

**SHRI SHANKARACHARYA INSTITUTE OF PROFESSIONAL MANAGEMENT AND TECHNOLOGY**

**DEPARTMENT OF MECHANICAL ENGINEERING**

**Class Test – II**

**Session- July-December, 2022**

**Month- Feb, 2023**

**Semester 3<sup>rd</sup>**

**Subject- Engineering Thermodynamics**

**Code – B000314(037)**

**Time Allowed: 2 Hours**

**Max Marks: 40**

*Note: - Part A(MCQ) of sections 1 and 2 is compulsory, from other parts B, C and D of sections 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
<b>Section – 1</b>				
1.A	<i>Explain the term Dryness fraction and Wetness Fraction. What is the significance of Dryness fraction?</i>	4	R	5
1.B	<i>A boiler working at a pressure of 15 bar (gauge) is supplied with water at 80°C. The ambient pressure is 750 mm of Hg. The quality of steam at outlet from the boiler is 80% dry. Steam from boiler passes through superheater to get 80°C degree of superheat. For an evaporation of 200 kg/hr, calculate the rate of heat transfer -  (i) in boiler (ii) in superheater in kJ/s.</i>	8	A	5
1.C	<i>A mass of wet steam at temperature 165°C is expanded at constant quality 0.8 to pressure 3 bar. It is then heated at constant pressure to a degree of superheat of 66.5°C. Find the enthalpy and entropy changes during expansion and during heating. Draw the T-s and h-s diagrams.</i>	8	A	5
1.D	<i>5 kg of steam at 10 bar 0.9 dry is heated at constant temperature and the final pressure of steam at 4 bar. Find the condition of steam after heating, change in internal energy, heat transfer and work done during the process.</i>	8	A	5

**Section - 2**

<p><b>2.A</b></p>	<p><b>1. Consider the following statements regarding the throttling process of wet steam:</b></p> <ol style="list-style-type: none"> <li>1. The steam pressure and temperature decrease but enthalpy remains constant.</li> <li>2. The steam pressure decreases; the temperature increases but enthalpy remains constant.</li> <li>3. The entropy, specific volume, and dryness fraction increase.</li> <li>4. The entropy increases but the volume and dryness fraction decrease.</li> </ol> <p>Which of these statements are correct?</p> <ol style="list-style-type: none"> <li>(a) 1 and 4</li> <li>(b) 2 and 3</li> <li>(c) 1 and 3</li> <li>(d) 2 and 4</li> </ol> <p><b>2. Which one of the following represents the condensation of a mixture of saturated liquid and saturated vapor on the enthalpy-entropy diagram?</b></p> <ol style="list-style-type: none"> <li>(a) A horizontal line</li> <li>(b) An inclined line of constant slope</li> <li>(c) A vertical line</li> <li>(d) A curved line</li> </ol>	<p align="center">4</p>	<p align="center">R</p>	<p align="center">5</p>
<p><b>2.B</b></p>	<p>Steam initially at 1.5 MPa, 300°C expands reversibly and adiabatically in a steam turbine to 40C. Determine ideal work output of the turbine per kg of steam.</p>	<p align="center">8</p>	<p align="center">U</p>	<p align="center">5</p>
<p><b>2.C</b></p>	<p>A piston cylinder arrangement has 0.2 kg of steam at 10 bar and 300°C. The steam expands up-to a pressure of 1 bar till its volume becomes six times according to the polytropic law <math>pv^n = \text{constant}</math>. Find</p> <ol style="list-style-type: none"> <li>(i) Index "n"</li> <li>(ii) Work done</li> <li>(iii) Change in internal energy.</li> <li>(iv) Heat transfer.</li> </ol>	<p align="center">8</p>	<p align="center">R</p>	<p align="center">5</p>
<p><b>2.D</b></p>	<p>Steam at a pressure of 8 bar and 0.9 dry is expanded hyperbolically in a cylinder up-to 1 bar pressure. Determine the work-done and heat transfer during the process. Assume <math>C_p = 2.0 \text{ kJ/kg K}</math></p>	<p align="center">8</p>	<p align="center">R</p>	<p align="center">5</p>

07/09/23/ME (M) 5-II

**SHRI SHANKARACHARYA INSTITUTE OF PROFESSIONAL MANAGEMENT AND TECHNOLOGY**

**DEPARTMENT OF MECHANICAL ENGINEERING**

Class Test – II	Session- July to Dec. 2022	Month – Feb 2023
Sem- 3 <sup>rd</sup>	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
<b>Unit – I</b>				
A	Write down the Bernoulli's equation for incompressible flow.	4	Remembering	CO3
B	Explain the construction and working of Hot wire anemometer. Also write its advantages and disadvantages.	8	understanding	CO3
C	Explain the principle, construction and working of venturi meter with a suitable diagram.	8	Understanding	CO3
D	Write short notes on (any two)- (1) Magnetic Flow meter (2) Ultra sonic flow meter (3) Significance of flow measurement	8	Understanding	CO3

**Unit – II**

A	What do you mean by Vibration measurement? Why is it important?	4	Understanding	CO3
B	Explain the construction and working of Seismic instruments for vibration measure with neat sketch.	8	Understanding	CO3
C	Explain the principle and operation of multi channel Data acquisition system with a suitable diagram.	8	Understanding	CO3
D	Write short notes on (any two)- (1) Nozzle (2) Orifice meter (3) DAS	8	Understanding	CO3

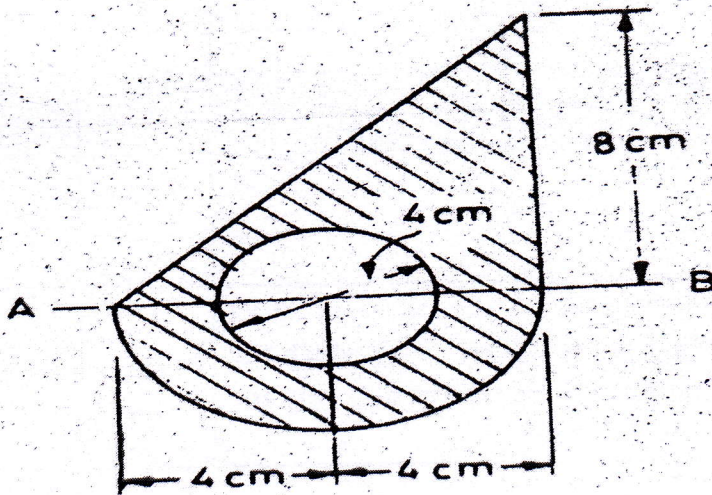
**SHRI SHANKARACHARYA INSTITUTE OF PROFESSIONAL MANAGEMENT AND TECHNOLOGY, Raipur**

**DEPARTMENT OF MECHANICAL ENGINEERING**

Class Test: II	Session: July-December, 2022	Month: February, 2023
Semester 3rd	Subject: Engineering Mechanics	
Code: B000313(037)	Time Allowed: 2 Hours	Max Marks: 40

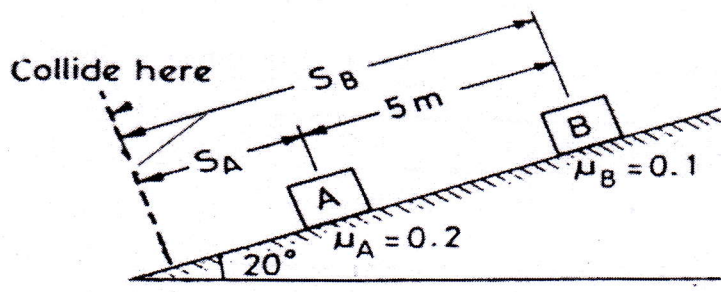
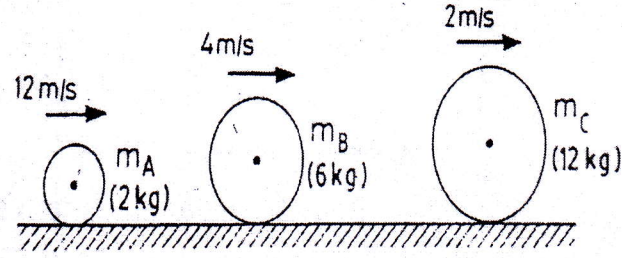
*Note: - Part A of Questions 1 and 2 is compulsory, from other parts B, C and D of Questions 1 and 2, attempt any two parts.*  
 Ignore the columns of Level of Bloom's taxonomy and CO.

Q. No	Questions	Marks	Levels of Bloom's taxonomy	CO
<b>Question – 1</b>				
1.A	Analyze the difference between area moment of inertia and mass moment of inertia.	4	Understand	3
1.B	Derive the formula of product of inertia of right angled triangle about its own centroidal axes.	8	Apply	3
1.C	Determine the moment of inertia of the shaded area shown with respect to the horizontal and vertical centroidal axis.	8	Apply	3
1.D	Write the formula for area moment of inertia of (i) right angled triangle about its centroidal x and y axis. (ii) semicircle about its centroidal x and y axis (iii) rectangle about its centroidal x and y axis (iv) circle about its centroidal x and y axis.	8	Remember	3



P.T.O.

**Question – 2**

2.A	Analyze the importance of D'Alembert's principle in dynamics.	4	Analyze	5
2.B	<p>Two blocks A and B are held on an inclined plane 5m apart as shown in following figure. The coefficients of friction between block A and B and the inclined plane are 0.2 and 0.1 respectively. If the blocks begin to slide down the plane simultaneously, calculate the time and distance travelled by each block before collision.</p> 	8	Apply	5
2.C	<p>Three spherical balls of mass 2 kg, 6 kg and 12 kg are moving in the same direction with velocities 12 m/s, 4 m/s and 2 m/s respectively. If the ball of mass 2 kg impinges with the ball of mass 6 kg which in turn impinges with the ball of mass 12 kg, prove that the balls of mass 2 kg and 6 kg will be brought to rest by the impacts. Assume the balls to be perfectly elastic.</p> 	8	Apply	5
2.D	<p>A gun of mass 3000 kg fires horizontally a shell of mass 50 kg with a velocity of 3000 m/s. What is the velocity with which the gun will recoil? Also find the uniform force required to stop the gun in 0.6m. In how much time will it stop?</p>	8	Apply	5

SHRI SHANKARACHARYA INSTITUTE OF PROFESSIONAL MANAGEMENT AND TECHNOLOGY		
DEPARTMENT OF MECHANICAL ENGINEERING		
Class Test – II	Session- 2022-23	Month- February
Sem- 3 <sup>rd</sup>	Subject- Materials Science	
Code - B037315(037)	Time Allowed: 2hours	Max Marks: 40
<b>Note: - Note: - Attempt all question. Parts (a) are compulsory of each question. Solve any two parts from (b), (c) and (d) of each question.</b>		

Q. No	Questions	Marks	Levels of Bloom's taxonomy	CO
<b>Part-A</b>				
1.A	What do you mean by Nucleation?	4	Understanding	CO1
1.B	Explain homogeneous and heterogeneous nucleation.	8	Understanding	CO1
1.C	Discuss the metal ingot structure having dendritic gains with a neat sketch.	8	Understanding	CO1
1.D	Draw and explain iron-iron carbide phase diagram and show its important points.	8	Understanding	CO2

<b>Part-B</b>				
2.A	What is Lever rule?	4	Understanding	CO1
2.B	Explain the following: (a) Gibb's phase rule (b) Hume Rothery's rule	8	Understanding	CO1
2.C	Explain T-T-T curve with neat sketch. What information is made available by this curve that was lacking in Fe-C diagram?	8	Understanding	CO1
2.D	Write short notes on: a) Eutectic reaction b) Eutectoid reaction c) Peritectic reaction	8	Understanding	CO1



## Shri Shankaracharya Institute of Professional Management & Technology

Class Test-II Session-July-Dec.2022

Sem-3<sup>rd</sup> Branch-Mechanical

Subject-Mathematics III Code-B000311(014)

Time Allowed: 2 hrs Max Marks: 40

Note: - Part A is compulsory and attempt any two parts from B, C & D.

Q.N	Questions	Marks	Levels of Bloom's taxonomy	COs														
<b>Unit IV</b>																		
A.	From the following table, estimate the number of students who obtained marks between 40 and 45. <table style="margin-left: 20px; border-collapse: collapse;"> <tr> <td>Marks:</td> <td>30-40</td> <td>40-50</td> <td>50-60</td> <td>60-70</td> <td>70-80</td> </tr> <tr> <td>No. of students:</td> <td>31</td> <td>42</td> <td>51</td> <td>35</td> <td>31</td> </tr> </table>	Marks:	30-40	40-50	50-60	60-70	70-80	No. of students:	31	42	51	35	31	[4]	Applying	CO4		
Marks:	30-40	40-50	50-60	60-70	70-80													
No. of students:	31	42	51	35	31													
B.	Use Stirling's and Bessels formula to find $y(25)$ given, $y_{20} = 2854, y_{24} = 3162, y_{28} = 3544, y_{32} = 3992$ .	[8]	Applying	CO4														
C.	Using Newton's divide difference formula, evaluate $f(9)$ & $f(15)$ , given <table style="margin-left: 20px; border-collapse: collapse;"> <tr> <td><math>x</math> :</td> <td>4</td> <td>5</td> <td>7</td> <td>10</td> <td>11</td> <td>13</td> </tr> <tr> <td><math>f(x)</math> :</td> <td>48</td> <td>100</td> <td>294</td> <td>900</td> <td>1210</td> <td>2028</td> </tr> </table>	$x$ :	4	5	7	10	11	13	$f(x)$ :	48	100	294	900	1210	2028	[8]	Applying	CO4
$x$ :	4	5	7	10	11	13												
$f(x)$ :	48	100	294	900	1210	2028												
D.	Find $f(x)$ using Lagrange's interpolation formula, as a polynomial of $x$ if <table style="margin-left: 20px; border-collapse: collapse;"> <tr> <td><math>x</math> :</td> <td>0</td> <td>1</td> <td>2</td> <td>5</td> </tr> <tr> <td><math>f(x)</math> :</td> <td>2</td> <td>3</td> <td>12</td> <td>147</td> </tr> </table> Hence find $f(3)$ .	$x$ :	0	1	2	5	$f(x)$ :	2	3	12	147	[8]	Applying	CO4				
$x$ :	0	1	2	5														
$f(x)$ :	2	3	12	147														
<b>Unit V</b>																		
A.	Using Taylor's series, find the solution of the differential equation, $xy' = x - y, y(2) = 2$ at $x = 2.1$ correct to five decimal places.	[4]	Applying	CO5														
B.	Solve the following differential equation by modified Euler's method $\frac{dy}{dx} = \log(x + y), y(0) = 1$ at $x = 0.2$ and $x = 0.5$ with $h = 0.2$ .	[8]	Applying	CO5														
C.	Apply Runge-Kutta method of fourth order to approximate the value of $y$ at $x = 0.2$ correct to 4 decimal places in steps of	[8]	Applying															

	0.1 if $\frac{dy}{dx} = y^2 + x, y(0)=1.$			CO5
D.	Use milne's predictor corrector method and find $y(0.4)$ given that $\frac{dy}{dx} = \frac{1}{2}(1+x^2)y^2$ and $y(0) = 1, y(0.1) = 1.06, y(0.2) = 1.12, y(0.3) = 1.21.$	[8]	Applying	CO5