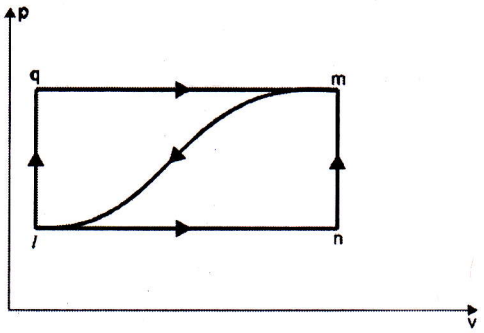
SHRI SHANKARACHARYA INSTITUTE OF PROFESSIONAL MANAGEMENT AND TECHNOLOGY		
DEPARTMENT OF MECHANICAL ENGINEERING		
Class Test – I	**Session- July-December, 2022**	**Month- December, 2022**
Semester 3rd	**Subject- Engineering Thermodynamics**	
Code – B000314(037)	**Time Allowed: 2 Hours**	**Max Marks: 40**

Note: - Part A(MCQ) of questions 1 and 2 is compulsory, from other parts B, C and D of questions 1 and 2, attempt any two parts.
Ignore the columns of Level of Bloom's taxonomy and CO.

Q. No	Questions	Marks	Levels of Bloom's taxonomy	CO
	Question – 1			
1.A	*1. A definite area or space where some thermodynamic process takes place is known as* *(a) thermodynamic system (b) thermodynamic cycle* *(c) Thermodynamic process (d) thermodynamic law.* *2. An open system is one in which -* *(a) heat and work cross the boundary of the system, but the mass of the working substance does not* *(b) Mass of working substance crosses the boundary of the system but the heat and work do not* *(c) both the heat and work as well as mass of the working substances cross the boundary of the system* *(d) Neither the heat and work nor the mass of the working substances cross the boundary of the system.*	**4**	**R**	**1**
1.B	*A cylinder contains 1 kg of a certain fluid at an initial pressure of 20 bar. The fluid is allowed to expand reversibly behind a piston according to a law* pv^2 *= constant until the volume is doubled. The fluid is then cooled reversibly at constant pressure until the piston regains its original position; heat is then supplied reversibly with the piston firmly locked in Position until the pressure rises to the original value of 20 bar. Calculate the net work done by the Fluid, for an initial volume of 0.05 m3.*	**8**	**A**	**1**

1.C	*When a system is taken from state l to state m, in Fig. 4.18, along path lqm, 168 kJ of heat flows into the system, and the system does 64 kJ of work :* *(i) How much will be the heat that flows into the system along path lnm if the work doneis 21 kJ ?* *(ii) When the system is returned from m to l along the curved path, the work done on the system is 42 kJ. Does the system absorb or liberate heat, and how much of the heat is absorbed or liberated?* *(iii) If Ul = 0 and Un = 84 kJ, find the heat absorbed in the processes ln and nm.*  	**8**	**A**	**1**
1.D	*A fluid system, contained in a piston and cylinder machine, passes through a complete cycle of four processes. The sum of all heat transferred during a cycle is – 340 kJ. The System completes 200 cycles per min. Complete the following table showing the method for each item, and compute the net rate of work output in kW.* *Process — Q (kJ/min) — W (kJ/min) — E (kJ/min)* *1—2 — 0 — 4340 — —* *2—3 — 42000 — 0 — —* *3—4 — - 4200 — — — - 73200* *4—1 — — — — —*	**8**	**A**	**1**

	Question – 2			
2.A	*1. The processes or systems that do not involve heat are called -* *(a) isothermal processes* *(b) equilibrium processes* *(c) thermal processes* *(d) steady processes* *(e) Adiabatic processes.*	**4**	**R**	**1**

	2. Internal energy of a perfect gas depends on - *(a) temperature, specific heats and pressure* *(b) temperature, specific heats and enthalpy* *(c) Temperature, specific heats and entropy* *(d) temperature only.*			
2.B	*Show that the relation for a heat transfer during process 1-2 in polytrophic process is -* $Q_{1\text{-}2} = \frac{\gamma - n}{\gamma - 1}$ *X Polytropic Work Done*	**8**	**U**	**1**
2.C	*A cylinder contains 0.45 m3 of a gas at 1 × 10^5 N/m2 and 80°C. The gas is compressed to a volume of 0.13 m3, the final pressure being 5 × 10^5 N/m2. Determine :* *(i) The mass of gas ;* *(ii) The value of index 'n' for compression;* *(iii) The increase in internal energy of the gas ;* *(iv) The heat received or rejected by the gas during compression.* *Take γ = 1.4, R = 294.2 J/kg°C.*	**8**	**R**	**1**
2.D	*A turbo compressor delivers 2.33 m^3/s of air at 0.276 MPa, 43°C which is heated at this pressure to 430°C and finally expanded in a turbine which delivers 860 kW. During expansion there is a heat transfer of 0.09 MJ/s to the surroundings. Calculate the turbine exhaust temperature if changes in kinetic and potential energy are negligible.*	**8**	**R**	**2**

SHRI SHANKARACHARYA INSTITUTE OF PROFESSIONAL MANAGEMENT AND TECHNOLOGY

DEPARTMENT OF MECHANICAL ENGINEERING

Class Test – I	Session- July to Dec. 2022	Month - December
Sem- 3rd	Subject – MMM	
Code – B000311(037)	Time Allowed: 2 hrs	Max Marks: 40

Note: - 1. Students are Required to focus on question and marks columns only.
2. In Unit I & II, Question A is compulsory and attempt any two from B, C & D.

Q. No	Questions	Marks	Levels of Bloom's taxonomy	CO
	Unit – I			
A	Write down the name of instruments used for measuring following physical quantities – 1. Blood Pressure 2. Oxygen level of body	4	Remembering	CO1
B	For given observations:- Temp (x): 197, 198, 199, 200, 201, 202, 203, 204, 205 Frequency: 2, 4, 10, 24, 36, 14, 5, 3, 2 Calculate all the statistical parameters.	8	Apply	CO1
C	Explain the construction and working of Bourdon tube pressure gauge on the basis of GMS.	8	Understanding	CO1
D	Explain the following terms- (1) Accuracy (2) Noise (3) Linearity (4) Dead time & Dead Zone	8	Understanding	CO1
	Unit – II			
A	What is the main application of IR Sensor? Explain in brief.	4	Understanding	CO1
B	Define transducers. Explain the classification of transducers.	8	Understanding	CO1
C	Explain the functioning components of GMS with examples.	8	Understanding	CO1
D	Explain the dynamic characteristics of measuring instruments.	8	Understanding	CO1

Shri Shankaracharya Institute of Professional Management & Technology

Department of Mechanical Engineering

Class Test – I Session- July – Dec. 2022 Month- December

Sem- Mech. 3rd Subject- Mathematics III Code - B000311(014)

Time Allowed: 2 hrs Max Marks: 40

NOTE: - ***QUESTION A IS COMPULSORY. ATTEMPT ANY TWO FROM B, C AND D.***

Q.N.	Questions	Marks	Levels of Bloom's taxonomy	COs
	Part 1			
A.	Solve $z = y^2 + 2f\left(\frac{1}{x} + \log y\right)$	[4]	Applying	CO2
B.	Solve the following equation by method of separation of variables $4\frac{\partial u}{\partial x} + \frac{\partial u}{\partial y} = 3u$, given that $u = 3e^{-y} - e^{-5y}$, when $x = 0$.	[8]	Applying	CO2
C.	Solve $4\frac{\partial^2 z}{\partial x^2} - 4\frac{\partial^2 z}{\partial x \partial y} + \frac{\partial^2 z}{\partial y^2} = 16\log(x + 2y)$.	[8]	Applying	CO2
D.	Solve $px\left(z - 2y^3\right) + qy\left(z - y^2 - 2x^3\right) = z\left(z - y^2 - 2x^3\right)$	[8]	Applying	CO2
	Part 2			
A.	Apply the binomial distribution for which $mean = 2 \times \text{var}\,iance, mean + \text{var}\,iance = 3$	[4]	Applying	CO3
B.	Fit Poisson's distribution to the following and calculate theoretical frequencies Deaths: 0 1 2 3 4 Frequency: 122 60 15 2 1	[8]	Applying	CO3
C.	The probability density function p(x) of a continuous random variable is given by $p(x) = y_0 e^{-\lvert x \rvert}, -\infty < x < \infty$ Prove that $y_0 = 1/2$. Calculate mean and variance.	[8]	Applying	CO3
D.	In a test on 2000 electrical bulbs, it was found that the life Of a bulb, was normally distributed with an average life of 2040 hrs and S.D. of 60 hrs. evaluate the number of bulbs likely to burn for (a) More than 2150hrs (b) Less than 1950 hrs (c) More than 1920 hours, but less than 2160 hrs.	[8]	Applying	CO3

SHRI SHANKARACHARYA INSTITUTE OF PROFESSIONAL MANAGEMENT AND TECHNOLOGY		
DEPARTMENT OF MECHANICAL ENGINEERING		
Class Test – I	Session- 2022-23	Month- December
Sem- 3rd	Subject- Materials Science	
Code –B037315(037)	Time Allowed: 2hours	Max Marks: 40

Note: - Note: - Attempt all question. Parts (a) are compulsory of each question. Solve any two parts from (b), (c) and (d) of each question.

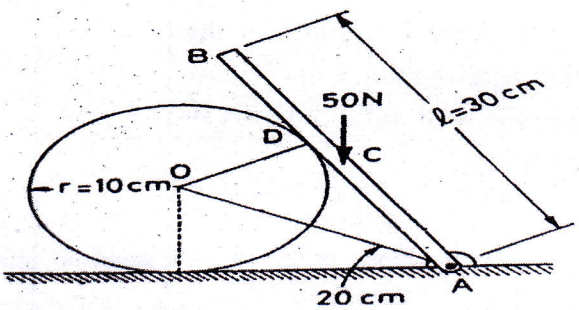
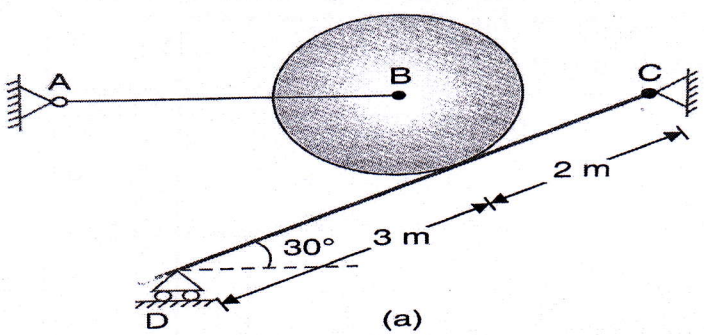
Q. No	Questions	Marks	Levels of Bloom's taxonomy	CO
	Part-A			
1.A	Analyse and write the difference between crystalline and non-crystalline solids?	4	Analyzing	CO1
1.B	Write short notes on following: a) Face-centered cubic crystal structure b) Body-centered cubic crystal structure	8	Understanding	CO1
1.C	Write short notes on following: a) Tilt and Twin boundary b) Hexagonal close-packed crystal structure	8	Understanding	CO1
1.D	Draw a [110] [100], [110], [111], [120], [0$\bar{1}$0], [00 $\bar{1}$] and [1 21] direction within a cubic unit cell. Also construct a (001), (110), (111), (0$\bar{1}$1), and (0 $\bar{1}$ 2) plane within a cubic unit cell.	8	Creating	CO2
	Part-B			
2.A	Draw a neat sketch of stress-strain diagram showing the limit of proportionality, elastic limit, yield point, the point of maximum loading and rupture.	4	Understanding	CO1
2.B	Write short notes on hardness, toughness, ductility, and brittleness.	8	Remembering	CO1
2.C	Explain in detail types of line defects.	8	Remembering	CO1
2.D	Explain in detail types of point defects.	8	Understanding	CO1

SHRI SHANKARACHARYA INSTITUTE OF PROFESSIONAL MANAGEMENT AND TECHNOLOGY

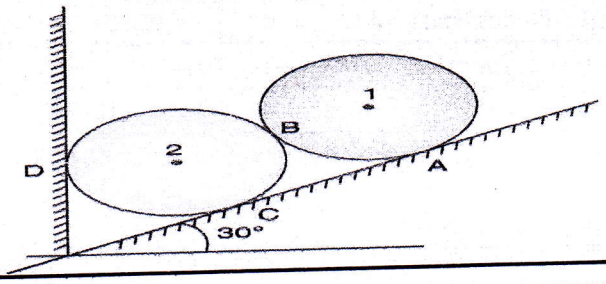
DEPARTMENT OF MECHANICAL ENGINEERING

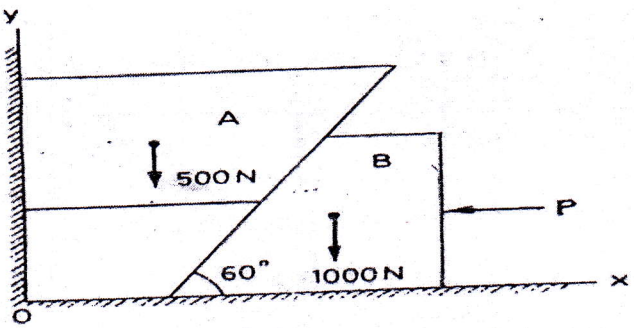
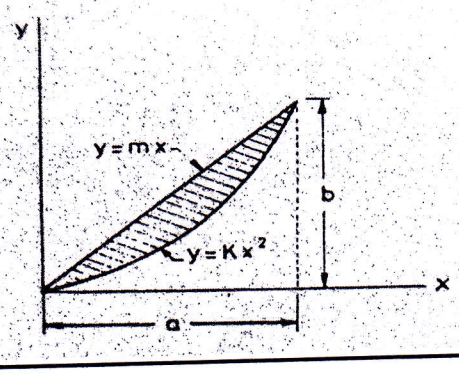
Class Test: I	**Session: July-December, 2022**	**Month: December, 2022**
Semester 3rd	**Subject: Engineering Mechanics**	
Code: B000313(037)	**Time Allowed: 2 Hours**	**Max Marks: 40**

Note: - Part A of Questions 1 and 2 is compulsory, from other parts B, C and D of Questions 1 and 2, attempt any two parts.
Ignore the columns of Level of Bloom's taxonomy and CO.

Q. No	Questions	Marks	Levels of Bloom's taxonomy	CO
	Question – 1			
1.A	**Explain Resultant of a force system with suitable example.**	**4**	**Understand**	**1**
1.B	**A smooth cylinder of radius 10 cm resting on a horizontal surface supports a bar AB of length 30cm which is hinged at A. The weight of the bars is 50N. The cylinder is kept from rolling away by a string AO of length 20cm, Assuming all surfaces to be frictionless, find the tension in the string.** 	**8**	**Apply**	**1**
1.C	**A roller weighing 2000N rests on an inclined bar CD weighing 800N as shown. Consider support at C to be hinge. Assuming weight of the bar AB is negligible, determine the reactions developed at supports C and D.**  (a)	**8**	**Apply**	**1**

P.T.O.

1.D	Two identical cylinders each weighing 500N are placed in a trough as shown. Determine reactions developed at contact points A, B, C and D. Assume all points of contact are smooth. 	8	Apply	1

Question – 2				
2.A	Analyze the statement " Friction is a necessary evil"	4	Analyze	2
2.B	A 7m long ladder rests against a vertical wall, with which it makes an angle of 45^0, and on a floor. If a man, whose weight is one half of the ladder, climbs it, at what distance along the ladder will he be, when the ladder is about to slip? The coefficients of friction between the ladder and the wall is 1/3 and that between ladder and floor is 1/2.	8	Apply	2
2.C	Two Blocks A and B are resting against a wall and the floor as shown. Find the value of the horizontal force P applied to the lower block that will hold the system in equilibrium. Coefficients of friction are: 0.25 at the floor, 0.3 at the wall and 0.2 between the blocks. 	8	Apply	2
2.D	Determine the moments of inertia of the shaded area with respect to the x-axis and y-axis by direct integration. 	8	Apply	3