DR. BABASAHEB AMBEDKAR TECHNOLOGICAL UNIVERSITY, LONERE

Supplementary Summer Examination – 2023

Course: B. Tech. **Branch : Mechanical** **Semester : III**

Subject Code & Name: BTMC302 , Fluid Mechanics

Max Marks: 60 **Date: 10/08/2023** **Duration: 3 Hr.**

Instructions to the Students:

1. *All the questions are compulsory.*
2. *The level of question/expected answer as per OBE or the Course Outcome (CO) on which the question is based is mentioned in ( ) in front of the question.*
3. *Use of non-programmable scientific calculators is allowed.*
4. *Assume suitable data wherever necessary and mention it clearly.*

		(Level/CO)	Marks
Q. 1	**Solve Any Two of the following.**		**12**
A)	What are the conditions of equilibrium of floating body and sub-merged Body?	**CO1**	**6**
B)	Define and explain the following fluid properties. Viscosity, specific gravity, specific volume, specific weight, surface tension, compressibility.	**CO1**	**6**
C)	The space between two square flat parallel plates is filled with oil. Each side of the plate is 60 cm. The thickness of the oil film is 12.5 mm. The upper plate, which moves at 2.5 metre per sec requires a force of 98.1 N to maintain the speed. Determine : (i) the dynamic viscosity of the oil , and (ii) the kinematic viscosity of the oil if the specific gravity of the oil is 0.95	**CO1**	**6**
Q.2	**Solve Any Two of the following.**		**12**
A)	Define the following flow: (i) Steady Flow (ii) Non-Uniform Flow (iii) Laminar Flow (iv) Turbulant Flow (v) Compressible Flow (vi) Irrotatinal Flow	**CO2**	**6**
B)	Derive the general equation for continuity for a three dimensional flow in Cartesian Co-ordinates for a steady incompressible flow	**CO2**	**6**
C)	The velocity potential function is given by $\varphi = 5(x^2-y^2)$. Calculate the velocity components at the point (4, 5).	**CO2**	**6**

Q. 3	**Solve Any Two of the following.**		**12**
A)	Derive an expression for the velocity distribution for laminar flow through a circular pipe. Also sketch the velocity distribution and shear stress distribution across a section of the pipe	**CO3**	**6**
B)	What is minor energy loss in the pipe? Explain various types of minor losses in pipe flow.	**CO3**	**6**
C)	Calculate the discharge through a pipe of diameter 200 mm when the difference of pressure head between the two ends of a pipe 500 m apart is 4 m of water. Take the value of f =0.009 in the formula $h_f = \frac{4fLV^2}{2g*d}$	**CO3**	**6**
Q.4	**Solve Any Two of the following.**		**12**
A)	State Buckingham's π–Theorem and explain procedure for determining the π–groups and their functional relationship	**CO4**	**6**
B)	What is Siphon? Explain its working with neat sketch.	**CO4**	**6**
C)	Derive Dupit's equation & Explain concept of equivalent pipe.	**CO4**	**6**
Q. 5	**Solve Any Two of the following.**		**12**
A)	Define a centrifugal pump. Explain the working of a single-stage centrifugal pump with sketches.	**CO5**	**6**
B)	What is priming? Why is it necessary?	**CO5**	**6**
C)	Write a short note on multistage centrifugal pump	**CO5**	**6**

***** End *****

DR. BABASAHEB AMBEDKAR TECHNOLOGICAL UNIVERSITY, LONERE

Supplementary End Semester Examination – Summer 2023

Branch: Mechanical Engineering

Course: B Tech **Semester**: **III**

Subject Code & Name: Material Science and Metallurgy (BTMEC302)

Max Marks: 60 **Date: 10/08/2023**

Duration: 3 Hr.

Instructions to the Students:

1. *Each question carries 12 marks.*
2. *Attempt **any Five** questions of the following.*
3. *Illustrate your answer with neat sketches, diagram, etc., wherever necessary.*
4. *Assume suitable data wherever necessary & mention it clearly.*

(Marks)

Q.1 Solve the following. **(12)**

a) Explain in short different imperfections in crystal structure. **6**

b) Explain slip mechanism of plastic deformation. Give difference between slip and twinning. **6**

Q. 2 Solve the following. **(12)**

a) Define Creep. Explain effect of creep rate on creep curve. **6**

b) Explain Brinell hardness test w.r.t. principle of working, indenter details, formula, advantages and limitations. **6**

Q. 3 Solve the following. **(12)**

a) Draw the Fe-Fe3C diagram. Explain Phases and Critical Temperatures. **6**

b) What is the importance of TTT diagram? Explain TTT diagram in detail. **6**

Q. 4 Solve the following. **(12)**

a) Define heat treatment and give its objectives. Explain tempering process w.r.t. types, variation of properties with tempering temperature. **6**

b) What is surface hardening? Explain induction hardening with neat sketch. **6**

Q. 5 Solve the following. **(12)**

a) Explain specimen preparation for optical metallurgical microscope. **6**

b) Explain sulphur print test w.r.t. purpose, significance, and procedure. **6**

Q. 6 Solve the following. **(12)**

a) Give Different types of NDT. Explain in brief Magnaflux Test. **6**

b) Write short notes on: **6**

1) Basic Types of Crystal Structure
2) Space Lattice and Lattice Parameters

End

DR. BABASAHEB AMBEDKAR TECHNOLOGICAL UNIVERSITY, LONERE

Supplementary Summer Examination – 2023

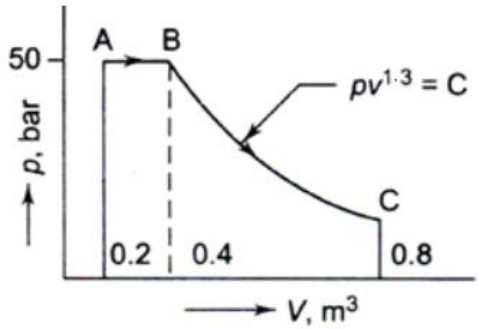
Course: B. Tech. Branch : Mechanical Engineering Semester :III

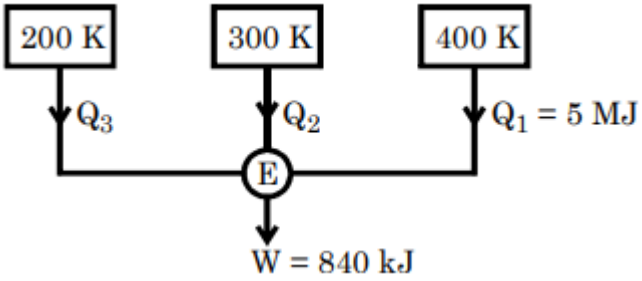
Subject Code & Name: Thermodynamics (BTMC303)

Max Marks: 60 Date: 14-08-2023 Duration: 3 Hr.

Instructions to the Students:

1. *All the questions are compulsory.*
2. *The level of question/expected answer as per OBE or the Course Outcome (CO) on which the question is based is mentioned in ( ) in front of the question.*
3. *Use of non-programmable scientific calculators is allowed.*
4. *Use of steam table is allowed*
5. *Assume suitable data wherever necessary and mention it clearly.*

		(Level/ CO)	Marks
Q. 1	**Solve Any Two of the following.**		**12**
A)	Define the thermodynamic system. Classify it with brief explanation and example of each.	L2 - Understand CO1	**6**
B)	Define thermodynamic equilibrium and classify it with brief explanation of each	L2 - Understand CO1	**6**
C)	Determine the total work done by a gas system following an expansion process as shown in Figure. 	L3 -Apply CO1	**6**
Q.2	**Solve Any Two of the following.**		**12**
A)	A mass of 8 kg gas expands within a flexible container so that the p–v relationship is of the from $pv^{1.2}$ = constant. The initial pressure is **1000 kPa** and the initial volume is 1 m^3. The final pressure is **5 kPa**. If specific internal energy of the gas decreases by **40 kJ/kg**, find the heat transfer in magnitude and direction.	L3 -Apply CO2	**6**
B)	A reciprocating air compressor takes in 2 m^3/min at 0.11 MPa, 20°C which it delivers at 1.5 MPa, 111°C to an aftercooler where the air is cooled at constant pressure to 25°C. The power absorbed by the compressor is 4.15 kW. Determine the heat transfer in (a) The compressor (b) The cooler. State your assumptions.	L3 -Apply CO2	**6**

C)	Explain different forms of energy and write down the equation of each.	L2 - Understand CO2	**6**
Q. 3	**Solve Any Two of the following.**		**12**
A)	Two reversible heat engines A and B are arranged in series, A rejecting heat directly to B. Engine A receives **200 kJ** at a temperature of **421°C** from a hot source, while engine B is in communication with a cold sink at a temperature of **4.4°C**. If the work output of A is twice that of B, find (a) The intermediate temperature between A and B (b) The efficiency of each engine (c) The heat rejected to the cold sink	L3 -Apply CO3	**6**
B)	A reversible engine, as shown in Figure during a cycle of operations draws **5 MJ** from the **400 K** reservoir and does **840 kJ** of work. Find the amount and direction of heat interaction with other reservoirs.  	L3 -Apply CO3	**6**
C)	State and explain the following statements of second law of thermodynamics 1. Clausius Statement of the Second Law of thermodynamics. 2. Kelvin–Planck Statement of the Second Law of thermodynamics.	L2 - Understand CO3	**6**
Q.4	**Solve Any Two of the following.**		**12**
A)	Air contained in a cylinder fitted with a piston is compressed reversibly according to the law $pV^{1.25}$ = const. The mass of air in the cylinder is **0.1 kg**. The initial pressure is **100 kPa** and the initial temperature **20°C**. The final volume is **1/ 8** of the initial volume. Determine the work and the heat transfer.	L3 -Apply CO4	**6**
B)	A closed system allows nitrogen to expand reversibly from a volume of **0.25 m^3** to **0.75 m^3** along the path **$pv^{1.32}$ = const.** The original pressure of the gas is **250 kPa** and its initial temperature is **100°C.** (a) Draw the p-v and T-s diagrams. (b) What are the final temperature and the final pressure of the gas? (c) How much work is done and how much heat is transferred? (d) What is the Entropy change of nitrogen?	L3 -Apply CO4	**6**
C)	State the following laws related to ideal gases and write the their equations **1. Boyle's Law** **2. Charles' Law** **3. Gay Lussac's Law** **4. Avogadro's Law**	L2 - Understand CO4	**6**

Q. 5	**Solve Any Two of the following.**		**12**
A)	Explain the phase change process of the pure substance and plot the same on **T-s Plot** by assume the initial state of the substance to be **solid ice** and it is heated at constant pressure.	L2 - Understand CO5	**6**
B)	Define the following terms related to pure substances (only definitions) 1. Saturated Liquid. 2. Saturated Vapor States 3. Saturated Liquid–Vapor Mixture 4. Superheated Vapor 5. Compressed Liquid 6.Dryness Fraction	L2 - Understand CO5	**6**
C)	Find the enthalpy and entropy of steam when the pressure is **2 MPa** and the specific volume is **0.09 m^3/kg.**	L3 -Apply CO5	**6**
	***** End *****		

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DR. BABASAHEB AMBEDKAR TECHNOLOGICAL UNIVERSITY, LONERE

Supplementary Examination – Summer 2023

Branch: Mechanical Engineering

Course: B Tech **Semester**: **III**

Subject Code & Name: Material Science and Metallurgy (BTMES304)

Max Marks: 60 **Date: 18/08/2023** **Duration: 3 Hr.**

Instructions to the Students:

1. All the questions are compulsory.

2. Use of non-programmable scientific calculator is allowed.

3. Figure to right indicates full marks.

4. Assume suitable data wherever necessary & mention it clearly.

		(Level/CO)	Marks
Q. 1	**Solve Any Two of the following.**		**12**
A)	Define the following terms i. Unit cell ii. Atomic packing factor iii. Co-ordination number	Remember	6
B)	Sketch the following crystal imperfections i. Vacancy ii. Interstitialcy iii substitution impurity	Remember	6
C)	Draw stress strain diagram for mild steel, Show effect of carbon content on shape of stress strain diagram.	Understand	6
Q. 2	**Solve Any Two of the following.**		**12**
A)	What is Solid Solution? Differentiate between substitutional and interstitial solid solution?	Remember	6
B)	Draw neatly iron carbon-carbon equilibrium diagram and mention the three variant reactions involved in the phase diagram.	Understand	6
C)	What is T-T-T diagram? How it is different from phase diagram? Explain.	Understand	6
Q. 3	**Solve Any Two of the following.**		**12**
A)	What is annealing? List different types of annealing along with their purpose.	Remember	6
B)	Explain with neat sketches different types of flame hardening.	Remember	6
C)	Write short notes on the following with their objectives. i. Normalizing ii. Tempering	Understand	6
Q. 4	**Solve Any Two of the following.**		**12**
A)	Explain steps in specimen preparation for microscopy.	Remember	6
B)	Explain the principle of working of optical metallurgical microscope. Compare it with electron microscope.	Understand	6
C)	For spark test draw the sparks for the following specimen. i CI ii MS iii HSS	Remember	6
Q. 5	**Solve Any Two of the following.**		**12**
A)	Write a note on strain hardening.	Understand	6
B)	Explain Dye penetrant test. What are its Applications?	Remember	6
C)	Explain dispersion strengthening w.r.t. basic mechanism, critical factors, advantage, and commercial examples.	Understand	6

End

	DR. BABASAHEB AMBEDKAR TECHNOLOGICAL UNIVERSITY, LONERE **Supplementary Examination – Summer 2022** **Course: B. Tech. Branch : Mechanical Engineering Semester : III** **Subject Code & Name: Engineering Mathematics – III (BTBSC301)** **Max Marks: 60 Date: / /2022 Duration: 3 Hr.**		
	Instructions to the Students: *1. All the questions are compulsory.* *2. The level of question/expected answer as per OBE or the Course Outcome (CO) on which the question is based is mentioned in ( ) in front of the question.* *3. Use of non-programmable scientific calculators is allowed.* *4. Assume suitable data wherever necessary and mention it clearly.*		
		(Level/CO)	Marks
Q. 1	**Solve Any Two of the following.**		**12**
A)	**Find L $\{f(t)\}$, where f(t) = $t^2e^t \cos 2t$**	Understand	**6**
B)	**Find Laplace transform of periodic function f(t) = E sin αt $0< t < \frac{\pi}{\alpha}$ and $f(t) = f(t+\frac{\pi}{\alpha})$**	Understand	**6**
C)	**Using Laplace transform evaluate $\int_0^\infty e^{-2t}\frac{sin^2t}{t}$ dt**	Evaluation	**6**
Q.2	**Solve Any Three of the following.**		**12**
A)	**Find $L^{-1}\left\{\log(\frac{s+a}{s+b})\right\}$ = ……**	Application	**4**
B)	**Find $L^{-1}\left\{\frac{s^2}{(s^2+3^2)(s^2+2^2)}\right\}$ using Convolution theorem.**	Application	**4**
C)	**Using Laplace transform solve y'' + y = 6 cos 3t , y(0) = 3 , $y'(0)$ = 1**	Application	**4**
D)	**Solve $\frac{dx}{dt}$ = 2x – 3y and $\frac{dy}{dt}$ = y – 2x , given x(0) = 8 , y(0) = 3**	Application	**4**
Q. 3	**Solve Any Two of the following.**		**12**
A)	**Find the Fourier integral representation of the function :** **f(x) = 1, $\|x\| \leq 1$** **= 0, $\|x\| > 1$ Hence evaluate 1. $\int_0^\infty \frac{\sin\lambda\cos\lambda x}{\lambda}$ dλ , 2. $\int_0^\infty \frac{\sin\lambda}{\lambda}$ dλ**	Evaluation	**6**
B)	**Find the Fourier Cosine integral representation of the function :** **f(x) = x^2 , $0< x < a$** **= 0 , x > a**	Understand	**6**
C)	**Using the Fourier Sine integral representation show that** **$e^{-2x} - e^{-3x} = \frac{10}{\pi}\int_0^\infty \frac{\lambda \sin\lambda x}{(\lambda^2+3^2)(\lambda^2+2^2)}$ dλ**	Understand	**6**
Q.4	**Solve Any Three of the following.**		**12**
A)	**Form the partial differential equation by eliminating arbitrary function**	Understand	**4**

	$f\ from\ f(xy + z^2, x + y + z) = 0$		
B)	**Solve the partial differential equation (x^2- yz) p + (y^2- zx) q = z^2- xy**	Analysis	**4**
C)	**Solve $\frac{\partial u}{\partial t}$ = 4 $\frac{\partial^2 u}{\partial x^2}$ subject to the condition u(0, t) = 0 = (π , t)** **u (x , 0) = 2 sin 3x - 4 sin 5x**	Application	**4**
D)	**Solve $\frac{\partial^2 z}{\partial x^2}$ = 4 $\frac{\partial^2 z}{\partial y^2}$ satisfying the condition z = $\frac{\partial z}{\partial y}$ = sin x , when y = 0**	Application	**4**
Q. 5	**Solve Any One of the following.**		**12**
1.A	**If f (z) is analytic function and f'(z) = 0 then prove that f (z) is a constant function.**	Understand	**6**
1.B	**Evaluate $\oint \frac{z+4}{z^2+2z+5}\, dz$ Over C, Where C is the circle $\lvert z + 1 - i \rvert$ = 2**	Evaluation	**6**
	OR		
2.A	**If φ = - x^3+ 3xy^2 is flux function is an electrostatic field , find potential function and hence complex potential function.**	Understand	**6**
2.B	**Find the Residues of f (z) = $\frac{\sin z}{z \cos z}$ at its poles inside the circle $\lvert z \rvert$= 2**	Understand	**6**
	***** End *****		

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	DR. BABASAHEB AMBEDKAR TECHNOLOGICAL UNIVERSITY, LONERE **Supplementary Examination – Summer 2022** **Course: B. Tech. Branch : Mechanical Semester : I** **Subject Code & Name: BTMC302 / Fluid Mechanics** **Max Marks: 60 Date: Duration: 3 Hrs**		
	Instructions to the Students: *1. All the questions are compulsory.* *2. The level of question/expected answer as per OBE or the Course Outcome (CO) on which the question is based is mentioned in ( ) in front of the question.* *3. Use of non-programmable scientific calculators is allowed.* *4. Assume suitable data wherever necessary and mention it clearly.*		
		(Level/CO)	Marks
Q. 1	**Solve any two of the following.**		
A) 1.	If 15 m^3 of certain oil weighs 45 kN, calculate the specific weight, specific gravity and mass density of the oil.		**3**
2.	Define and derive Hydrostatic law.		3
B) 1.	Determine the total pressure and centre of pressure of a circular plate of diameter 1.5m which is placed vertically in water in such a way that the centre of the plate is 3m below the free water surface.		**3**
2.	Determine the dynamic viscosity of a liquid having kinematic viscosity of 6 stokes and specific gravity 1.9.		**3**
C)	A solid cylinder has a diameter of 4.0 m and height 3.0 m. Find the metacentric height of the cylinder when it floats with its axis vertical in water. The specific gravity of the cylinder is 0.6. Comment on stability of the floating cylinder.		**6**
Q.2	**Solve any two of the following.**		
A)	Differentiate a. Compressible and in-compressible flow b. Rotational and irrotational flow c. Laminar and turbulent flow		**6**
B)	Derive continuity equation for a 3 dimensional, steady, incompressible flow.		**6**
C)	A pipe of diameter 400 mm carries water at a velocity of 25 m/s. The pressures at the points A and B are given as 29.43 N/cm^2 and 22.563 N/cm^2 respectively while the datum head at A and B are 28 m and 30 m. Find the loss of head between A and B.		**6**
Q. 3	**Solve any one of the following.**		
A)	Derive the expression for loss of head due to friction in pipes.		**12**
B)	With a neat sketch explain Reynold's experiment. Name minor losses in pipe. Write the significance and expression of Hagen poiseuille's formula and mention what does each term stands for?		**6** **2** **4**

Q.4	**Solve any one of the following.**		
A)	i) What is Dimensional analysis? Write down the significance of dimensionless numbers. ii) Name two methods of Dimensional analysis. Explain Buckingham's pie theorem with an example.		**4** **8**
B)	A horizontal pipe line 40m long is connected to a water tank at one end discharges freely into the atmosphere at the other end. For the first 25 m of its length from the tank, the pipe is 150mm diameter and its diameter is suddenly enlarged to 300mm. The height of water level in the tank is 8m above the centre of the pipe. Considering all losses of head which occur, determine the rate of flow. Take f=0.01 for both sections of the pipe. Draw HGL and TGL.		**12**
Q. 5	**Solve any one of the following.**		
A)	With the help of neat sketch explain the construction and working of Centrifugal pump.		**12**
B) i)	Derive the equation for minimum starting speed of Centrifugal pump.		**6**
ii)	Define a) Priming b) Mechanical efficiency of Centrifugal pump **c)** Suction head of Centrifugal pump		**6**
	***** End *****		

DR. BABASAHEB AMBEDKAR TECHNOLOGICAL UNIVERSITY, LONERE

Winter Examination – 2022

Course: B. Tech. Branch: Mechanical Engg. Semester : III

Subject Code & Name: BTMC302 / Fluid Mechanics

Max Marks: 60 Date: 11 Mar 2023 Duration: 3 Hr.

Instructions to the Students:

1. *All the questions are compulsory.*
2. *The level of question/expected answer as per OBE or the Course Outcome (CO) on which the question is based is mentioned in ( ) in front of the question.*
3. *Use of non-programmable scientific calculators is allowed.*
4. *Assume suitable data wherever necessary and mention it clearly.*

		(Level/CO)	Marks
Q. 1	**Attempt the following.**		**12**
A)	Describe any three terms: 1) Density, 2) Pascal's Law, 3) Specific Gravity, 4) Surface Tension, 5) Mach number and its significance	Understand	**6**
B)	i) Calculate the capillary rise in a glass tube of 2.0 mm diameter when immersed vertically in (a) water and (b) Mercury. Take surface tension = 0.08 N/m for water and 0.5 N/m for mercury in contact with air. The specific gravity of mercury is 13.6 and angle of contact is 120º. ii) A hydraulic press has a ram of 20 cm diameter and plunger of 3 cm diameter. It is used to lift a weight of 30 kN. Find the force required at the plunger.	Evaluate	**6**
C)	What is the purpose of a manometer? Describe the various types of manometers along with neat schematics and its working.	Understand	**6**
Q.2	**Solve Any Two of the following.**		**12**
A)	A rectangular vertical plane surface is 2 m wide and 3 m deep. Determine the total pressure force and position of centre of pressure on the plane surface when its upper edge is horizontal and coincides with water level. Also determine the force and centre of pressure position when the top edge of plane surface is 2.5 m below the water level.	Evaluate	**6**
B)	Describe the conditions of stability of floating as well as submerged bodies along with neat schematic and tabular presentation.	Understand	**6**
C)	A rectangular block is 5.0 m long, 3 m wide and 1.2 m high. The depth of immersion of the block is 0.8 m in the sea water. If the centre of gravity is 0.6 m above the bottom of the block, determine the Metacentric height. Assume density of sea water as 1025 kg/cu. m.	Analyze and Evaluate	**6**
Q. 3	**Attempt any two of the following**		**12**
A)	Derive the Bernoulli's equation with the help of Euler's equation. Also discuss the significance of each terms of Bernoulli's equation.	Understand	**6**
B)	An oil of viscosity 0.1 Ns/m^2 and relative density 0.9 is flowing through a circular pipe of diameter 50 mm and of length 300 m. The rate of flow of fluid through the pipe is 3.5 litres/s. Find the pressure drop in a length of 300 mm and also the shear stress at the pipe wall.	Analyze and Evaluate	**6**
C)	A 0.30 m × 0.15 m Venturimeter is inserted in a vertical pipe of diameter 0.30 m. The throat size is 0.15 m. The water is flowing through the pipe in the upward direction. A differential mercury manometer connected to the inlet and throat of Venturimeter gives a reading of 0.2 m. Find the flow rate of water (Assume, C_d = 0.98).	Evaluate	**6**

Q.4	**Attempt any two of the following**		**12**
A)	Describe in detail the various types of major and minor losses in pipes.	Understand	**6**
B)	Explain: i) Dimensional Homogeneity and ii) Raleigh's method	Understand	**6**
C)	Explain: i) Water hammer effect in pipes, ii) Hydraulic gradient line and Total gradient line	Remember	**6**
Q. 5	**Attempt the following**		**12**
A)	Describe Reynolds experiment with the help of neat sketches along with the significance of Reynolds number.	Understand	**6**
B)	Three pipes of lengths 800m, 500m, and 400 m and of diameters 50 cm, 40 cm and 30 cm, respectively are connected in series. These pipes are to be replaced by a single pipe of length 1700 m. Find the diameter of single equivalent pipe.	Analyze and Evaluate	**6**

***** End *****

	DR. BABASAHEB AMBEDKAR TECHNOLOGICAL UNIVERSITY, LONERE **Winter Examination – 2022** **Course: B. Tech. Branch :Mechanical Engg. Semester :III** **Subject Code & Name: BTMC303 Thermodynamics** **Max Marks: 60 Date: Duration: 3 Hr.**		
	Instructions to the Students: *1. All the questions are compulsory.* *2. The level of question/expected answer as per OBE or the Course Outcome (CO) on which the question is based is mentioned in ( ) in front of the question.* *3. Use of non-programmable scientific calculators is allowed.* *4. Assume suitable data wherever necessary and mention it clearly.*		
		(Level/CO)	Marks
Q.1	**Solve Any Two of the following.**		**12**
A)	Explain closed and open system with examples.	CO1	**6**
B)	Derive an equation of work done for constant temperature process in a closed system.	CO1	**6**
C)	Explain Quasi Static process with a neat sketch.	CO1	**6**
Q.2	**Solve Any Two of the following**.		**12**
A)	State and explain first law of thermodynamics for a closed system undergoing a cycle and process.	CO2	**6**
B)	Prove that the Energy – A property of system (Point function).	CO2	**6**
C)	In an air compressor air flows steadily at the rate of 0.5 kg/s through an air compressor. It enters the compressor at 6 m/s with a pressure of 1 bar and a specific volume of 0.85 m^3/kg and leaves at 5 m/s with a pressure of 7 bar and a specific volume of 0.16 m^3/kg. The internal energy of the air leaving is 90 kJ/kg greater than that of the air entering. Cooling water in a jacket surrounding the cylinder absorbs heat from the air at the rate of 60 kJ/s. Calculate : (i) The power required to drive the compressor ; (ii) The inlet and output pipe cross-sectional areas.	CO2	**6**
Q.3	**Solve Any Two of the following**.		**12**
A)	State and explain the Kelvin- Plank and Clausius statements of second law of thermodynamic.	CO3	**6**
B)	Define the Entropy. Explain the Clausius inequality equations.	CO3	**6**
C)	A Carnot cycle operates between source and sink temperatures of 250°C and – 15°C. If the system receives 90 kJ from the source, find: (i) Efficiency of the system (ii) The net work transfer (iii) Heat rejected to sink.	CO3	**6**
Q.4	**Solve Any Two of the following.**		**12**
A)	State and explain Boyle's law, Charl's law and Gay-Lussac law.	CO4	**6**
B)	Derive the relation: $C_p - C_v = R$ Where C_p=Specific heat at constant pressure C_v = Specific heat at constant volume R =Characteristic Gas Constant	CO4	**6**

C)	One kg of ideal gas is heated from 18.3°C to 93.4°C. Assuming R=0.287 kJ/kg.k and γ =1.18 for the gas, find out: (i) Specific heats (ii) change in internal energy (iii) Change in enthalpy	CO4	**6**
Q.5	**Solve Any Two of the following.**		**12**
A)	Draw and explain a p-T (pressure-temperature) diagram for a pure substance.	CO5	**6**
B)	Define (i) Triple point (ii) Dryness fraction of steam (iii) Sensible heat and Latent heat.	CO5	**6**
C)	Write a short note on Mollier diagram.	CO5	**6**
	***** End *****		

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	DR. BABASAHEB AMBEDKAR TECHNOLOGICAL UNIVERSITY, LONERE **Supplementary Examination – Summer 2022** **Course: B. Tech. (Second Year) Branch : Mechanical Semester : III** **Subject Code & Name: BTMEC302 Materials Science and Metallurgy** **Max Marks: 60 Date: Duration: 3 Hr.**		
	Instructions to the Students: 1. *All the questions are compulsory.* 2. *The level of question/expected answer as per OBE or the Course Outcome (CO) on which the question is based is mentioned in ( ) in front of the question.* 3. *Use of non-programmable scientific calculators is allowed.* 4. *Assume suitable data wherever necessary and mention it clearly.*		
		(Level/CO)	Marks
Q. 1	**Solve Any Two of the following.**		4
A)	Draw the crystal Structure of FCC and HCP.	CO1	2
B)	Define toughness and hardness.	CO2	2
C)	What is Gibbs phase rule?	CO3	2
Q.2	**Solve Any Two of the following.**		16
A)	Explain screw dislocation and edge dislocation in detail.	CO1	8
B)	What is importance of equilibrium diagram? Explain in detail.	CO3	8
C)	What are the different methods of hardness measurement? Explain any two.	CO2	8
Q. 3	**Solve Any Two of the following.**		16
A)	Draw the neat sketch Iron-iron carbide equilibrium diagram and explain phases existing on it.	CO3	8
B)	Explain hardening heat treatment process. Why tempering is only followed by hardening process?	CO4	8
C)	Classify surface hardening processes. Explain any two methods of hardening.	CO4	8
Q.4	**Solve Any Two of the following.**		16
A)	Write down short note on Sulphur printing test and Spark test.	CO5	8
B)	What are the types of Strengthening Mechanisms? Explain any one in detail.	CO6	8
C)	Write about the specimen preparation procedure in detail.	CO5	8
Q. 5	**Solve Any Two of the following.**		8
A)	Differentiate between annealing and normalizing processes.	CO3	4
B)	What are the steps involved in dye Penetrant inspection?	CO5	4
C)	What is objective of TTT diagram?	CO4	4
	***** End *****		

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	DR. BABASAHEB AMBEDKAR TECHNOLOGICAL UNIVERSITY, LONERE **Supplementary End Semester Examination – Winter 2022-23** **Course: B. Tech. Branch: Mechanical Engg. Semester : III** **Subject Code & Name: Fluid Mechanics (BTMEC303)** **Max Marks: 60 Date: __/01/2023 Duration: 3 Hr.**		
	Instructions to the Students: *1. All the questions are compulsory.* *2. The level of question/expected answer as per OBE or the Course Outcome (CO) on which the question is based is mentioned in ( ) in front of the question.* *3. Use of non-programmable scientific calculators is allowed.* *4. Assume suitable data wherever necessary and mention it clearly.*		
Q. 1	**Describe the following.**	(Level/CO)	Marks
A)	Describe any three terms: 1) Mach number, 2) Pascal's Law, 3) Manometer, 4) Steady and unsteady flow, 5) Incompressible fluid flow	Understand	**6**
B)	i) Calculate the capillary rise in a glass tube of 2.0 mm diameter when immersed vertically in (a) water and (b) Mercury. Take surface tension = 0.08 N/m for water and 0.5 N/m for mercury in contact with air. The specific gravity of mercury is 13.6 and angle of contact is 120°. ii) A hydraulic press has a ram of 25 cm diameter and plunger of 4 cm diameter. It is used to lift a weight of 50 kN. Find the force required at the plunger.	Evaluate	**3 × 2**
Q.2	**Attempt any two questions A/B/C**		
A)	A rectangular vertical plane surface is 2 m wide and 2 m deep. Determine the total pressure force and position of centre of pressure on the place surface when its upper edge is horizontal and coincides with water level. Also determine the force and centre of pressure position when top edge of plane surface is 1.5 m below the water level.	Evaluate	**6**
B)	Describe the conditions of stability of floating as well as submerged bodies along with neat schematic and tabular presentation.	Understand	**6**
C)	A rectangular block is 5 m long, 4 m wide and 1.4 m high. The depth of immersion of the block is 0.8 m in the sea water. If the centre of gravity is 0.7 m above the bottom of the block, determine the metacentric height. Assume density of sea water as 1020 kg/cu. m.	Analyze and Evaluate	**6**
Q. 3	**Attempt any two of the following**		
A)	Derive the Bernoulli's equation with the help of Euler's equation.	Understand	**6**
B)	The right limb of a simple U-tube manometer containing mercury is open to the atmosphere while the left limb is connected to a pipe in which a fluid of specific gravity 0.85 is flowing. The centre of the pipe is 0.12 m below the level of mercury in the right limp. Find the pressure of fluid in the pipe if the difference of mercury level in the two limps is 0.2 m.	Analyze and Evaluate	**6**
C)	A 0.35 m × 0.18 m Venturimeter is inserted in a vertical pipe of diameter 0.35 m. The throat size is 0.18 m. The water is flowing through the pipe in the upward direction. A differential	Evaluate	**6**

	mercury manometer connected to the inlet and throat of Venturimeter gives a reading of 0.2 m. Find the flow rate of water (Assume, C_d = 0.98).		
Q.4	**Attempt any two of the following**		
A)	Describe in detail the various types of major and minor losses in pipes.	Understand	**6**
B)	Explain: i) Dimensional Homogeneity and ii) Raleigh's method	Understand	**6**
C)	Explain: i) Water hammer effect in pipes, ii) Hydraulic gradient line and Total gradient line	Remember	**6**
Q. 5	**Attempt the following**		
A)	Describe Reynolds experiment with the help of neat sketches along with the significance of Reynolds number.	Understand	**6**
B)	Three pipes of lengths 800m, 600m, and 400 m and of diameters 40 cm, 35cm and 30 cm, respectively are connected in series. These pipes are to be replaced by a single pipe of length 1600 m. Find the diameter of single equivalent pipe.	Analyze and Evaluate	**6**
	***** End *****		

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Dr. Babasaheb Ambedkar Technological University Lonere

Semester Examination

S. Y. B. Tech. (Mechanical)

Subject: Machine Drawing and Computer Aided Drafting

Max. Marks: 60 **Max. Time: Four hrs.**

INSTRUCTIONS: 1. Attempt any **FIVE** questions.
2. Necessary data are given in the respective questions. If such a data is not given, it means that the knowledge of the data is a part of the examination.
3. Make suitable assumptions if necessary and state them clearly giving reasons.

Que.1: A pictorial view of a clamp is shown in Figure A. Draw full size the following views by using first angle of method of projection.

a) Front view looking in the direction of X.

b) Top view

c) Half sectional side view (Section along A-B) (12)

Que.2:

A) Draw symbols for the following pipe fittings and valves. (4)

a) cross b) cap c) gate valve d) plug

B) Draw neat and dimensioned sketch of the following (ANY TWO) (8)

i) Eye foundation bolt

ii) Square and ACME thread profile

iii) Castle nut

iv) Knuckle or Pin joint

Que.3: Two unequal size pipes, Main pipe vertical and 88 mm diameter and branch pipe inclined at 60^0 to vertical and of 50 mm diameter, are connected with their axes offset and parallel to V. P. Axes of branch pipe is nearer to V.P. by 15 mm as compared to the axis of the vertical main pipe. draw the projections along with curve of penetration or intersection. (12)

Que.4:

Figure B shows two views of Universal coupling for 50 mm diameter shafts. Material list of the coupling is as given below. Draw two orthographic views of each coupling details. (12)

S. No.	Part Name	Material	Quantity
1	Fork	CI	2
2	Center block	CI	1
3	Pin	MS	2
4	Taper pin	MS	2
5	Collor	MS	2

Que.5:

A) Determine allowance and tolerances for the following dimensions of mating parts according to hole basis system. State the type of fit. (04)

Shaft	Hole
Ø29.90 mm	Ø 30.000 mm
Ø29.85 mm	Ø30.025 mm

B) Define the following terms related to surface roughness. (04)

a) Waviness b) Roughness

c) Surface roughness number d) Ideal surface

C) What do you understand by lay? Draw various type of lays with their symbols. (04)

Que.6:

A) Explain in brief the followings

i) Wire frame modeling

iii) Solid modeling (04)

B) Explain the following 2D drawing entities with help of sketch.

i) Arc ii) Donut iii) Polygon ii) Polyline (04)

C) Explain the boolean operations that can be performed on solid primitives with suitable example. (04)

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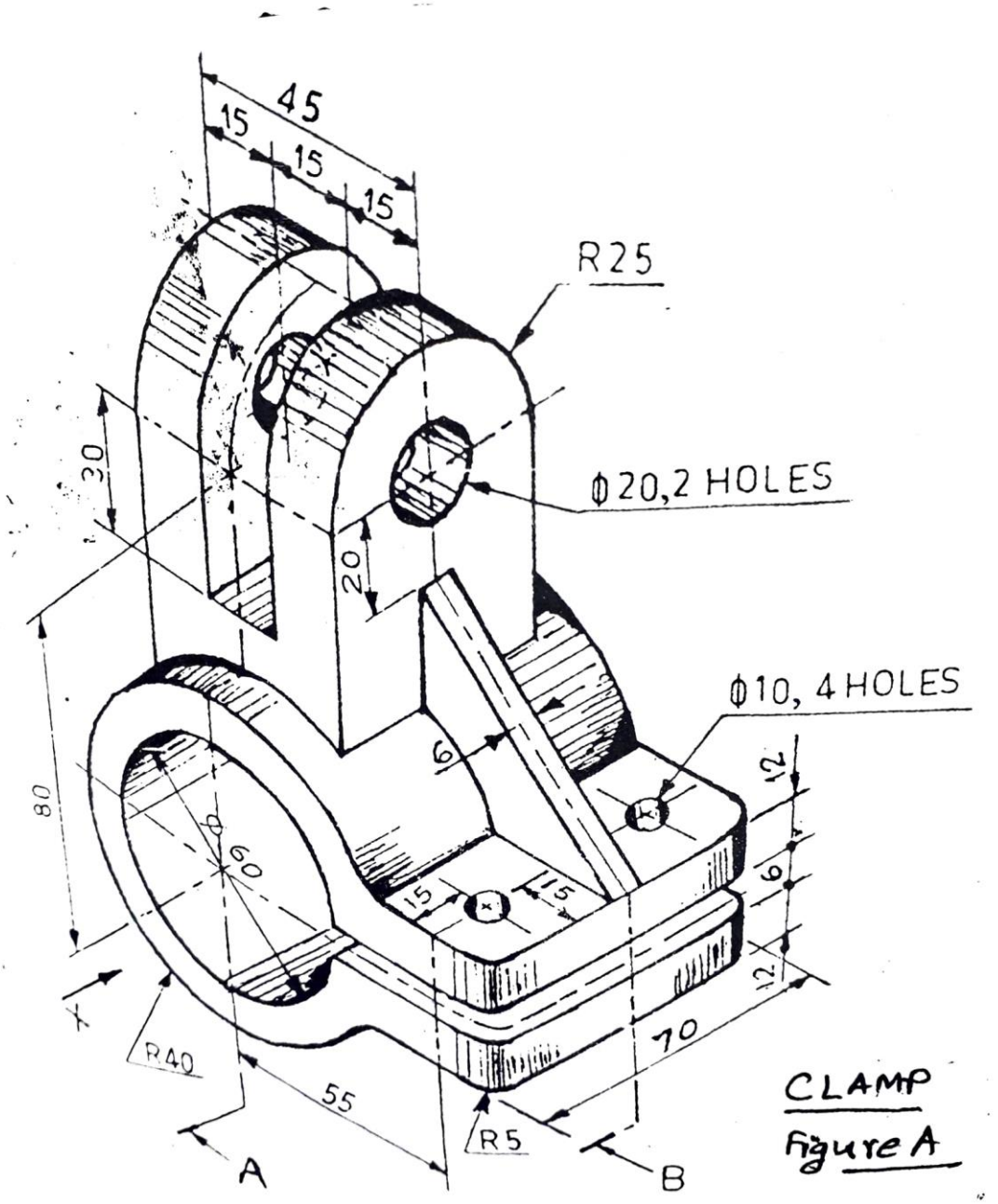
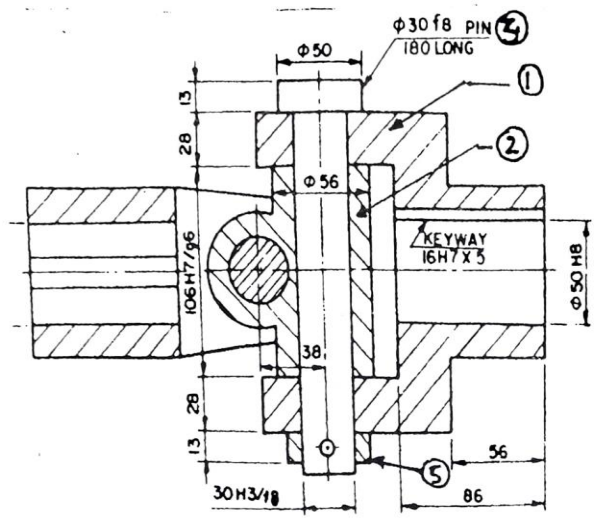
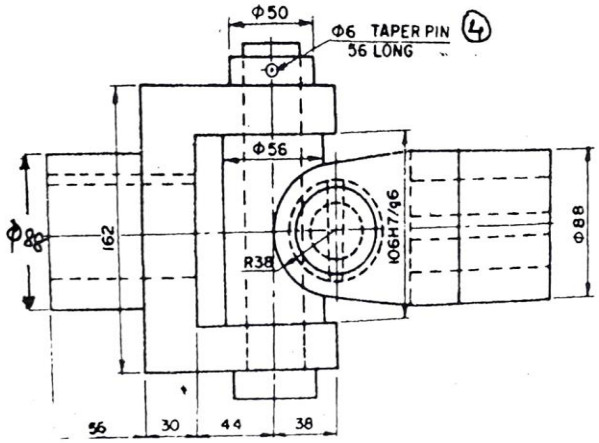

45
15
15
15
R25
30
Φ20,2 HOLES
20
Φ10, 4 HOLES
6
12
80
Φ60
15
15
6
12
70
R40
55
R5
A
B
CLAMP
Figure A





Sr No	Part's Name	Material	No off
1	Fork	C I	2
2	Center block	C I	1
3	Pin	M S	2
4	Taper pin	M S	2
5	Collar	M S	2

Figure B

DR. BABASAHEB AMBEDKAR TECHNOLOGICAL UNIVERSITY, LONERE

Supplementary End Semester Examination – Winter 2022-23

Course: B. Tech. Branch: Mechanical Engg. Semester : III

Subject Code & Name: Thermodynamics (BTMEC305)

Max Marks: 60 Date: __/01/2023 Duration: 3 Hr.

Instructions to the Students:

1. *All the questions are compulsory.*
2. *The level of question/expected answer as per OBE or the Course Outcome (CO) on which the question is based is mentioned in ( ) in front of the question.*
3. *Use of non-programmable scientific calculators is allowed.*
4. *Assume suitable data wherever necessary and mention it clearly.*
5. *Use of steam table is permitted.*

Q. 1	**Attempt the following**	(Level/CO)	Marks
A)	Describe various types of thermodynamic equilibrium.	Understand	**4**
B)	In a steam power plant, steam flows steadily from the steam generator to the turbine. In order to increase the velocity of stream it passes through a horizontal nozzle having an inlet area of 0.1 m^2. Steam at 1000 kPa and 400°C enters the nozzle with a velocity of 70 m/s. The steam leaves the nozzle at 300 kPa and 300°C and there is a heat loss of 30 kW while steam passing through it. Properties of steam can be referred from the table:	Evaluate	**8**

Pressure (*kPa*)	**Temperature (*°C*)**	**Enthalpy (*kJ/kg*)**	**Specific Volume (m^3/kg)**
1000	400	3264	0.30
300	300	3069.3	0.88

Determine the mass flow rate of steam, the exit velocity and the exit area of the nozzle.

Q.2	**Attempt any two questions A/B/C**		
A)	Describe the three laws of thermodynamics: 1) Zeroth Law, 2) First law and 3) Statements of second law of thermodynamics.	Understand	**6**
B)	Describe the following terms: 1) Types of system, 2) Control Volume, 3) Homogeneous and heterogeneous System, 4) Extensive and Intensive properties, along with practical examples.	Understand	**6**
C)	A rigid tank contains 1 m^3 of air at 200 kPa and at 50°C. How much heat must be transferred to the air to raise the air pressure to 400 kPa? Air can be considered as an ideal gas and the value of constant volume specific heat (C_v) for air at 210°C is 0.742 kJ/kg °C.	Analyze and Evaluate	**6**
Q. 3	**Attempt any two of the following**		
A)	A cyclic hat engine operates between a source temperature of 800°C and a sink temperature of 30°C. What is the least rate of heat rejection for 1 kW as net work output of the engine?	Evaluate	**6**
B)	Describe the Inequality of Clausius and the three criteria/ conditions of the reversibility of a cycle.	Remember /Understand	**6**
C)	Describe the applications of entropy principle. Also describe the phenomenon of entropy transfer with the heat flow.	Evaluate	**6**
Q.4	**Attempt any two of the following**		
A)	Describe the terminology: i) High and Low grade energy, ii) Available and Unavailable energy, iii) Dead state	Understand	**6**

B)	What is Quality or Dryness fraction of steam. Describe any one calorimeter in detail which can measure the quality of steam, with the help of neat schematic and mathematical expressions.	Understand	**6**
C)	Steam initially at 0.3 MPa, 250°C is cooled at constant volume. (i) at what temperature will the steam become saturated vapour ? (ii) What is the quality at 80°C ? What is the heat transferred per kg of steam in cooling from 250°C to 80°C.	Remember	**6**
Q. 5	**Attempt the following**		
A)	A fluid at 200 kPa and 300°C has a volume of 0.8 m^3. In a frictionless process at constant volume the pressure changes to 100 kPa. Find the final temperature and the heat transferred if the fluid is air. Also find the properties if the fluid is steam.	Analyze and Evaluate	**6**
B)	State and describe the various process steam can undergo in a cycle with the help of P-h (Pressure –Enthalpy) and or T-S (Temperature-Entropy) Charts.	Understand	**6**
	***** End *****		

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	DR. BABASAHEB AMBEDKAR TECHNOLOGICAL UNIVERSITY, LONERE **Winter Examination: 2022 - 23** **Program: B. Tech. Branch: Mechanical Engineering Semester: III** **Course Code & Name: BTMEC302 Materials Science and Metallurgy** **Max. Marks: 60 Date: 15.3.2023 Duration: 3 Hrs.**		
	Instructions to the Students: *1. All the questions are compulsory.* *2. The level of question/expected answer as per OBE or the Course Outcome (CO) on which the question is based is mentioned in ( ) in front of the question.* *3. Use of non-programmable scientific calculator is permitted.* *4. Assume suitable data wherever necessary and mention it clearly.*		
		(Level/CO)	Marks
Q. 1	**Solve *Any Two* of the following.**		**12**
A)	**What is atomic packing factor? Prove that the atomic packing factor for FCC structure is 0.74.**	Understand	**6**
B)	**What are the mechanisms of plastic deformation? Explain slip mechanism due to the movement of edge dislocations and screw dislocations with neat sketch.**	Understand	**6**
C)	**Discuss Vickers hardness test w.r.t working principle, indentor details, formula, advantages and limitations.**	Remember	**6**
Q.2	**Solve *Any Two* of the following.**		**12**
A)	**Draw Iron-Carbide Equilibrium diagram and define all the phases.**	Remember	**6**
B)	**Explain Hume-Rothery's rules of solid solubility. What is Gibb's phase rule.**	Remember	**6**
C)	**What is the importance of TTT diagram? Explain the procedure to determine these diagrams with the help of neat sketch.**	Understand	**6**
Q. 3	**Solve *Any Two* of the following.**		**12**
A)	**What are the objectives of heat treatment? Explain different types of annealing processes with the help of schematic diagrams.**	Understand	**6**
B)	**Define hardenability and explain, in detail, the Jominy End Quench Test with neat sketch.**	Remember	**6**
C)	**Explain induction hardening process in detail. Give its advantages and limitations.**	Understand	**6**
Q.4	**Solve *Any Two* of the following.**		**12**
A)	**Describe various steps in specimen preparation for microscopy.**	Understand	**6**
B)	**Explain the construction and working principle of metallurgical microscope with neat sketch.**	Remember	**6**
C)	**Discuss Spark test in detail and draw the spark pattern for the Mild Steel and High Carbon Steel.**	Understand	**6**

Q. 5	**Solve *Any Two* of the following.**		**12**
A)	**Describe Magnetic Particle testing w.r.t. principle of working and applications.**	Understand	**6**
B)	**Explain Dye Penetrant Test in detail w.r.t. basic principle, steps, and limitations.**	Understand	**6**
C)	**Explain basic mechanism of dispersion strengthening. What are its critical factors, advantages and applications?**	Remember	**6**
	***** End *****		

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