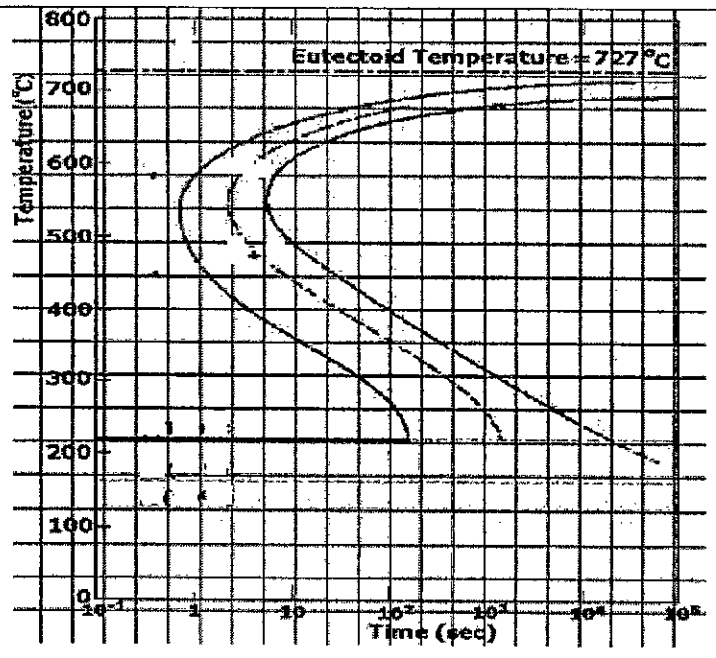
END SEM/~~RE-EXAM~~ EXAMINATION ~~DEC~~/JAN 2024-25

					
4B	The tool life equation for HSS tool is $VT^{0.14} f^{0.7} d^{0.4}$ = Constant. The tool life (T) of 35 min is obtained using the following cutting conditions: V = 42 m/min, f = 0.42 mm, d = 2.0 mm If speed (V), feed (f) and depth of cut (d) are increased individually by 35%, calculate the tool life (in min).	05	4	3	6
4C	Explain the plasma spheroidization process in the context of powder metallurgy. Describe how it enhances the characteristics of powder particles and its significance in improving the properties of sintered components.	05	2	3	5
5A	Different alloy steel compositions are provided below. Analyze the given compositions, and based on the presence of the alloying elements, write the expected properties of each alloy steel. 1. **C: 0.6%, Cr: 14.5%, Mo: 0.8%, V: 0.2%** 2. C: 0.15 to 1.2%, Mn: 1%, Si: 1%, Cr: 11.5 to 18% 3. **C: 0.35%, Ni: 2.5%, Mn: 1%, Pb: 0.3%**	06	4	4	03
5B	Define nanomaterials and elaborate on the top-down and bottom-up approaches used in their synthesis. Write any two applications of nanomaterials.	06	4	4	4
5C	Apply your understanding of case hardening to explain its purpose and process. Analyze the following case hardening techniques by describing the elements added, their characterization, and applications: 1. Carbonitriding 2. Boronizing 3. Flame Hardening	08	3,4	4,5	2
6A	Classify composites based on the matrix material and explain the characteristics of each category. Provide a detailed explanation of metal matrix composites and carbon matrix composites, including their properties, applications, and operating temperature ranges.	08	4	4	4

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(Government Aided Autonomous Institute) Munshi Nagar, Andheri (W) Mumbai – 4

END SEM/~~RE-EXAM~~ EXAMINATION ~~DEC~~/JAN 2024-25

6B	Apply your knowledge of material compositions to write the chemical composition of the following materials. Analyze their properties and suggest suitable engineering applications for each: 1. Muntz Metal 2. Admirality gun-metal 3. Nickel Gun Metal	06	3,4	3	3
6C	Analyze a manufacturing scenario where a metal's mechanical properties need to be enhanced after forming. Apply your understanding to explain the roles of cold working, warm working, and hot working in metal forming	06	4	3	7
7A	Mild steel is being machined at a cutting speed of 205 m/min with a tool rake angle of 10^0. The width of cut and uncut chip thickness are 2 mm and 0.2mm, respectively. If the average value of coefficient of friction between the tool and chip is 0.5 and the shear stress of the work material is 385N/mm2. Determine: cutting and thrust components of machining force. Assume $2\Phi + \lambda - \alpha = (\pi/2)$.	06	2,3	4	6
7B	Explain the importance of particle size and powder flowability in the additive manufacturing process, focusing on their role in ensuring consistent material deposition and final part quality. Discuss how variations in particle size directly influence powder flowability and the properties of the final product.	07	1,4	3	5
7C	The following data from an orthogonal cutting test is available Rake angle = 17^o ,Chip thickness ratio(cutting ratio) = 0.383, Uncut chip thickness = 0.8 mm ,Width of cut= 4 mm, Yield stress of material in shear = 285 N/mm², Average coefficient of friction on the tool face = 0.75. Determine the normal and tangential forces on the tool face	07	1,3	4,5	6

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End Semester Examination January 2025 (R23)

Program: **S.Y .Mechanical Engineering (Working Professional)** Duration: 3 Hour

Course Code: **VE- BTM001** Maximum Points: 50

Course Name: **Health Safety and Sustainable Environment**

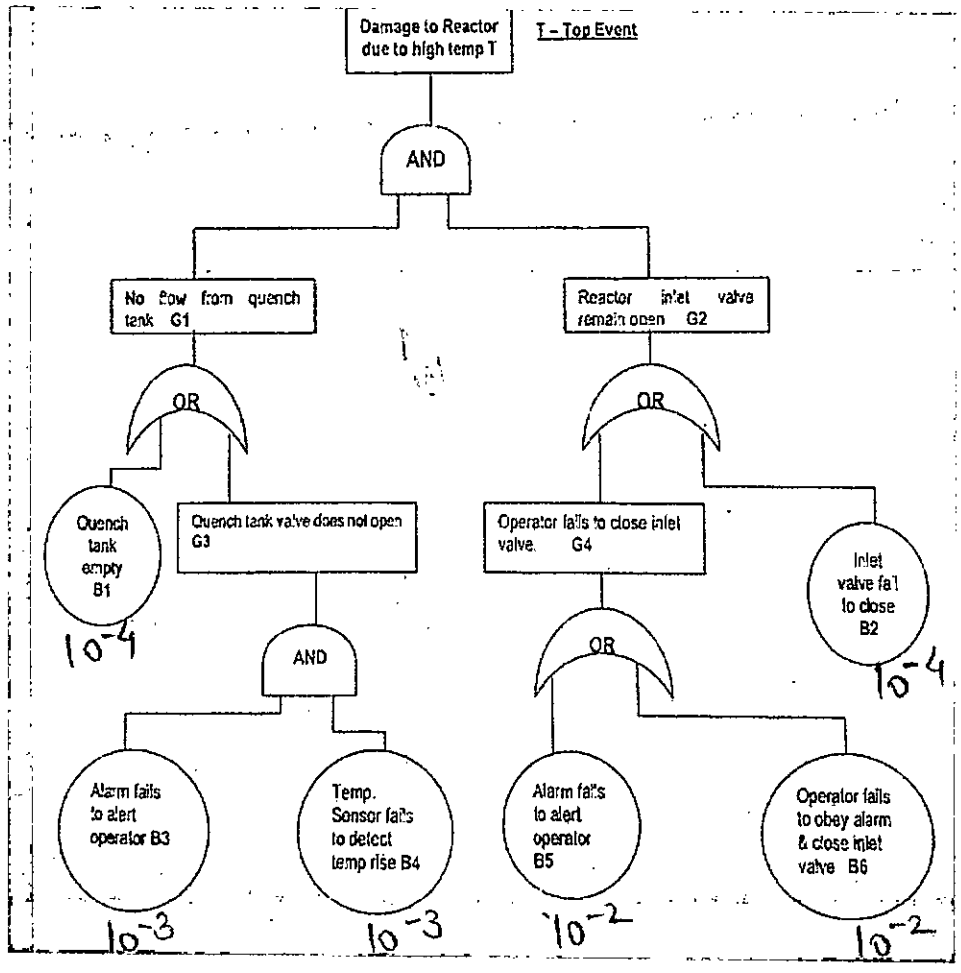
Semester: 3

Notes: 1. Solve any FIVE main questions.
2. Draw neat schematic diagrams wherever is necessary, highlight important points.
3. Assume suitable data if necessary and mention it.

Q. No.	Questions	Pt	CO	BL	M
Q1 A	Give definition 1 and 2 of occupational health and safety in details?	5	2	1	1
B	Write a short note on cycle of neglect? Draw neat schematic sketch for safety engineer's knowledge base as Primary elements and as Secondary elements?	5	2	2	1
Q2 A	Explain scientific definition of the following; Safety, Risk, Accident, Incident and Hazard?	5	4	2	3
B	What is risk perception factor? Give an example of expressing risk in qualitative and quantitative form? Draw neat sketch of typical safety domain ontology for any case study?	5	4	1	3
Q3 A	Draw Hazard triangle and Peterson accident causation model?	5	1	3	2
B	A stamping machine used in automobile industry is found to have the following risk: process risk score of 0.15, technology risk score of 0.45, physical environment risk score of 0.12, human resource risk score of 0.25, residual risk associated with the system is 0.03. Calculate system risk? Write a short note OHSAS 18001 and its PDCA tool?	5	2	1	2
Q4 A	Draw neat sketch Up-Down (Function) approach applied to a system using failure mode and effect analysis (FMEA) technique? Draw its worksheet?	5	1	2	4
B	Give all steps involved in implementation PHL hazard analysis techniques?	5	2	2	4
Q5 A	List down benefits and commitment to be followed by the participating parties in RAMSAR convention for wetland conservation?	5	3	2	7
B	Give functions and values offered by wetlands?	5	4	1	7
Q6 A	Give classification of waste according to different criteria's?	5	3	1	6

End Semester Examination January 2025 (R23)

B	Give different ways by which we can dispose waste more effectively? Also how to reduce different types of waste generation?	5	3	1	6
Q7 A	Write a short note on cut set method? Explain MOCUS type approach to obtain cut set? (Stepwise answer expected)	5	2	3	5
B	Quantify the top event failure probability for given fault tree. Show all calculations and formulae in detailed?	5	2	3	5



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ENDSEM/~~RE~~ - EXAMINATION DEC/~~JAN~~ 2024~~-25~~

9/12/24

SET # 1

S. Y.

Program: B.Tech Mechanical Sem III

Duration: 3 hrs.

Course Code: PC-BTM305

Maximum Points: 100.

Course Name: Computer Aided Mechanical Drawing

Semester: III

Important Notes:

1. Question 1 is compulsory.
2. Attempt any three out of remaining five questions.
3. Create a new folder and rename it to <Reg. No._CAMD_ENDSEM>
4. Create separate .dwg file for each question and save in the above created folder only. File name should be <Q1_Reg. no._Endsem>.
5. Answers to free hand sketches should be drawn on given A4 answer sheet and submit is back.
6. Students to carry only Admit Card, Pen, Pencil, eraser and sharpener in Exam Hall. Use of scale and any geometric instrument is prohibited in Exam Hall.
7. At the end of exam, your folder with autocad and pdf files will be uploaded by the authorized person. Before leaving the exam seat, student have to confirm that his/her folder is uploaded by the authorized person.
8. Assume suitable data wherever only if necessary.
9. **Save your Work** in AutoCad Regularly.

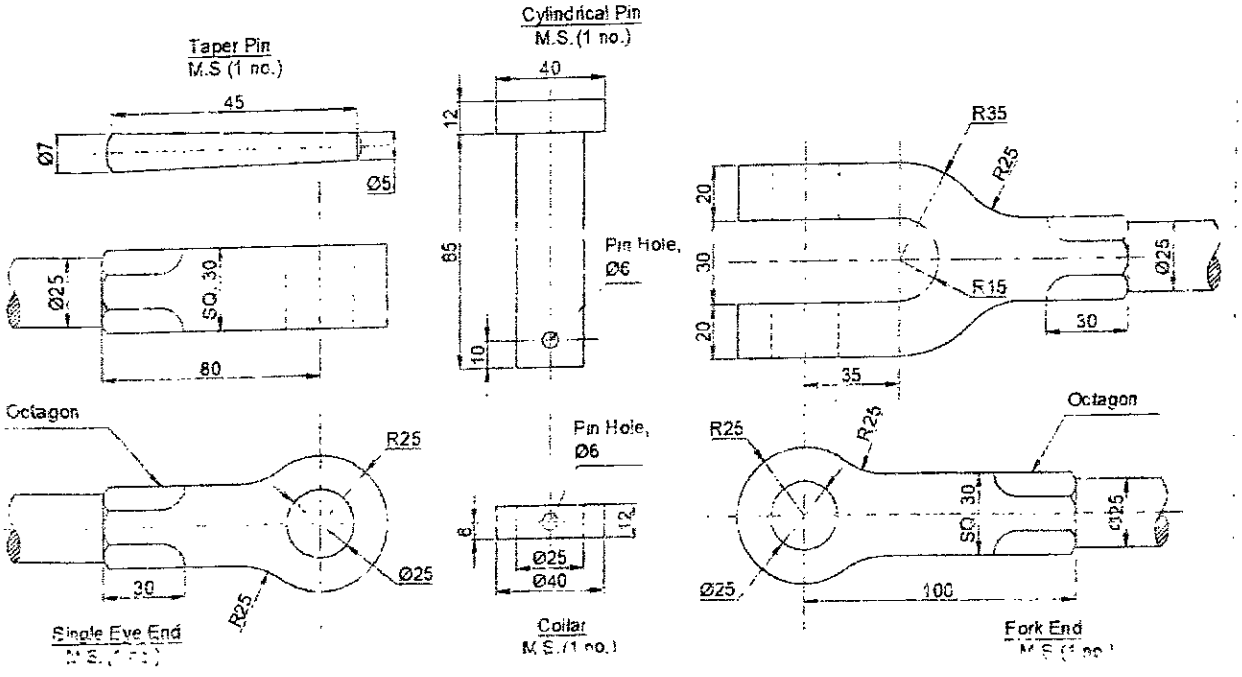
Set A					
Q. No.		**Points**	**MO/ CO**	**BL**	**PI**
Q.1	Given in the figure is the details of Knuckle Joint. Complete the following tasks:		03/--	03	5.1.2
	a) Draw detail drawing of each part in **2d.**	06	01		
	b) Make one copy of each part and assemble the parts at their functional positions where u can see **Sectional Front View** of Assembly in **2d.**	07	03		
	c) Create a Bill of Material and plot a pdf file of the assembly with given CAMD Exam layout.	04	04		
	d) Draw Free Hand Sketches of the following:		02/	01	1.4.1
	i. BSW Thread.	04	02		
	ii. Buttress Thread	04			

Q.2	A vertical square pyramid, base 70 mm side and axis 100 mm is resting on its base on the H.P. with all sides of base equally inclined to V.P. A horizontal cylinder, diameter 30 mm, having its axis parallel to both the V.P. and H.P. penetrates the pyramid. The axis of the solids intersects each other at right angle and cylinder axis is 30 mm above the pyramid base.		01/--	03	5.1.2
	a) Create **3d** models of the pyramid and cylinder.	05	01		
	b) Create a copy of **3d** models of the pyramid- cylinder and assemble them as described in problem statement.	04	03		
	c) Plot the projections of the assembly in F.V., T.V., and S.V. showing curves of intersections in the given CAMD Exam layout.	08	04		
	d) Draw Free Hand Sketches of the following: 1. Square Neck Stud. 2. Hook Headed-Bolt	 04 04	02/ 02	01	1.4.1
Q.3	Given in the figure is the Details of Standard Flange Coupling. Complete the following tasks.		04/--	03	5.1.2
	a) Create the Part drawing in **3d** space.	07	01		
	b) Make one copy of each part and assemble the parts at their functional positions where u can see **Front View (Upper Half in section) and Side View** of Assembly in **2d.**	08	03		
	c) Create a Bill of Material and plot a pdf file of the assembly with given CAMD Exam layout.	05	04		
	d) Draw Free Hand Sketches of the following: 1. Flat Saddle Key	05	04/ 02	01	1.4.1

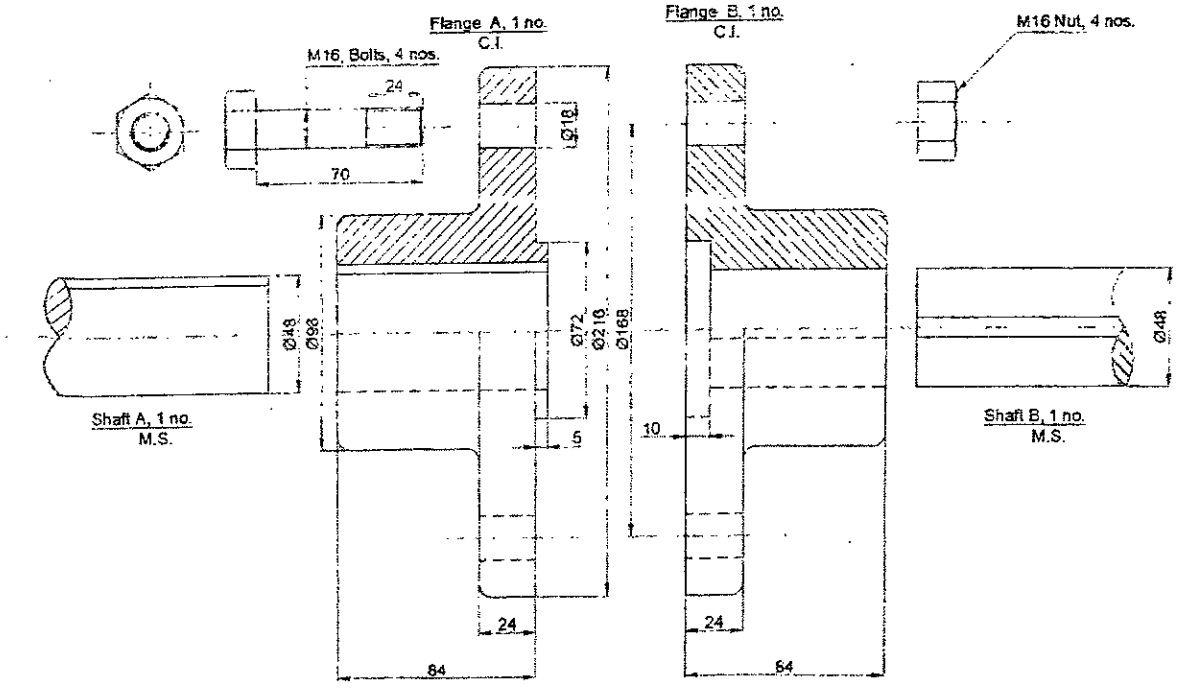
ENDSEM/~~RE~~ – EXAMINATION DEC/~~JAN~~. 2024-~~25~~

Q.4	Given in the figure is the Details of V-Belt Pulley. Complete the following tasks.		05/--	03	5.1.2
	a) Create the part model of all parts in **3d** space.	10	01		
	b) Make one copy of each part and assemble the parts at their functional positions.	5	03		
	c) Plot **Sectional Front View and Side View** of Assembly in **2d** layout with CAMD Exam Layout and create PDF.	5	04		
	d) Calculate the limits for Ø25 H7, f7	5	02 02	01	1.4.1
Q.5	Given in the figure is the Expansion Valve Assembly.		06/--	03	5.1.2
	a) Plot the **2d** detail drawing for: **Body**: i) Sectional Front View	8	01		
	ii) Side View	7	01		
	b) Plot the **2d** detail drawing for: **Gland Bush**: i) Sectional Front View	5	03		
	ii) Side View	5	04		
Q.6	Given in the figure is the Drill Jig Assembly.		07/--	03	5.1.2
	a) Plot the **2d** detail drawing for **Jig Plate**: i) Sectional Front View	08	03		
	ii) Side View	07	04		
	b) Plot the **2d** detail drawing for **Latch Washer**: i) Sectional Front View	05	03		
	ii) Side View	05	04		

ENDSEM/~~RE~~ - EXAMINATION DEC/~~JAN.~~ 2024-~~25~~

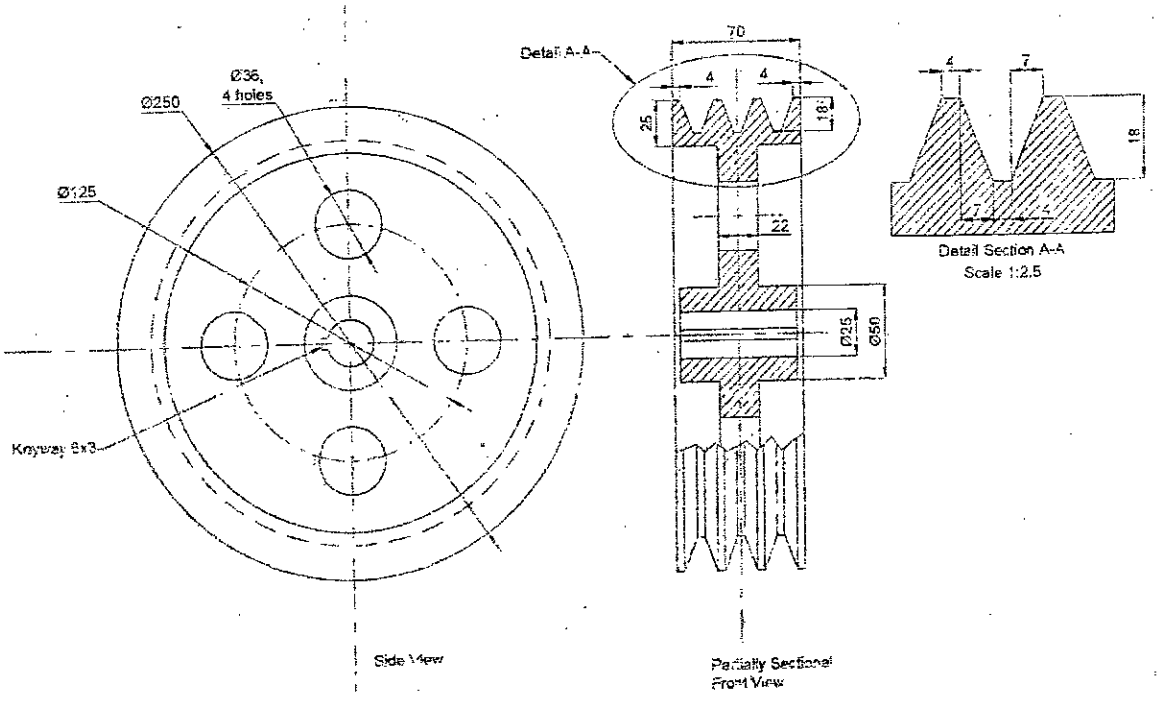


Q.1. Knuckle Joint



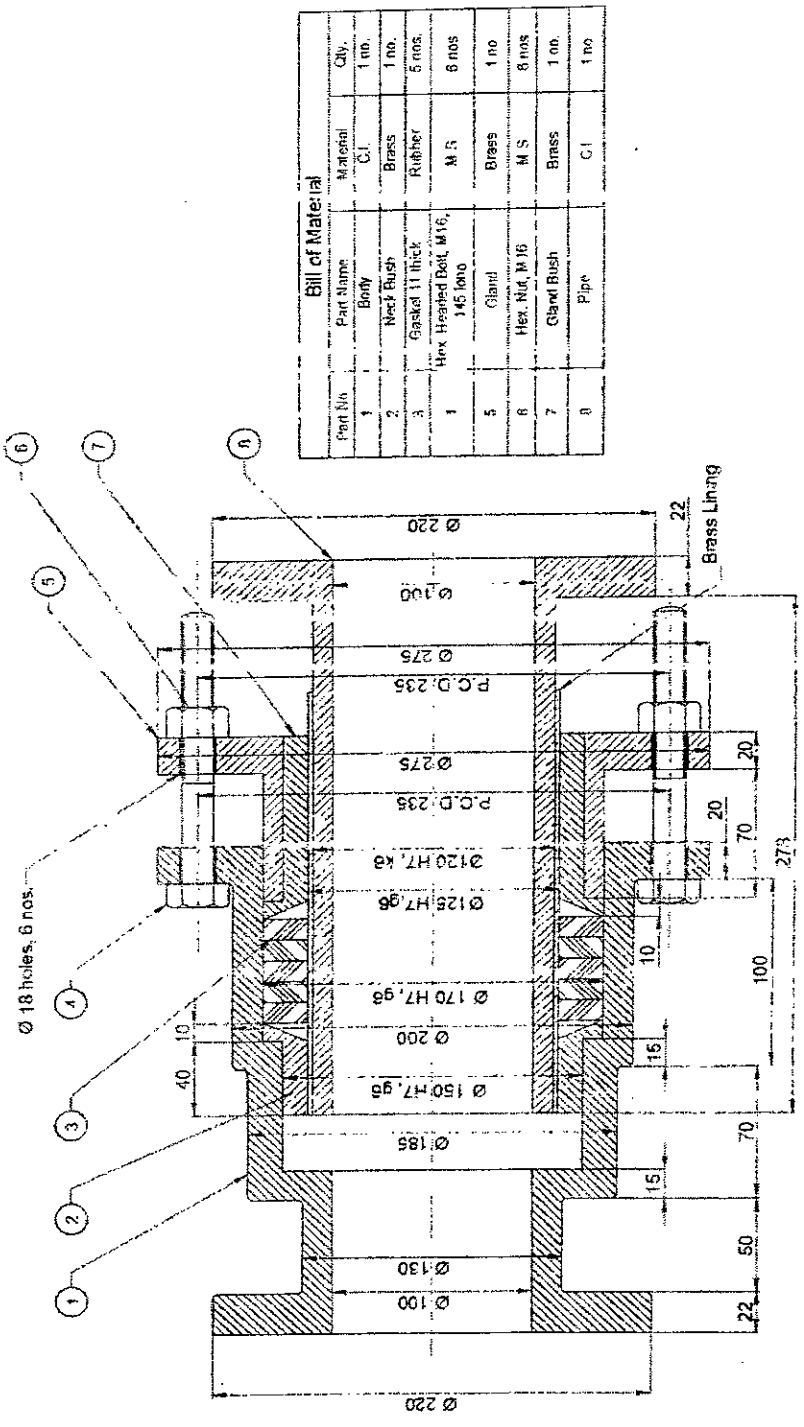
Q.3. Standard Flange Coupling

ENDSEM/~~RE~~- EXAMINATION DEC/~~JAN.~~ 2024-~~25~~



Q.4. V-Belt Pulley

ENDSEM/~~RE~~ - EXAMINATION DEC/~~JAN.~~ 2024-~~25~~



Q.5. Exapnsion Joint

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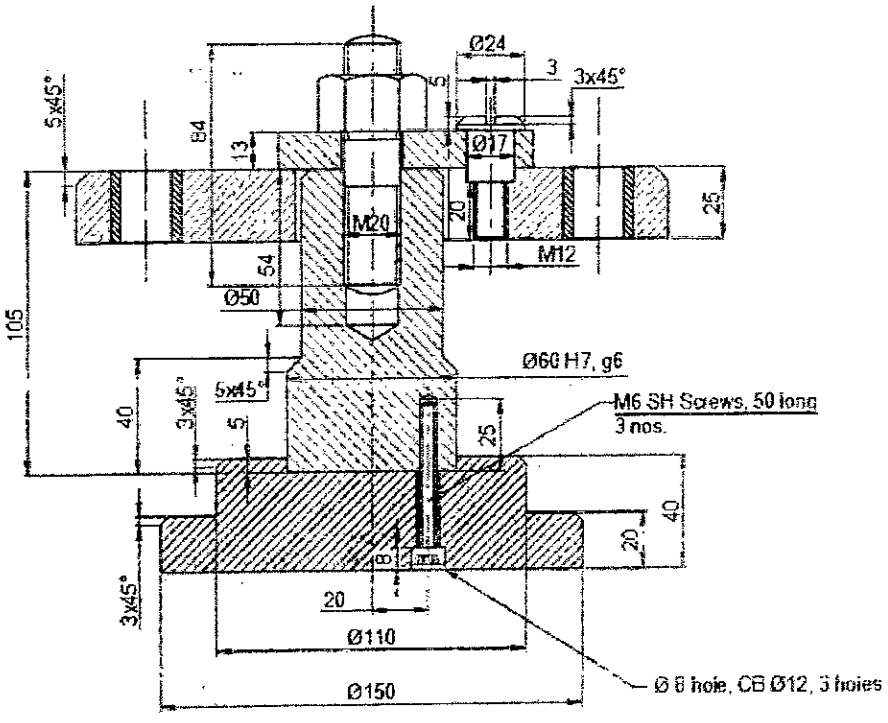
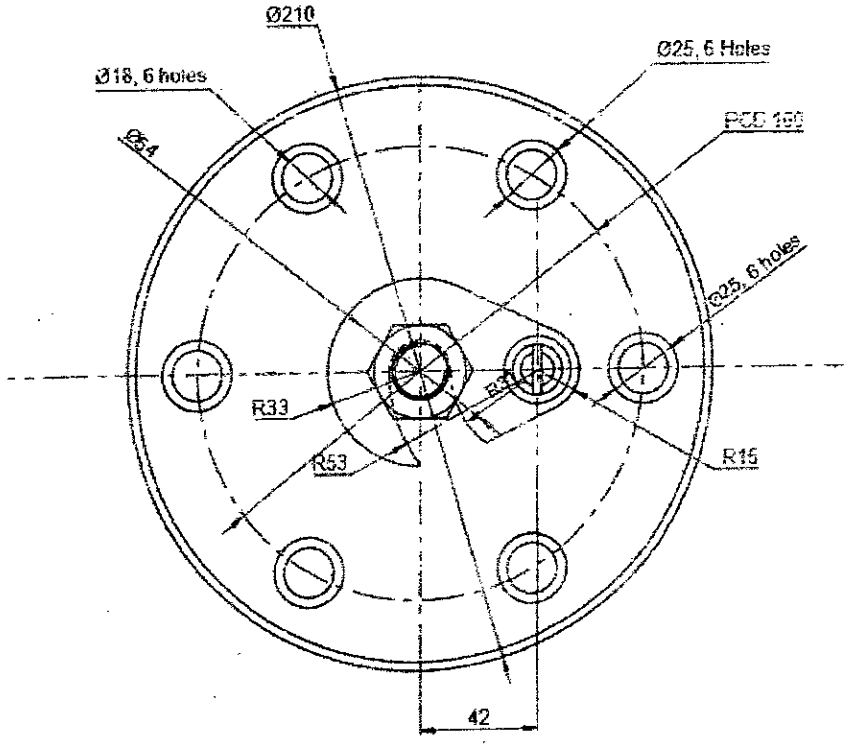
ENDSEM/~~RE~~ - EXAMINATION DEC/~~JAN~~ 2024-~~25~~





Q.6. Drill Jig Assembly

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ENDSEM/~~RE~~ EXAMINATION DEC/~~JAN.~~ 2024-~~25~~

Limits, Tolerance Tables

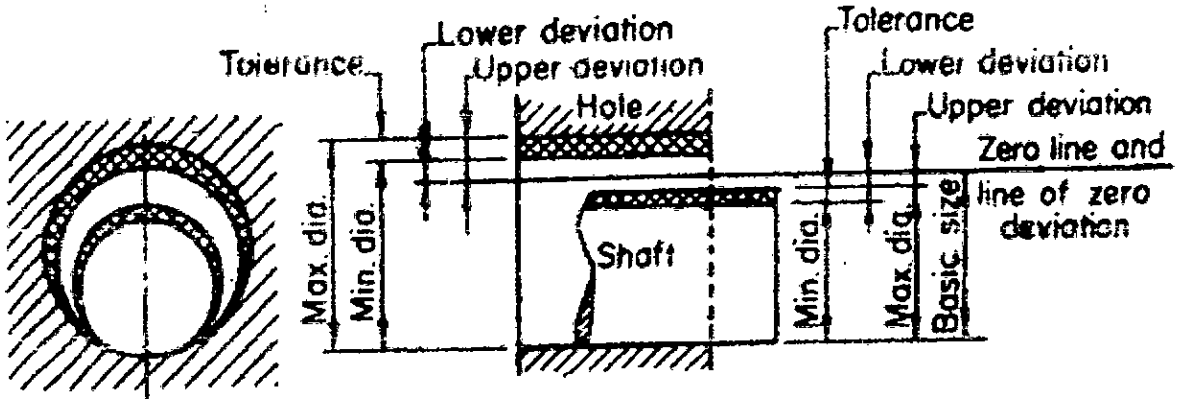

Table 1 Recommended diameter steps upto 500 mm (13 steps)

Over	-	3	6	10	18	30	50	80	120	180	250	315	400
Upto	3	6	10	18	30	50	80	120	180	250	315	400	500

Table 2 Equations to calculate fundamental deviation of shaft size up to 500 mm (D = Geometrical mean dia. in mm)

Symbol	Fundamental deviation in microns	Symbol	Fundamental deviation in microns
d	$-16D^{0.44}$	js	$\pm (IT/2)$
e	$-11D^{0.41}$	k4 to k7	$+0.63D^{1/2}$
f	$-5.5D^{0.41}$	m	+ (IT7 – IT6)
g	$-2.5D^{0.34}$	n	$+5D^{0.34}$
h	0	p	+ (IT7 + 0 to 5)

Table 3 Fundamental Tolerance for IT grades in terms of i.

IT Grade	IT5	IT6	IT7	IT8	IT9	IT10	IT11	IT12	IT13	IT14	IT15	IT16
Tolerance in Microns	7i	10i	16i	25i	40i	64i	100i	160i	250i	400i	640i	1000i

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Munshi Nagar, Andheri (W) Mumbai – 400058

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9/12/24

S.Y. B.Tech Sem III

SET A 2

Program: B.Tech Mechanical **Duration: 3 hrs.**

Course Code: PC-BTM305 **Maximum Points: 100.**

Course Name: Computer Aided Mechanical Drawing **Semester: III**

Important Notes:

1. Question 1 is compulsory.
2. Attempt any three out of remaining five questions.
3. Create a new folder and rename it to **<Reg. No._CAMD_ENDSEM>**
4. Create separate .dwg files for each question and save in the above created folder only. File name should be **<Q1_Reg. no._Endsem>**.
5. Answers to free hand sketches should be drawn on given A4 answer sheet and submit is back.
6. Students to carry only Admit Card, Pen, Pencil, eraser and sharpener in Exam Hall. Use of scale and any geometric instrument is prohibited in Exam Hall.
7. At the end of exam, your folder with Autocad and pdf files will be uploaded by the authorized person. Before leaving the exam seat, student have to confirm that his/her folder is uploaded by the authorized person.
8. Assume suitable data wherever only if necessary.
9. **Save your Work** in AutoCad Regularly.

Set B

Q. No.		Points	CO/ MO	BL	PI
Q.1	Given in the figure 1 is the details of Knuckle Joint. Complete the following tasks:		03/--	03	5.1.2
	a) Draw detail drawing of each part in **2d**.	06	01		
	b) Make one copy of each part and assemble the parts at their functional positions where u can see **Front View** of Assembly in **2d.**	07	03		
	c) Create a Bill of Material and plot a pdf file of the assembly with given template layout.	04	04		
	d) Draw Free Hand Sketches of the following:		02/	01	1.4.1
	i. Metric Thread.	04	02		
	ii. ACME Thread	04			

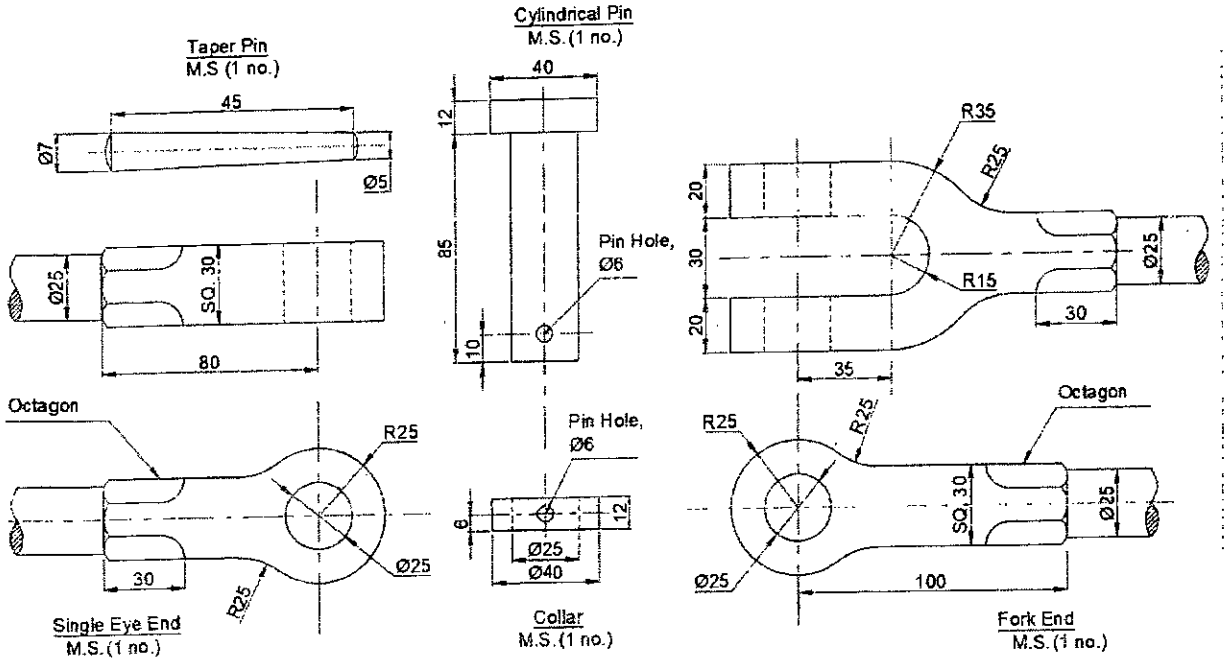
ENDSEM/~~RE~~ - EXAMINATION DEC/~~JAN~~. 2024~~-25~~

Q.2	A vertical cone pyramid, base diameter 80 mm side and axis 120 mm is resting on its base on the H.P. with all sides of base equally inclined to V.P. A horizontal prism, side 40 mm, with all sides of base equally inclined to V.P. and having its axis parallel to both the V.P. and H.P. penetrates the cone. The axis of the solids intersects each other at right angle and prism axis is 40 mm above the cone base.		01/--	03	5.1.2
	a) Create 3d models of the cone and prism. b) Create a copy of 3d models of the cone- prism and assemble them as given in problem. c) plot the projections of the assembly in F.V., T.V., and S.V. showing curves of intersections in the given layout template.	06 04 07	01 03 04		
	d) Draw Free Hand Sketches of the following: 1. Wing Nut. 2. T-Bolt	04 04	02/ 02	01	1.4.1
Q.3	Given in the figure is the Details of Protected Flange Coupling. Complete the following tasks.		04/--	03	5.1.2
	a) Create the Part drawing in **2d** space. b) Make one copy of each part and assemble the parts at their functional positions where u can see **Sectional Front View and Side View** of Assembly in **2d.** c) Create a Bill of Material and plot a pdf file of the assembly with given template layout.	07 08 05	01 03 04		
	d) Draw Free Hand Sketches of the following: 1. Gib Headed Key	05	04/ 02	01	1.4.1

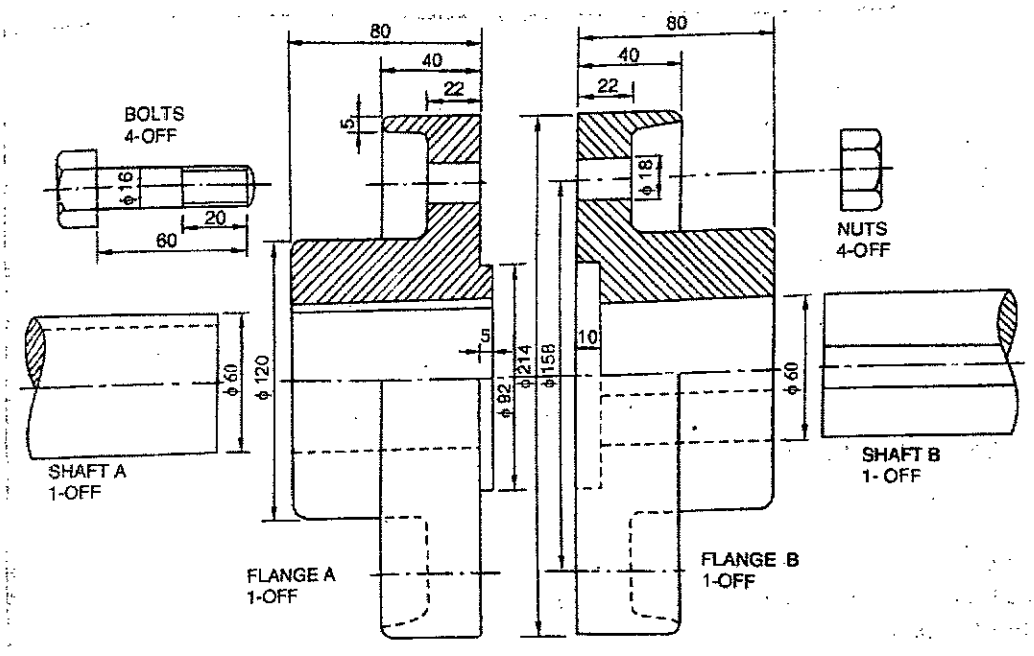
ENDSEM/~~RE~~ - EXAMINATION DEC/~~JAN.~~ 2024-~~25~~

Q.4	Given in the figure is the Details of V-Belt Pulley. Complete the following tasks.		05/--	03	5.1.2
	a) Create the part model of all parts in **3d** space.	10	01		
	b) Make one copy of each part and assemble the parts at their functional positions. Plot **Sectional Front View and Side View** of Assembly in **2d** layout with template.	5	03		
	c) Create a Bill of Material and plot a pdf file of the assembly.	5	04		
	d) Calculate the limits for Ø35 H8,f7	5	02/ 02	01	1.4.1
Q.5	Given in the figure is the Expansion Valve Assembly.		06/--	03	5.1.2
	a) Plot the **2d** detail drawing for:				
	Gland: i) Sectional Front View	8	01		
	ii) Side View	7	01		
	b) Plot the **2d** detail drawing for:				
	Neck Bush: i) Sectional Front View	5	03		
	ii) Side View	5	04		
Q.6	Given in the figure is the Drill Jig Assembly.		07/--	03	5.1.2
	a) Plot the **2d** detail drawing for **Base Plate**:				
	i) Sectional Front View	08	03		
	ii) Side View	07	04		
	b) Plot the **2d** detail drawing for **Latch Washer**:				
	i) Sectional Front View	05	03		
	ii) Side View	05	04		

ENDSEM~~RE~~ - EXAMINATION DEC/~~JAN.~~ 2024-~~25~~

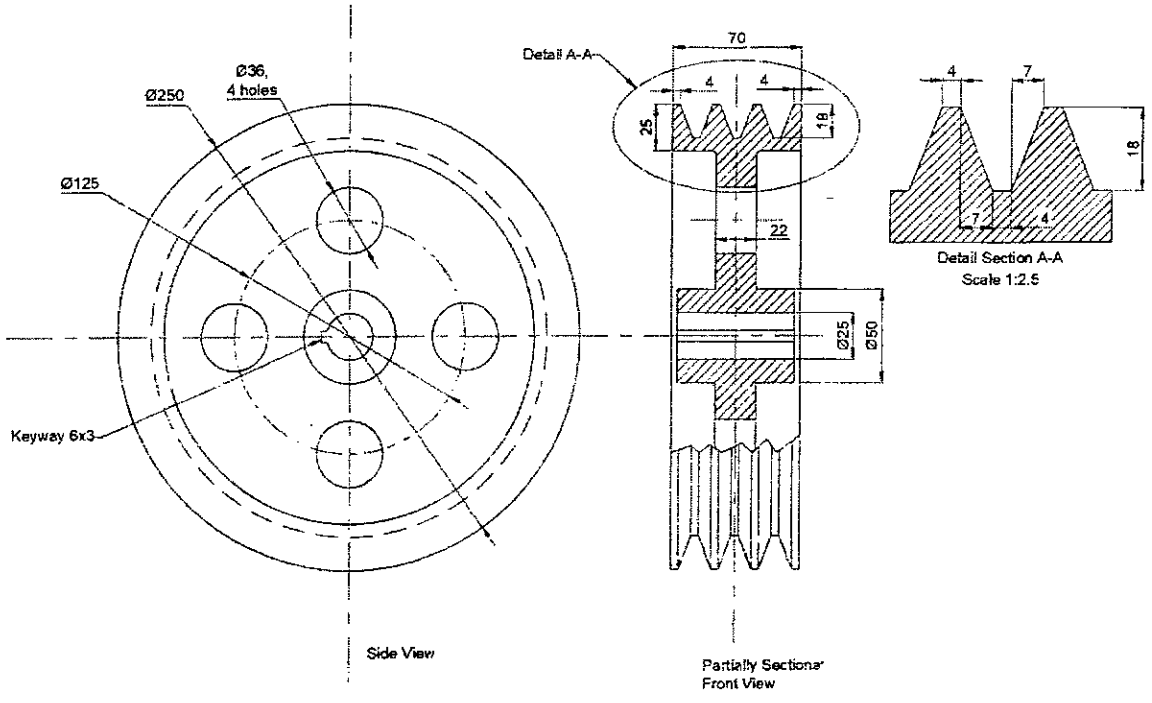


Q.1. Knuckle Joint



Q.3. Protected Type Flange Coupling

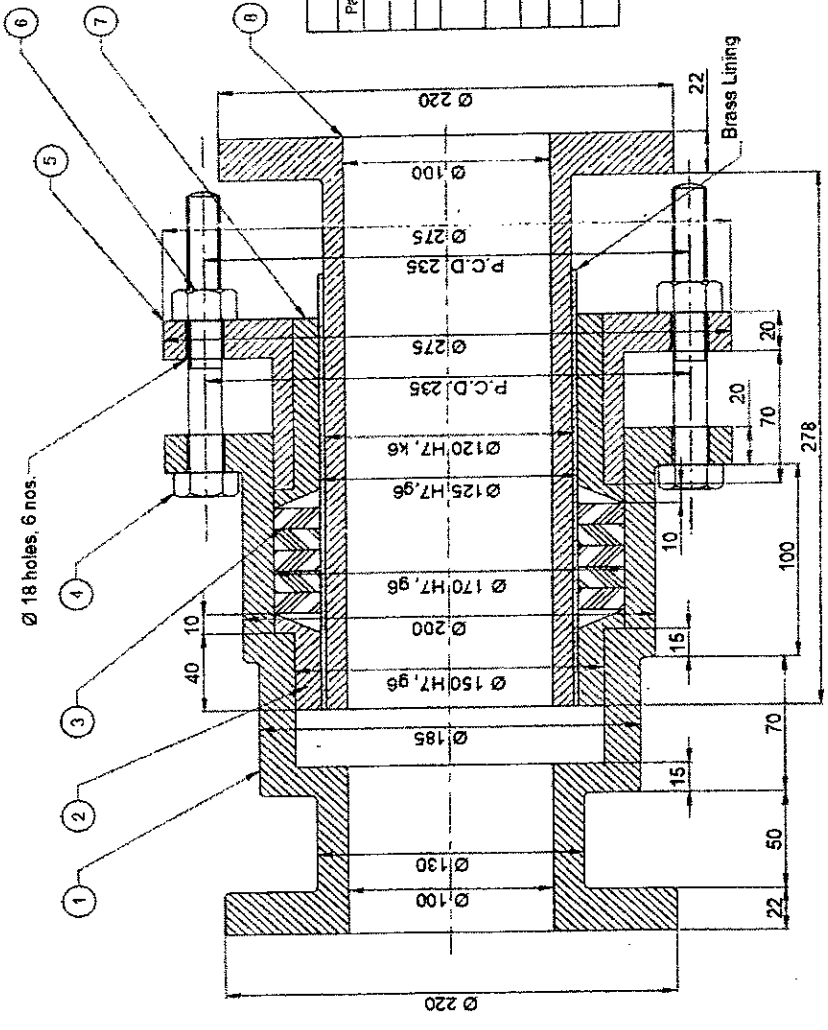
ENDSEM/~~RE~~ - EXAMINATION DEC/~~JAN.~~ 2024-~~25~~



Q.4. V-Belt Pulley

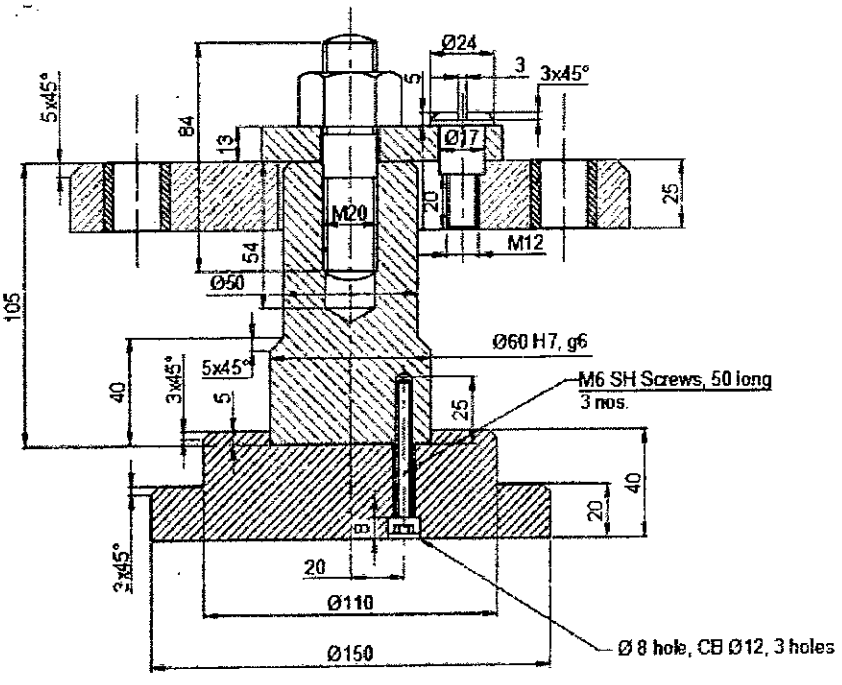
ENDSEM/~~RE~~ - EXAMINATION DEC/~~JAN~~. 2024-~~25~~

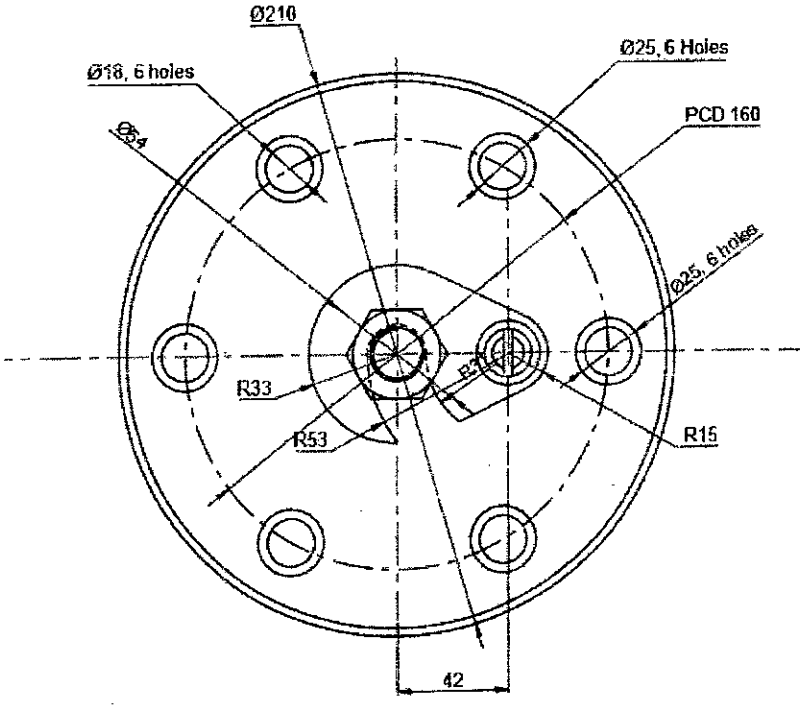
Bill of Material			
Part No.	Part Name	Material	Qty.
1	Body	C.I.	1 no.
2	Neck Bush	Brass	1 no.
3	Gasket 11 thick	Rubber	5 nos.
4	Hex. Headed Bolt, M16, 145 long	M.S.	6 nos.
5	Gland	Brass	1 no.
6	Hex. Nut, M16	M.S.	6 nos.
7	Gland Bush	Brass	1 no.
8	Pipe	C.I.	1 no.



Q.5. Exapnsion Joint

ENDSEM/~~RE~~ - EXAMINATION DEC/~~JAN.~~ 2024-~~25~~





Q.6. Drill Jig Assembly

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Munshi Nagar, Andheri (W) Mumbai – 400058

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Limits, Tolerance Tables

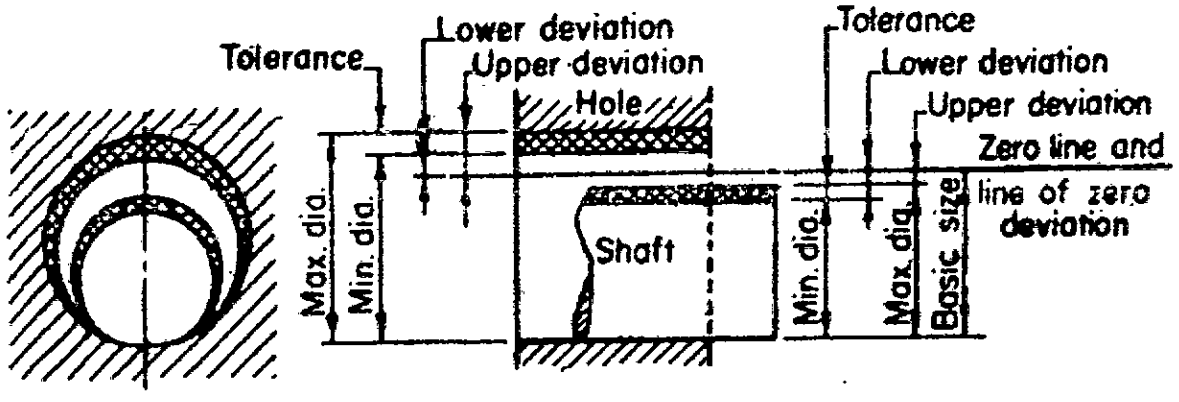

Table 1 Recommended diameter steps upto 500 mm (13 steps)

Over	-	3	6	10	18	30	50	80	120	180	250	315	400
Upto	3	6	10	18	30	50	80	120	180	250	315	400	500

Table 2 Equations to calculate fundamental deviation of shaft size up to 500 mm (D = Geometrical mean dia. in mm)

Symbol	Fundamental deviation in microns	Symbol	Fundamental deviation in microns
d	$-16D^{0.44}$	js	$\pm (IT/2)$
e	$-11D^{0.41}$	k4 to k7	$+0.63D^{1/2}$
f	$-5.5D^{0.41}$	m	+ (IT7 – IT6)
g	$-2.5D^{0.34}$	n	$+5D^{0.34}$
h	0	p	+ (IT7 + 0 to 5)

Table 3 Fundamental Tolerance for IT grades in terms of i.

IT Grade	IT5	IT6	IT7	IT8	IT9	IT10	IT11	IT12	IT13	IT14	IT15	IT16
Tolerance in Microns	7i	10i	16i	25i	40i	64i	100i	160i	250i	400i	640i	1000i

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Munshi Nagar, Andheri (W) Mumbai – 400058

ENDSEM/RE - EXAMINATION JAN. 2024-25

Program: B.Tech Mechanical (Working Professional) **Duration: 3 hrs.**

Course Code: PC-BTM305 **Maximum Points: 100.**

Course Name: Computer Aided Mechanical Drawing **Semester: III**

Important Notes:

1. **Question 1 is compulsory.**
2. Attempt **any three** out of **remaining five questions.**
3. Create a new folder and rename it to **<Reg. No._ENDSEM>**
4. Create separate .dwg file for each question and **save in the above created folder** only. File name should be **<Q1_Reg. no.>**.
5. Answers to free hand sketches should be drawn on given A4 answer sheet and submit is back.
6. Students to carry only Admit Card, Pen, Pencil, eraser and sharpener in Exam Hall. Use of scale and any geometric instrument is prohibited in Exam Hall.
7. At the end of exam, your folder with autocad and pdf files will be uploaded by the authorized person. Before leaving the exam seat, student have to confirm that his/her folder is uploaded by the authorized person.
8. Assume suitable data wherever only if necessary.
9. **Save your Work** in AutoCad Regularly.

Q. No.		Points	MO/ CO	BL	PI
Q.1	Given in the figure is the details of Spigot and Socket Joint. Complete the following tasks:		03/--	03	5.1.2
	a) Draw detail drawing of each part in **2d.**	07	01		
	b) Make one copy of each part and assemble the parts at their functional positions where u can see **Sectional Front View** of Assembly in **2d.**	06	03		
	c) Create a **Bill of Material** and **plot a pdf file** of the assembly.	04	04		
	d) Draw Free Hand Sketches of the following:		02/	01	1.4.1
	i. BSW Thread.	04	02		
	ii. ACME Thread.	04			

ENDSEM/RE - EXAMINATION JAN. 2024-25

Q.2	A vertical cone, base 80 mm side and axis 100 mm is resting on its base on the H.P. A horizontal cylinder, diameter 35 mm, having its axis parallel to both the V.P. and H.P. penetrates the cone. The axis of both the solids intersects each other at right angle and cylinder axis is 30 mm above the cone base.		01/--	03	5.1.2
	a) Create **3d models** of the Cone and Cylinder.	06	01		
	b) Create a copy of **3d models** of the cone - cylinder and assemble them as described in problem statement.	05	03		
	c) Plot the projections (F.V., T.V., and S.V.) of the assembly in showing curves of intersections.	06	04		
	d) Draw Free Hand Sketches of the following:		02/	01	1.4.1
	1. Square Neck Stud.	04	02		
	2. Hexagonal Headed Bolt	04			
Q.3	Given in the figure is the Details of Standard Flange Coupling. Complete the following tasks.		04/--	03	5.1.2
	a) Create the Parts with **3d modeling.**	07	01		
	b) Make one copy of each part and assemble the parts at their functional positions	04	03		
	c) Plot drawings of **Front View (Upper Half in section) and Side View** of Assembly.	04			
	d) Create a Bill of Material and plot a pdf file of the assembly with given CAMD Exam layout.	05	04		
	d) Draw Free Hand Sketches of the following:	05	04/	01	1.4.1
	1. Gib Headed Key		02		

ENDSEM/RE - EXAMINATION JAN. 2024-25

Q.4	Given in the figure is the Details of Foot Step Bearing. Complete the following tasks.		05/--	03	5.1.2
	a) Create the part drawing of all parts in **2d** space.	10	01		
	b) Assemble the parts at their functional positions wehre u can see **Sectional Front View** of Assembly in **2d** layout	05	03		
	c) Create Bill of Material and Plot a PDF.	05	04		
	d) Calculate the limits for Ø25 H7, g6	05	02/ 02	01	1.4.1
Q.5	Given in the figure is the Expansion Valve Assembly.		06/--	03	5.1.2
	a) Plot the **2d** detail drawing for:				
	Body: i) Sectional Front View	8	01		
	ii) Side View	7	01		
	b) Plot the **2d** detail drawing for:				
	Neck Bush: i) Sectional Front View	5	03		
	ii) Side View	5	04		
Q.6	Given in the figure is the Drill Jig Assembly.		07/--	03	5.1.2
	a) Plot the **2d** detail drawing for **Jig Plate**:				
	i) Sectional Front View	08	03		
	ii) ~~Side View~~ Top View	07	04		
	b) Plot the **2d** detail drawing for **Latch Washer**:				
	i) Sectional Front View	05	03		
	ii) ~~Side View~~ Top View	05	04		

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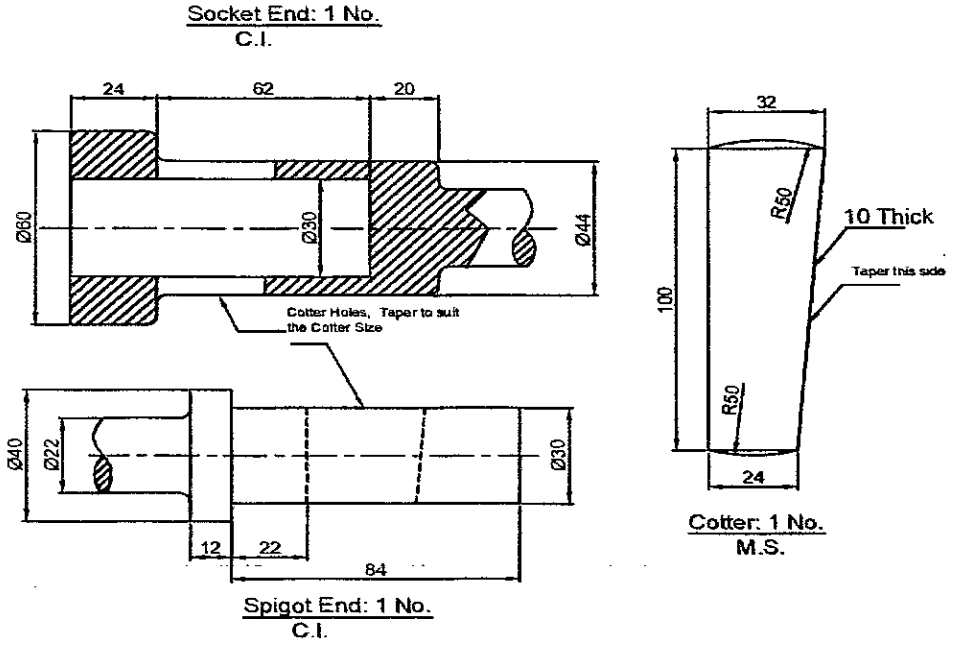
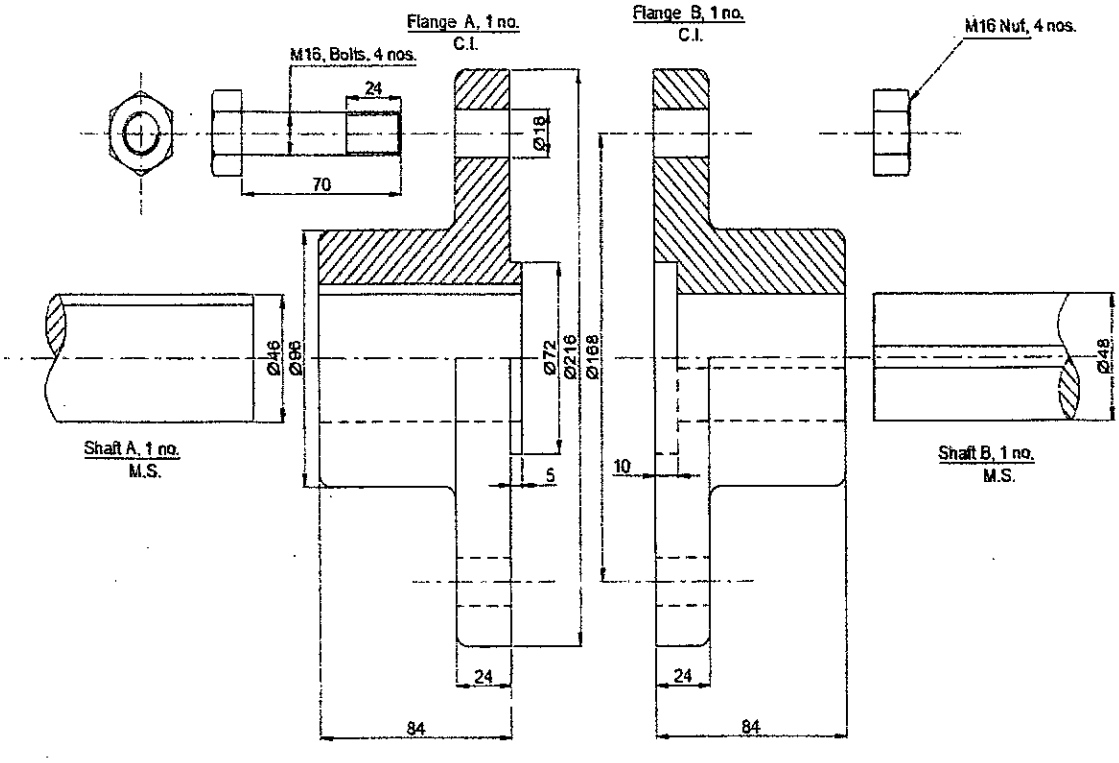


Q.1. Spigot and Socket Joint



Q.3. Standard Flange Coupling

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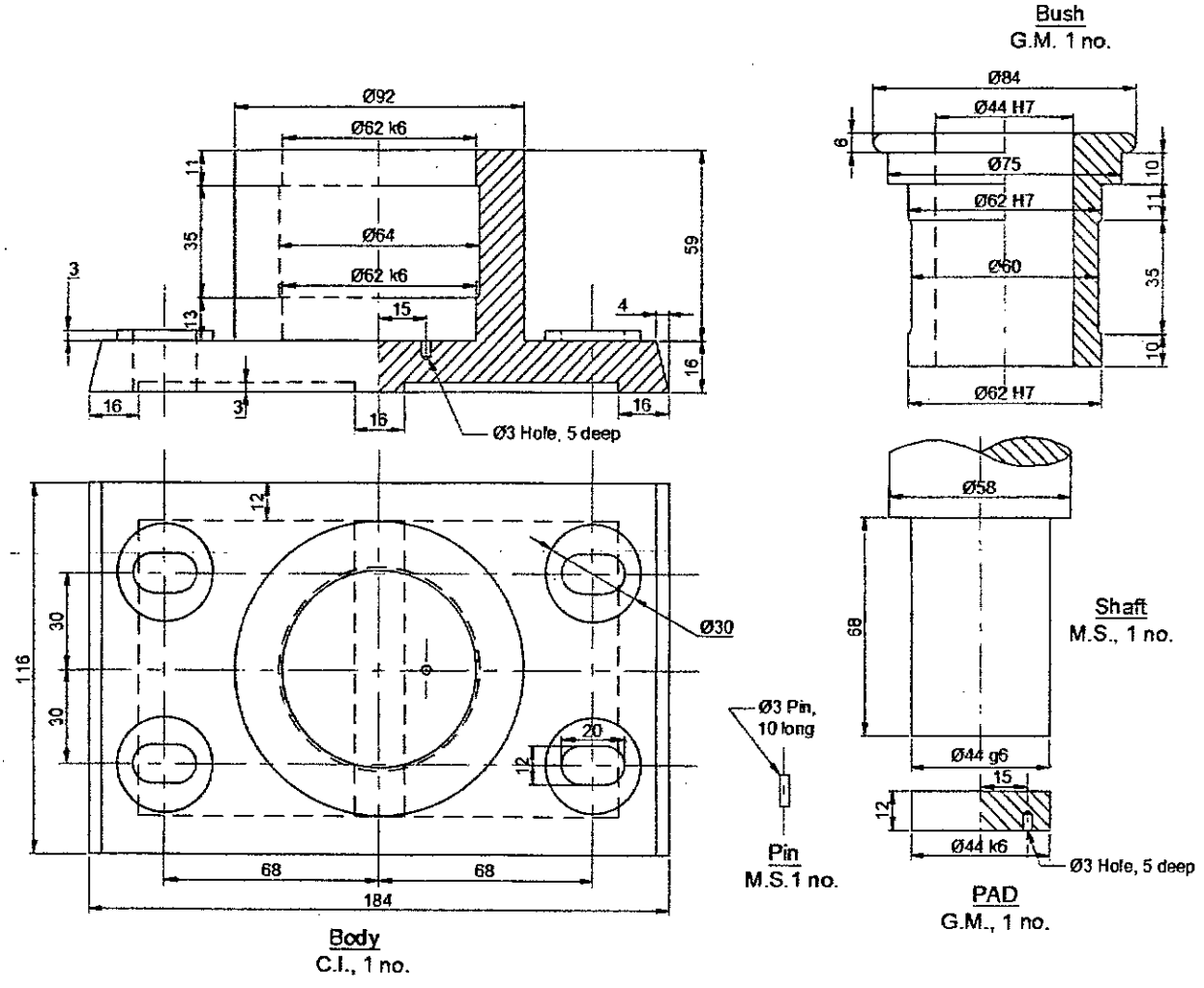
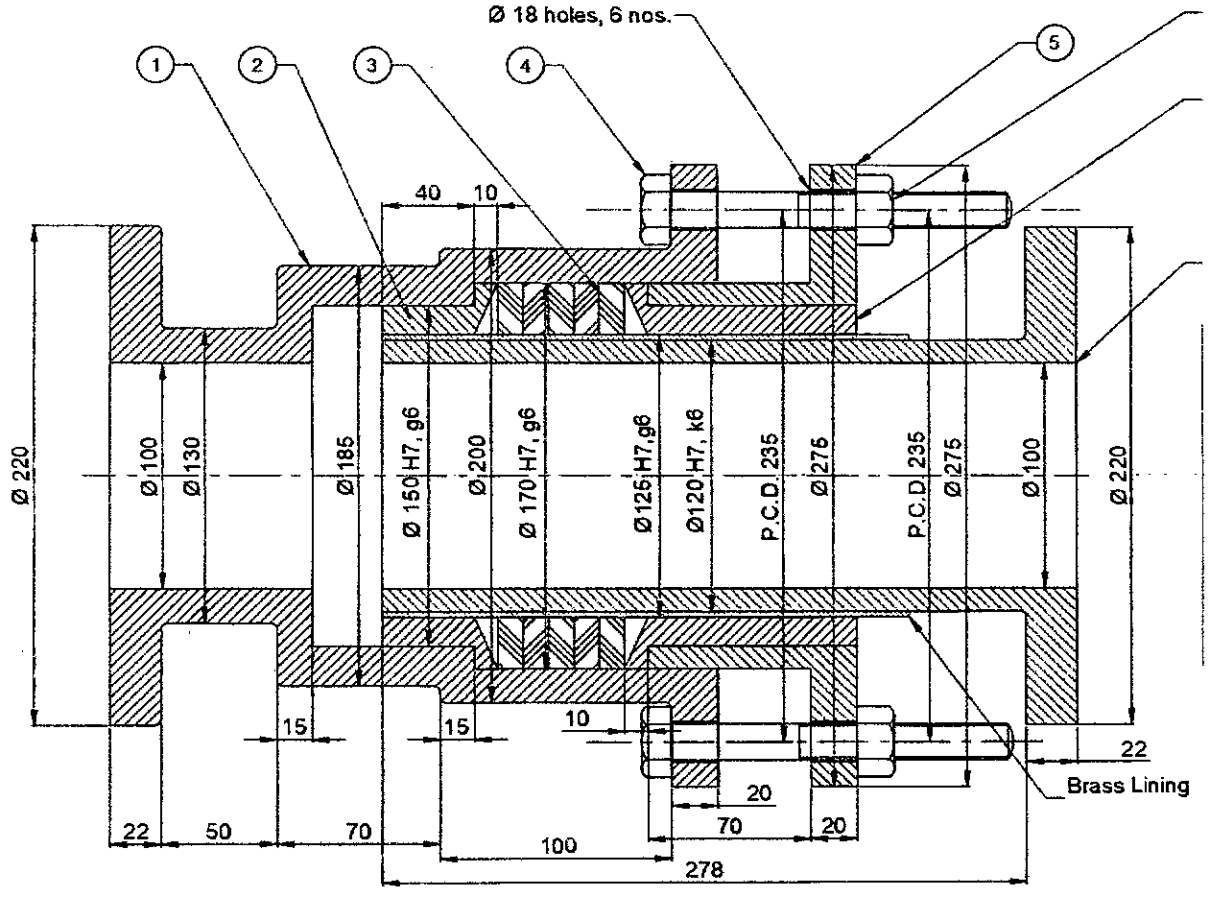


Q.4. Foot Step Bearing

ENDSEM/RE - EXAMINATION JAN. 2024-25



Q.5. Exapnsion Joint

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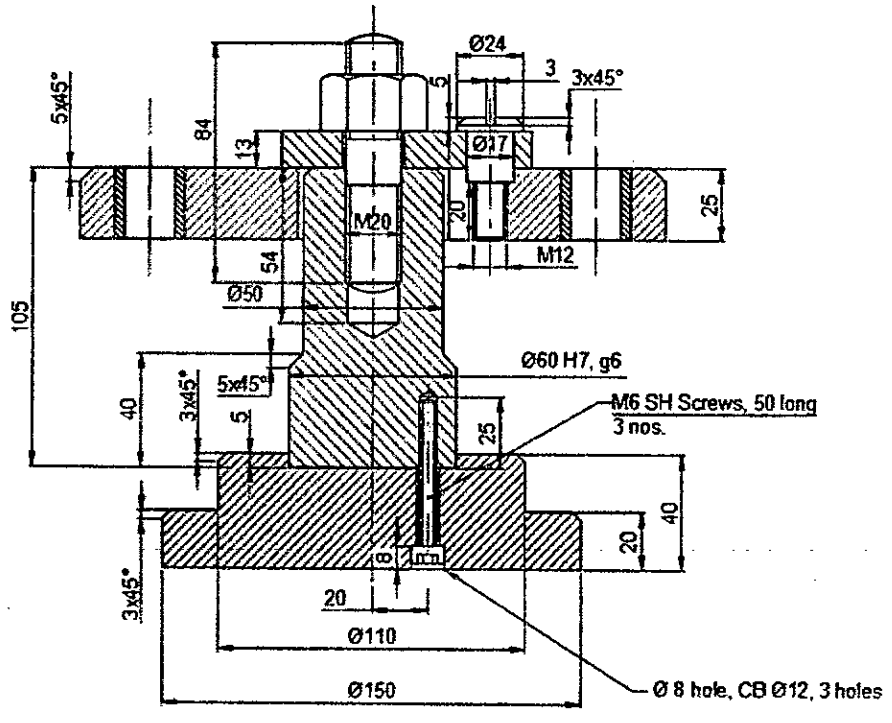

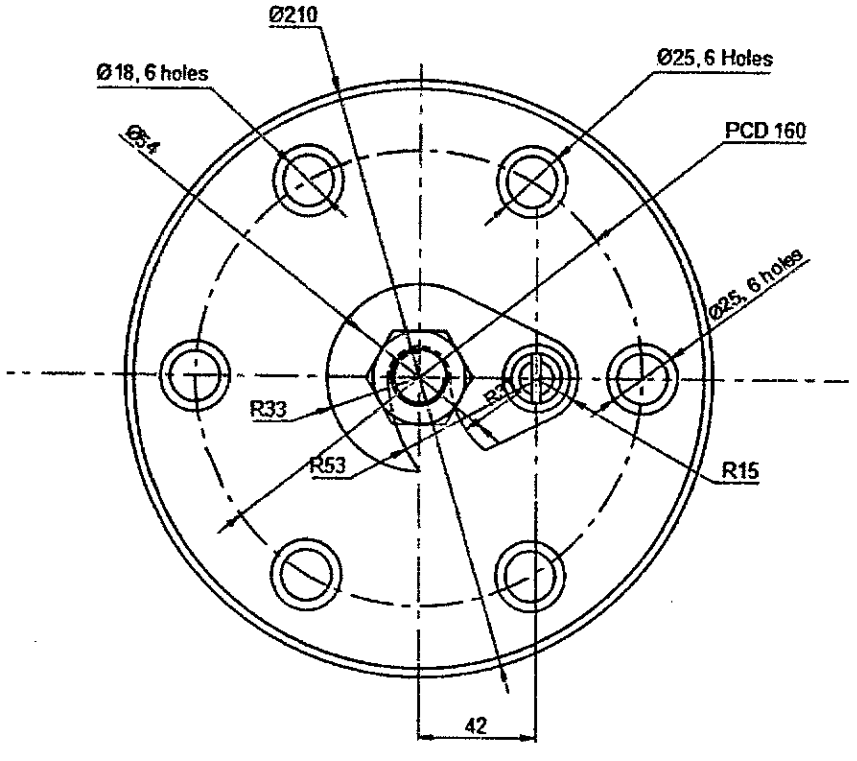

Q.6. Drill Jig Assembly

ENDSEM/RE - EXAMINATION JAN. 2024-25

Limits, Tolerance Tables

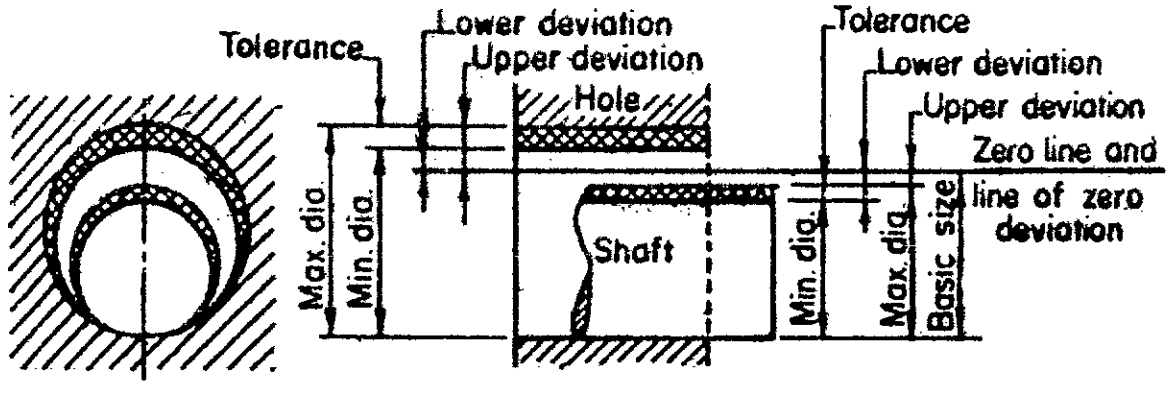

Table 1 Recommended diameter steps upto 500 mm (13 steps)

Over	-	3	6	10	18	30	50	80	120	180	250	315	400
Upto	3	6	10	18	30	50	80	120	180	250	315	400	500

Table 2 Equations to calculate fundamental deviation of shaft size up to 500 mm (D = Geometrical mean dia. in mm)

Symbol	Fundamental deviation in microns	Symbol	Fundamental deviation in microns
d	$-16D^{0.44}$	js	$\pm (IT/2)$
e	$-11D^{0.41}$	k4 to k7	$+0.63D^{1/2}$
f	$-5.5D^{0.41}$	m	+ (IT7 – IT6)
g	$-2.5D^{0.34}$	n	$+5D^{0.34}$
h	0	p	+ (IT7 + 0 to 5)

Table 3 Fundamental Tolerance for IT grades in terms of i.

IT Grade	IT5	IT6	IT7	IT8	IT9	IT10	IT11	IT12	IT13	IT14	IT15	IT16
Tolerance in Microns	7i	10i	16i	25i	40i	64i	100i	160i	250i	400i	640i	1000i