



SARDAR PATEL COLLEGE OF ENGINEERING

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



END SEMESTER ~~December 2025~~ / RE- EXAM February 2026

Program: Mechanical Second Year Mech. Working Duration: 3 hours

Course Code: BS-BTM301

Prof. Maximum Points: 100

Course Name: Linear algebra and Vector Calculus

Semester: III

Notes: 1) Attempt any 5 out of 7 questions.

2) Use of scientific calculator is allowed.

19/01/2026

Q.No.	Questions	Points	CO	BL	Module No.
Q1a	If $f(x) = \begin{cases} \pi x & 0 < x < 1 \\ \pi(2-x) & 1 < x < 2 \end{cases}$ using half-range cosine series, Hence using Parseval identity show that $\frac{1}{1^4} + \frac{1}{3^4} + \frac{1}{5^4} + \dots = \frac{\pi^4}{96}$	10	1	1,2,3	5
Q1b	Define a unitary matrix. if $N = \begin{bmatrix} 0 & 1+2i \\ -1+2i & 0 \end{bmatrix}$ is a matrix, then show that $(I-N)(I+N)^{-1}$ is a unitary matrix, where I is an identity matrix.	10	3	1,2,3	1
Q2a	Find the rank of $\begin{bmatrix} 2 & 3 & -1 & -1 \\ 1 & -1 & -2 & -4 \\ 3 & 1 & 3 & -2 \\ 6 & 3 & 0 & -7 \end{bmatrix}$	10	3	1,2,3	1
Q2b	Obtain the Fourier Series for $f(x) = \begin{cases} 0 & -2 \leq x \leq -1 \\ 1+x & -1 \leq x \leq 0 \\ 1-x & 0 \leq x \leq 1 \\ 0 & 1 \leq x \leq 2 \end{cases}$	10	1	1,2,3	6
Q3a	Find a Fourier series to represent, $f(x) = \pi - x$ for $0 < x < 2\pi$.	10	1	1,2,3	1
Q3b	Find non-singular matrices P, Q so that PAQ is a normal form	10	3	1,2,3	1



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	where $A = \begin{bmatrix} 2 & 1 & -3 & -6 \\ 3 & -3 & 1 & 2 \\ 1 & 1 & 1 & 2 \end{bmatrix}$				
Q4a	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 $(1, -1, 2)$	10	1	1,2,3	4
Q4b	Show that the equations $2x + 6y = -11$, $6x + 20y - 6z = -3$, $6y - 18z = -1$ are not consistent.	10	3	1,2,3	2
Q5a	Find a unit vector normal to the surface $x^2y + 2xz = 4$ at point $(2, -2, 3)$	10	1	1,2,3	4
Q5b	Find the eigen values and eigen vectors of the matrix. $A = \begin{bmatrix} 8 & -6 & 2 \\ -6 & 7 & -4 \\ 2 & -4 & 3 \end{bmatrix}$	10	3	1,2,3	2
Q6a	Solve $y'' + y = t$ Given $y(0) = 1$ $y'(0) = -2$ using laplace	10	1	1,2,3	3
Q6b	In usual notations prove that $\text{Divgrad } r^n = n(n+1)r^{n-2}$	10	1	1,2,3	4
Q7a	Verify Cayley-Hamilton's theorem for $A = \begin{bmatrix} 1 & 2 & 4 \\ -1 & 0 & 3 \\ 3 & 1 & -2 \end{bmatrix}$ & hence obtain A^{-1}	10	3	1,2,3	2
Q7b	Verify Green's theorem in the plane for $\oint_C (3x^2 - 8y^2)dx + (4y - 6xy)dy$ where C is the boundary of region defined by $y = \sqrt{x}$ & $y = x^2$.	10	1	1,2,3	6



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20/01/2026

END SEMSTER EXAM. DECEMBER-2025 / ~~RE-EXAMINATION, JAN/FEB-2026~~

Program: WP- DSY B.Tech. Mechanical

Duration: 3 Hour

Course Code: PCC-BTM302

Maximum Points: 100

Course Name: Thermodynamics

Semester: III

Notes: Solve: Any FIVE Questions. Answers must be SPECIFIC and in legible handwriting.

- 1) Draw neat system diagram/s and process diagrams wherever necessary.
- 2) Use Steam tables and Mollier Chart provided by Examination section, if required.
- 3) Illustrate your answers with suitable examples as and where necessary.
- 4) Assume suitable data wherever necessary and state the same.

Q	Question	Point	CO	BL	Mod
1.	a) Explain: i) Thermodynamic systems and its types, surrounding and universe and ii) Thermodynamic properties and its types. Illustrate: Your answers with suitable practical / engineering example of each. Draw: Neat sketches.	10	1	II, III,	1
	b) A piston-cylinder device operates with 1 kg of fluid at initial state (1) of 20 atm. pressure and the initial volume is 0.04 m ³ . The fluid is expanded reversibly to state 2 by a process 1-2 following relation $pV^{1.45} = C$, so that its volume becomes double at state 2. The fluid is then cooled at constant pressure to state 3 until the piston comes back to the original position. Keeping the piston at the same position, heat is added reversibly in process 3-1 to restore fluid pressure to initial pressure. Evaluate: i) Work transfer in each process and ii) Net work done in the entire cycle. Draw: Neat process diagram.	10	1, 4	III, VI	1
2.	a) For a control volume, State: General form of steady flow energy equation per unit time basis and per unit mass basis. Using general form of steady flow energy equation, Derive: Steady flow energy equation for i) Boiler and ii) Nozzle. State: Assumptions made in each case. Draw: neat schematic diagram for each case.	08	3	I, III, IV	2
	b) State: Continuity equation for a steady flow device. In a steam power plant, steam at 1000 kPa and 400 °C flows steadily through a horizontal nozzle having inlet area of 0.1 m ² with a velocity of 7 m/s and leaves the nozzle at 300 kPa and 300°C with	12	4	III, VI	2, 5



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	a heat loss of 30 kW during the flow through the nozzle. Evaluate: i) Exit velocity and ii) area of cross-section at the exit of the nozzle. and Draw: Neat i) System diagram, ii) T-s diagram and ii) h-s diagram.				
3.	a) Explain: Kelvin-Planck statement and Claussius statement of second law of thermodynamics. Draw: Neat block diagrams for each statement.	06	1	II, III	3
	b) Draw: Neat block diagrams and Discuss: Aspects of similarity and differences in the working of a Refrigerator and Heat Pump. Prove: $CoP_{HP} = CoP_R + 1$.	06	1,3	II, III, VI	3
	c) 1 kg of ice at -5°C is exposed to atmosphere which is at 20°C . The ice melts and comes in thermal equilibrium with the atmosphere. Evaluate: Total change in the entropy of the system during the entire process. Take c_p of ice = 2.093 kJ/kg.K and latent heat of fusion of ice, $h_{sf} = 333.3$ kJ/kg. Draw: Neat T-s diagram. Assume c_p of water = 4.1867 kJ/kg.K.	08	4	III, VI	4
4.	a) Explain: i) Isentropic efficiency of turbine and pump, ii) Critical point and its significance. Draw: Neat T-s diagram to illustrate the answers.	08	3	II, III, VI	5
	b) In a steam power plant working on an ideal Rankine, steam at 20 bar, 350°C is expanded in a steam turbine to 0.1 bar. Evaluate: i) Thermal efficiency of the plant and ii) Dryness fraction of the steam at the exit of turbine. Draw: i) Neat system diagram and ii) h-s diagram for the cycle.	12	4	II, VI	5
5.	a) Explain: Working and significance of Dual cycle for an I.C. Engine. Draw: Neat p-V and T-s diagrams of the cycle.	08	3	II, IV	6
	b) In an air standard Otto cycle, the compression ratio is 8 and compression begins at 27°C and 0.1 MPa. The heat added in the cycle is 1840 kJ/kg. Evaluate: i) Temperature and pressure at the cardinal points of the cycle, and ii) Cycle efficiency. Draw: Neat p-V and T-s diagrams of the cycle. For air, $c_v = 0.718$ kJ/kg.K, $\gamma = 1.4$.	12	4	I, I, IV	6
6.	a) Explain: Working of a Vapor Compression Refrigeration (VCR) cycle for a domestic refrigerator. Draw: Neat i) system diagram, ii) T-s diagram for the cycle.	08	1	II, III	3, 7
	b) Explain: Working of a fuel cell. Draw: Neat system diagram.	06	1	III, III	7



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	c) Explain: i) Stroke volume ii) Clearance volume iii) Indicated power iv) Mechanical efficiency for an I.C. Engine. Draw: Neat sketch.	06	1,2	II, III	1, 6
7.	Explain: ANY THREE of the following. Draw: Neat system diagram/ sketches/ process diagrams as applicable.	20	1	II, III	
	a) Dual cycle				6
	b) Cyclic heat engine with example and PMM-2				3
	c) Thermodynamic equilibrium				1
	d) Dryness fraction of steam and its significance				5
	e) Zeroth law of thermodynamics and IPTS				2



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END SEMESTER January 2026 / RE-EXAM February 2026

Program: Mechanical Engineering Working Professional

Duration: 03 Hrs.

Course Code: PC-BTM303

Second Year

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.

21/01/2026

Q. No.	Questions	Points	CO	BL	Module No.
1A	Draw the Fe-C equilibrium phase diagram and clearly label the compositions, phases, and critical transformation temperatures. On the same diagram, locate the invariant point at which a single liquid phase transforms simultaneously into two different solid phases. Using the horizontal isotherm corresponding to this transformation, apply the lever rule to determine the relative proportions of the two solid phases formed from the liquid.	10	3	4	1
1B	A cylindrical workpiece is subjected to a cold upset forging operation. The starting piece is 90 mm in height and 52 mm in diameter. It is reduced in the operation to a height of 45mm. The work material has a flow curve defined by $K = 350 \text{ MPa}$ 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 45mm. (initial strain is 0.002)	10	1,2	3	7
2A	Apply your understanding of powder production technologies to explain how different atomization methods influence particle shape, size distribution, and suitability for additive manufacturing.	5	4	2	5
2B	A 320 mm-wide strip 36 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 33 mm in one pass at a roll speed of 55 rev/min. The work material has a flow curve defined by $K = 270 \text{ MPa}$ and $n = 0.16$, 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	1,3	4,5	7
2C	Explain the concepts of nucleation rate, growth rate, and overall transformation rate during solidification or phase transformation.	5	3	4,5	1



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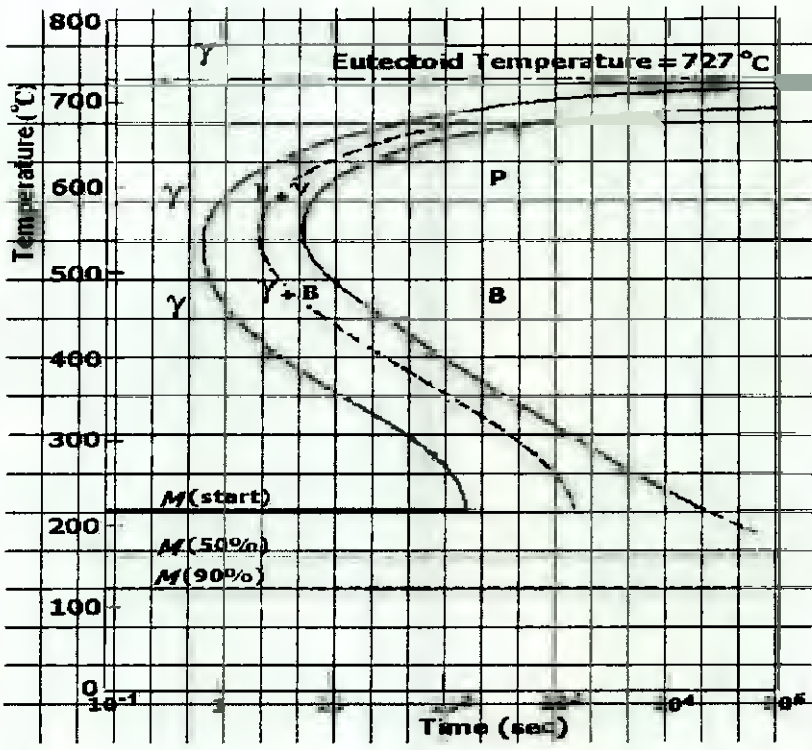
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	Justify why all these rates become zero at the melting point and at room temperature, using suitable reasoning and graphical representation.				
3 A	Determine the Miller indices for the directions and the planes shown in the following unit cell:[Note: provide the stepwise calculations for the given problem]	10(6 +4)	3	5	1
3B	Select the most suitable plain carbon steel for any one engineering component such as a railway axle, gear, crankshaft, or connecting rod. Justify your choice with reference to its carbon percentage, tensile strength, and specific application requirements.	05	1	4	3
3C	A hypoeutectoid steel containing about 0.2 wt.% carbon is subjected to a full annealing heat treatment. Using the Fe-C phase diagram, explain the heating and cooling stages involved in full annealing and describe the resulting microstructural changes.	05	4,3	4	2

**END SEMESTER January 2026 / RE - EXAM February 2026**

4A	Discuss each case of the heat treatment process of Fe-0.65% C eutectoid steel rapidly cooled from a preheated temperature of 860°C ($>727^{\circ}\text{C}$) 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 680°C and hold for 30 s, rapidly cool to 480°C hold for 10^3 s, quench to room temperature. 2. Rapidly cool to 250°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						
4B	The Taylorian tool-life equation for machining C-40 steel with an H.S.S. cutting tool at a feed of 0.2 mm/min and a depth of cut of 2 mm is given by $VT^n = C$, where n and C are constants. The following V and T observations have been noted: <table border="1" data-bbox="228 1642 1075 1721"><tr><td>V (m/min)</td><td>30</td><td>35</td></tr><tr><td>T (min)</td><td>90</td><td>25</td></tr></table> (i) Calculate n and C. (ii) Hence recommend the cutting speed for a desired tool life of 60 minutes.	V (m/min)	30	35	T (min)	90	25	05	4	3	6
V (m/min)	30	35									
T (min)	90	25									
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						



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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 = 0.15–0.80% 2. C = 1.85%, Co = 1%, Mo = 0.3%, Cr = 1.5% 3. C < 0.08%, Mn = 2–10%, Si = 1–2%, Cr = 16–26%, Ni = 3.5–22%	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. Cyaniding 3. carburizing.	08	3,4	4,5	2
6A	Classify composite materials according to the type of reinforcement used and explain the salient features of each class. Further, describe ceramic matrix composites and carbon matrix composites in detail, discussing their important properties, typical engineering applications, and permissible operating temperature ranges.	10	4	4	4
6B	Apply your knowledge of material compositions to write the chemical composition of the following materials. Analyse their properties and suggest suitable engineering applications for each: 1. Nickel Gun Metal 2. Muntz Metal 3. Dow Metal	10	3,4	3	3
7A	Mild steel is being machined at a cutting speed of 190 m/min with a tool rake angle of 10° . 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 355N/mm ² . Determine: cutting and thrust components of machining force. Assume $2\Phi + \lambda - \alpha = (\pi/2)$.	7	2,3	4	6
7B	Using the steps involved in gas atomization, explain how process control during melting, atomization, and solidification affects powder purity and microstructure for AM applications	05	1,4	3	5
7C	In an orthogonal cutting test on a steel workpiece, the following data is recorded: Rake angle = 5° , Chip thickness ratio = 0.40, Width of	8	1,3	4,5	6



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	cut = 3 mm ,Uncut chip thickness = 0.6 mm ,Material shear strength = 300 N/mm² ,Coefficient of friction between chip and tool = 0.75 Using Merchant's force diagram: 1. Calculate the shear angle, shear force, and normal force on shear plane. 2. Determine the friction force and normal reaction at the tool chip interface. 3. Compute the cutting force and thrust force acting on the tool				
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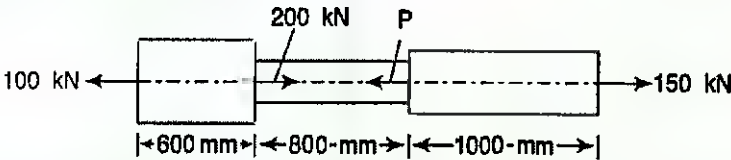
WP_END-SEM/~~Re~~/ EXAMINATIONS Jan/~~Feb~~ 2026

Program : BTech Mechanical engg Duration : 3 hr
 Course Code : PC-BTM304 *second Year* Maximum Points : 100
 Course Name : Strength of Materials.
 Semester : III

Instruction : Refer below

22/01/2026

1. Solve any **five** questions.
2. Answers to each sub-questions are grouped together
3. Use of scientific calculator is allowed
4. Begin answer to each question on new page.
5. Keep some margin on left side of answer paper
6. **Candidates should write the answer legibly**

Q. no.	Description	Pts	CO	BL
1	a) Why are I-sections preferred in engineering applications when it has to carry bending load? Elaborate your answer. b) Derive the expression for the elongation due to self-weight of a freely suspended bar having 'W' as self-weight, 'L' as length and 'A' as c/s area.	10 10	1,2 ,3	2,3
2	Determine the force 'P' necessary for equilibrium of the bar and total elongation. The diameters of the first, middle and last(from left to right) segments of the bar is 25mm, 15mm and 20mm. Find the diameter of the middle segment, if total elongation has to be zero, stress induced in each segment. $E=200\text{GPa}$. 	20	1	2,3
3	The state of a stress on two mutually perpendicular planes is, $\sigma_{xx} = -60\text{ MPa}$, $\sigma_{yy} = 90\text{ MPa}$, $\tau_{xy} = 30\text{ MPa}$. Determine:- a) The magnitudes of the principal stresses and their orientations. b) Find the state of a stress on plane making 35° with 'x' plane in clock-wise direction.	10 10	3	2,3
4	A 7 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 5 meter apart, the left hand support being at the left end. Calculate and draw the SFD, BMD and key points on it.	20	2	2,3

5	An I-section beam of 280 mm x 120 mm having flange thickness 6 mm and web thickness of 4 mm is subjected to shear force of 150 kN. Determine:- a) the maximum and minimum shear stress in the flange. b) the maximum and minimum shear stress in the web.	10	2	3,4
		10		
6	a) Calculate the maximum bending stress induced in a simply beam cross section (50mm deep and 25 mm wide) having 4 m span and load of 4 kN applied at the center. b) Derive the axial extension for a bar of gradually varying circular cross section.	10	1,2	3,4
		10		
7	a) A cylindrical shell, 1200 mm in diameter, thickness of metal 12 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. $E = 210 \text{ GPa}$, Poisson's ratio = 0.27. b) A circular shaft transmits 30 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 60 MPa.	10	2	3,4
		10		



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Second Year

Program: B.Tech. Mechanical for Working Professionals

Duration: 3 hrs.

Course Code: PC-BTM305

Maximum Points: 100.

Course Name: Computer Aided Mechanical Drawing

Semester: III

Important Notes:

23/01/2026

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.

Q. No.		Points	MO/ CO	BL
Q.1	Given in the figure is the details of Sleeve and Cotter Joint. Draw the following Assembly views: a) Sectional Front View b) Side View c) Create a Bill of Material and plot a pdf file of the assembly with given CAMD Exam layout.	10 03 04	01 03 04	03
	d) Draw Free Hand Sketches of the following: i. Metric Thread. ii. Butress Thread.	04 04	02/ 02	01



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Q.2	A vertical cone, diameter 80 mm and axis 100 mm is resting on its base on the H.P. A horizontal square prism, base 30 mm, sides equally inclined to V.P. Axis of horizontal prism is parallel to both the V.P. and H.P. and penetrates the cone. The axis of the solids intersects each other at right angle and prism axis is 30 mm above the cone base.		01/--	03
	a) Create 3d models of the cone and prism.	06	01	
	b) Create a copy of 3d models of the cone- prism and assemble them as described in problem statement.	04	03	
	c) Plot 2d projections of the assembly in F.V., T.V., and S.V. showing curves of intersections in the given CAMD Exam layout.	07	04	
	d) Draw Free Hand Sketches of the following: 1. Flange Nut. 2. T – Headed Bolt	04 04	02/ 02	01
Q.3	Given in the figure is the Details of Standard Flange Coupling. Draw the following Assembly views:		04/--	03
	a) Sectional Front View	10	01	
	b) Side View	05	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
Q.4	Given in the figure is the drawing of V- Belt Pulley. Complete the following tasks.		05/--	03
	a) Create the 3D model of V-Belt.	10	01	
	b) Plot following views in 2D layout			
	i. Side View and	04	03	
	ii. Sectional Front View.	06	04	
Q.4.	c) Calculate the limits for Ø25 H8, f7	05	02/ 02	01



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Q.5	Given in the figure is the Expansion Valve Assembly. a) Create 3D model of following parts I. Body II. Gland Bush b) Plot the following views of Body in 2d layout. I. Sectional Front View II. Side View c) Plot the following views of Gland Bush in 2d layout. I. Sectional Front View II. Side View	10 05 06 04	06/-- 03 03 04 04	03
Q.6	Given in the figure is the Drill Jig Assembly. a) Plot the 2d detail drawing for Jig Plate : i) Sectional Front View ii) Top View b) Plot the 2d detail drawing for Latch Washer : i) Sectional Front View ii) Top View	10 05 05 05	07/-- 03 03 04 04	03

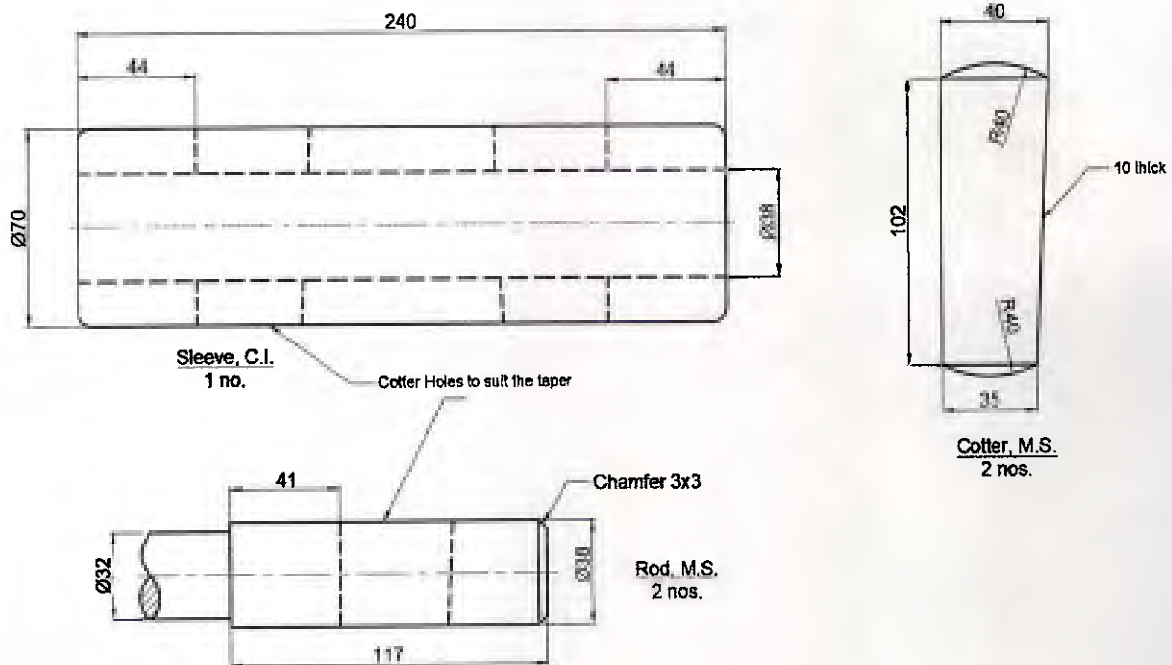


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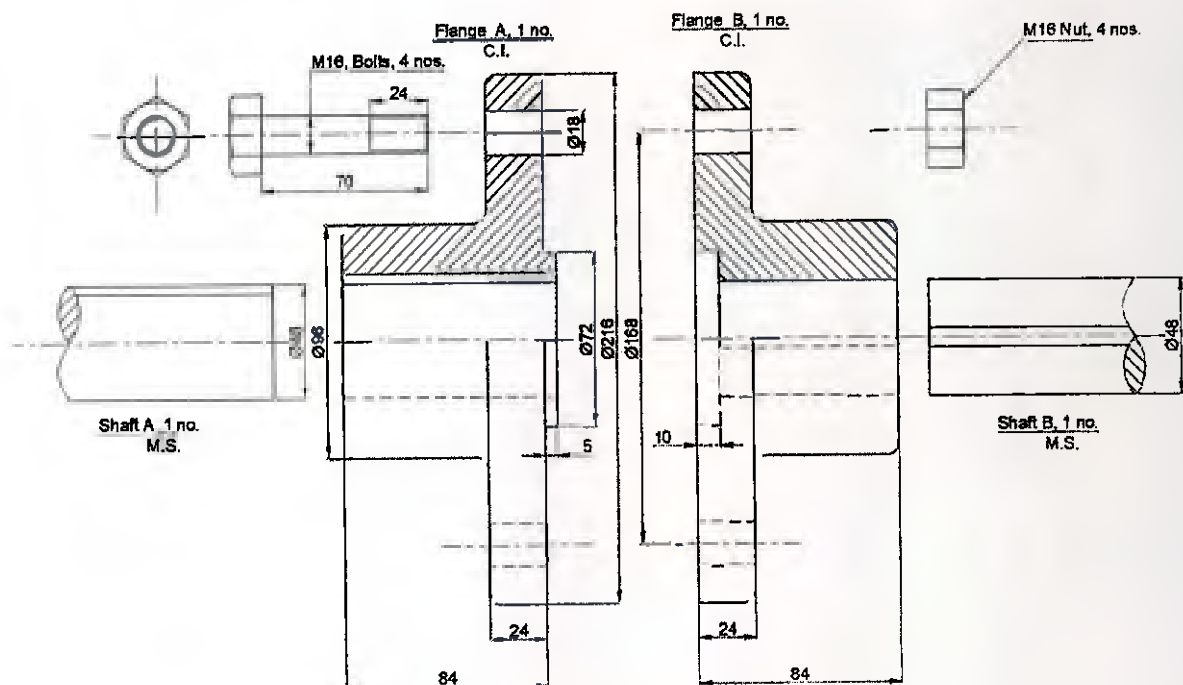
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Q.1. Sleeve and Cotter Joint



Q.3. Standard Flange Coupling

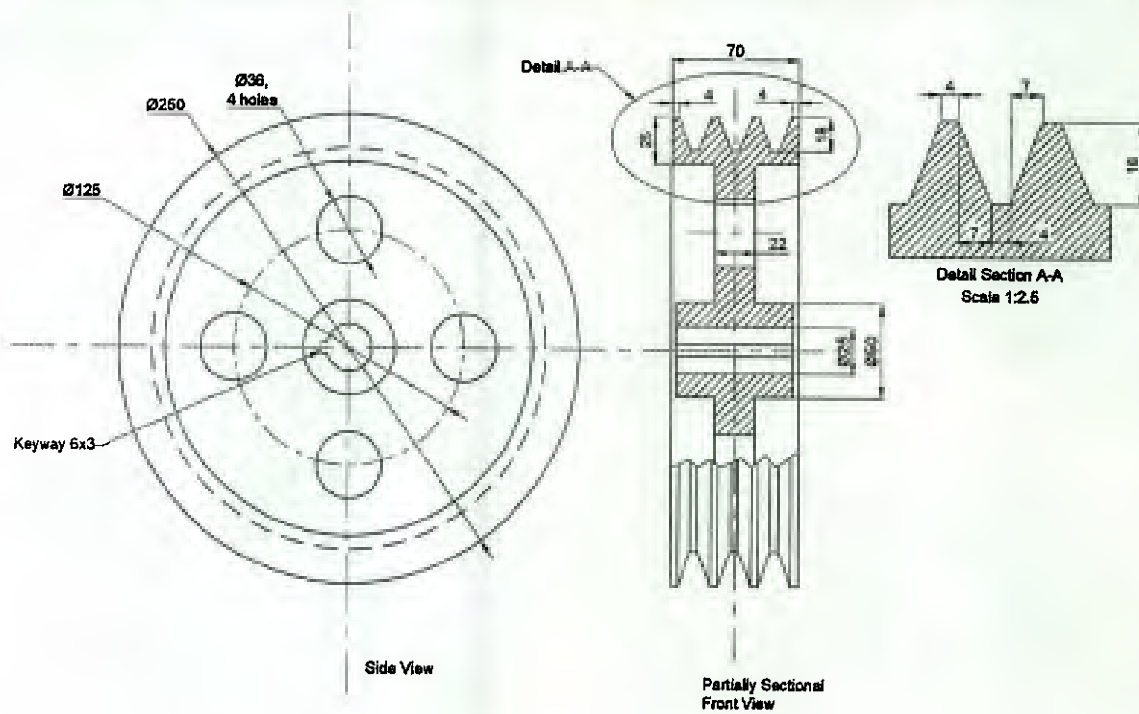


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Q.4. V-Belt Pulley

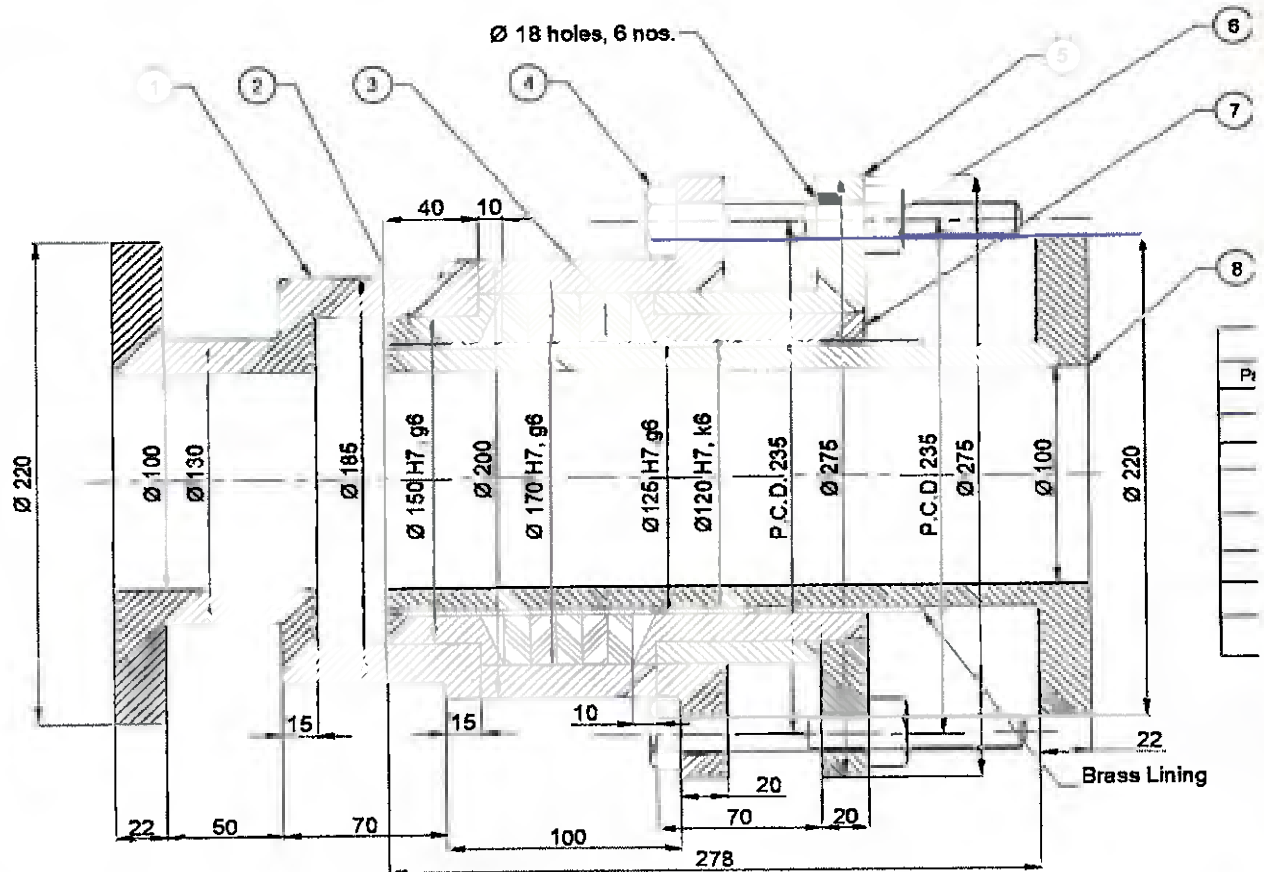


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Q.5. Expansion Joint

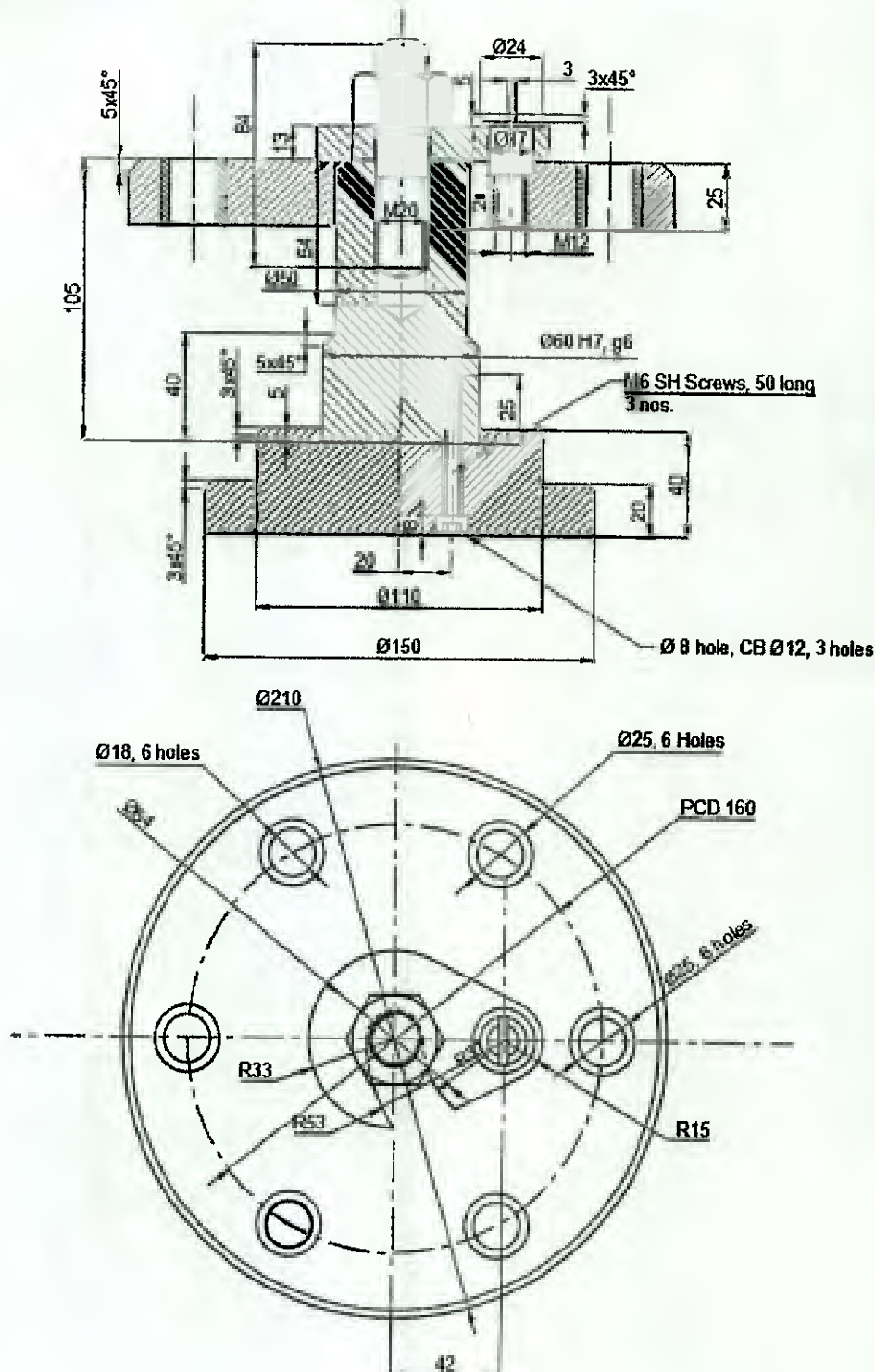


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END SEMESTER January 2026 / RE-EXAM February 2026



Q.6. Drill Jig Assembly



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Limits, Tolerance Tables

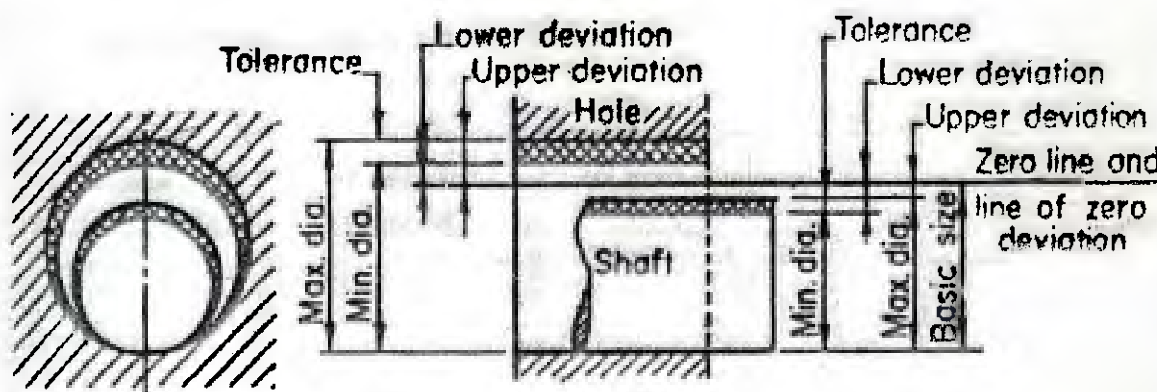


Table 1 Recommended diameter steps upto 500 mm (13 steps)

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	$+(IT7 + 0 \text{ to } 5)$

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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**End Semester Examination ~~December 2025~~ Jan 2026**Program: S.Y. Mechanical Engineering (Working Professional)

Duration: 3 Hour

Course Code: VE- BT001

Maximum Points: 100

Course Name: Health Safety and Sustainable EnvironmentSemester: III27/01/2026

- 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	What is aim of Occupational health and safety management system? List down all market driver of OHSAS 18001?	10	2	1	2
B	What is OSH scenario in developing countries? What is need of OSH and solution offered by OSH?	10	2	1	1
Q2 A	Explain the PHA methodology using the steps involved in that? Draw its format worksheet?	10	1	2	4
B	What is residual and entropic risk? Explain all terms in detail and its dependent entities using an diagram?	10	1	2	2
Q3 A	a) Explain the PHL methodology using the steps involved in that. b) Using any one standard example draw the PHL worksheet & give any three PHL.	10	1	2	4
B	If a designated Wet Land shows the degradation in its ecology, suggest stepwise restoration points? (Refer to 4 point framework of RAMSAR convention)	10	2	1,3	7
Q4 A	Enlist the different values of the functions being offered by the wetlands and also show the inter relation between function and values of the wetland	10	3	1	7
B	Using fault tree quantification technique for the following case1 attached, find the probability of top level event?	10	4	2	6

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Q5 A	Explain stepwise process or algorithm used for process related hazard analysis technique?	10	4	1	5
B	Write short note on the following i) Dick worker's Act 1958 ii) Mines act, 1952 iii) Factories act 1948 iv) Building and other construction worker's act 1996	10	2	1,2	1
Q6 A	Write short note on Bhopal gas tragedy? Write a short note on the following using 1 Normal control system 2 Emergency control system 3 On site off site counter measures Physical containment	10	1	2	3
B	Draw neat sketch Bottom Up approach applied to a system using failure mode and effect analysis (FMEA) technique? What is Pareto chart and explain its significance in relation to FMEA?	10	1	2	5
Q7 A	Use an example of leakage of poisonous and flammable gas in a room. Draw the appropriate event tree for that. Assume suitable data for intermediate events and calculate using the formula probability of different end events.	10	2	3	6



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	Draw Risk profile for the same?				
B	Write short note on Peterson model on accident causation? Draw general format sketch? What is Hazard-Mishap entity transition?	10	4	1	3