SHRI SHANKARACHARYA INSTITUTE OF PROFESSIONAL MANAGEMENT AND TECHNOLOGY, RAIPUR (C.G.)

DEPARTMENT OF MECHANICAL ENGINEERING

Class Test – II	Session- Jan-June, 2023	Month- June, 2023
Semester - 4th	Subject- Applied Thermodynamics	
Code – B037411(037)	Time Allowed: 2 Hours	Max Marks: 40

Note: - Part A is compulsory, from other parts B, C and D, 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	Define Volumetric Efficiency of a compressor . Also, Explain the utility of compressed air.	4	U	2
1.B	Explain the principle, construction and working of Single acting reciprocating compressor.	8	U	2
1.C	A single acting reciprocating compressor with Bore dia = 15 cm Stroke length = 12 cm Suction pressure = 1 Bar Discharge pressure = 6 Bar Suction temperature = 20 °C Discharge temperature = 177 °C Speed of machine = 800 RPM Shaft power = 6 kW Mass of air delivered = 1.6 kg/min Calculate: - (a) Volumetric Efficiency (b) Indicated power (c) Mechanical Efficiency (d) Isothermal Efficiency	8	A	2
1.D	Derive the expression for the power required to drive the single stage reciprocating compressor.	8	A	2

	Question – 2			
2.A	Describe the different operations of Rankine cycle with T-S diagram.	4	U	3
2.B	Steam at a pressure of 15 bar and 250°C is expanded through a turbine at first to a pressure of 4 bar. It is then reheated at constant pressure to the initial temperature of 250°C and is finally expanded to 0.1 bar. Using Mollier chart, estimate the work done per kg of steam flowing through the turbine and amount of heat supplied during the process of reheat. Compare the work output when the expansion is direct from 15 bar to 0.1 bar without any reheat. Assume all expansion processes to be isentropic.	8	A	3
2.C	A simple Rankine cycle works between pressures 28 bar and 0.06 bar, the initial condition of steam being dry saturated. Calculate the cycle efficiency, work ratio and specific steam consumption.	8	A	3
2.D	Explain with a neat diagram the working of a Binary vapour cycle.	8	A	3

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DEPARTMENT OF MECHANICAL ENGINEERING

Class Test – II	Session- Jan-June 2023	Month- June 2023
Sem- 4th	Subject- Fluid Mechanics	
Code - B037412(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			
1.A	Write Short Notes On Types of Flow.	4	Remember	2
1.B	Derive the Generalized Continuity equation and deduce from it the continuity equation for two- and one-dimensional frictionless flow.	8	Understanding	2
1.C	(a) The velocity distribution for a three dimensional flow is $$u = a + by - cz$$ $$v = d - bx - ez$$ $$w = f + cx - ey$$ Where a,b,c,e and f are arbitrary constants. Show that these are the velocity components of a fluid motion. (b) Does these velocity components represent irrotational flow? If not determine the vorticity and rotation.	8	Applying	2
1.D	Check whether the flow defined by the stream function $\Psi = 2xy$, is irrotational? If so, determine the corresponding velocity potential function.	8	Applying	2

	Unit – II			
2.A	State Buckingham's π-theorem and Dimensional Analysis.	4	Remember	5
2.B	The efficiency η of a fan depends on density ϱ, dynamic viscosity µ of the fluid, angular velocity ω, diameter D of the rotor and the discharge Q. Express η in terms of dimensionless parameters.	8	Understanding	5
2.C	The pressure difference Δp in a pipe of diameter D and length l due to turbulent flow depends on the velocity V, viscosity µ, density ϱ and roughness k. Using Buckingham's π-theorem, obtain an expression for Δp.	8	Applying	5
2.D	The ratio of length of a sub-marine and its model is 30:1. The speed of sub-marine(prototype) is 10m/s. the model is to be tested in a wind tunnel. Find the speed of air in wind tunnel. Also determine the ratio of the drag(resistance) between the model and its prototype. Take the value of kinematic viscosities for sea water and air as 0.012 strokes and 0.016 stokes respectively. The density for seawater and air is given as 1030 $\frac{kg}{m^3}$ and 1.24 $\frac{kg}{m^3}$ respectively.	8	Applying	5

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DEPARTMENT OF MECHANICAL ENGINEERING
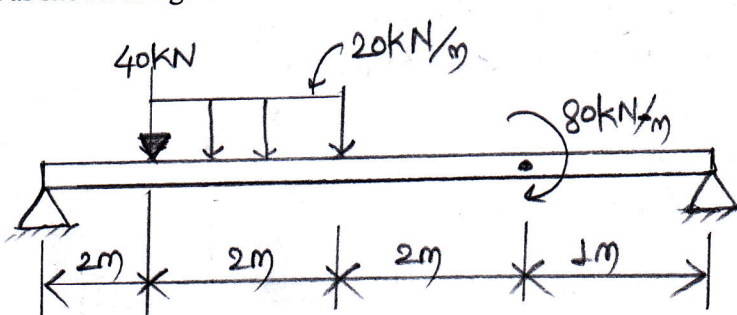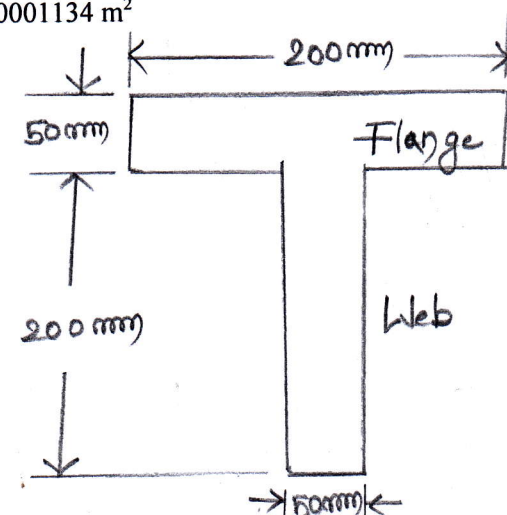
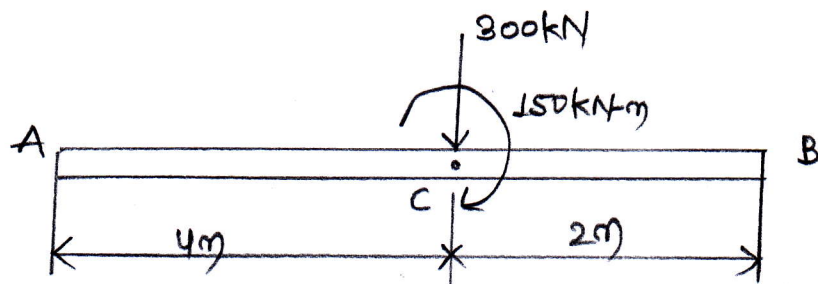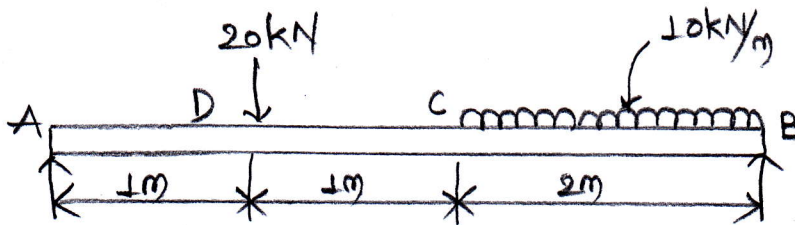| Class Test – II	Session-2022-23	Month- June
Sem- 4th	Subject- Strength of Materials	
Code – B037413(037)	Time Allowed: 2 Hrs	Max Marks: 40

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
	Unit – I			
1.A	What is pure bending? Analyze and write the types of loads and beams.	4	Analyzing	CO1
1.B	Prove that, $\dfrac{M}{I} = \dfrac{\sigma}{y} = \dfrac{E}{R}$	8	Applying	CO2
1.C	Draw shear force and bending moment diagram for the simply supported beam as shown in figure:	8	Applying	CO2
1.D	T-shaped cross section of a beam shown in fig. is subjected to a vertical shear force of 100 kN. Calculate the shear stress at the neutral axis and at the junction of the web and the flange. Moment of Inertia about the neutral axis is 0.0001134 m^2	8	Applying	CO2

	Unit – II			
2.A	Analyze and explain double integration method, Macaulay's method, and moment area method?	4	Analyzing	CO1
2.B	A beam AB of 4 meters span is simply supported at the ends and is loaded as shown in fig. Determine: (1) Deflection at C (2) Maximum deflection, and (3) Slope at the end A	8	Applying	CO2
2.C	A cantilever of 3 metres length and of uniform rectangular cross section 150 mm wide and 300 mm deep is loaded with a 30 kN load at its free end. In addition to this it carries a uniformly distributed load of 20 kN per metre run over its entire length, Calculate: (i) The maximum slope and maximum deflection; (ii) The slope and deflection at 2 metres from the fixed end. Take E=210 GN/m²	8	Applying	CO2
2.D	A beam 6 metres long is loaded as shown in the Figure. If the flexural rigidity (EI) of the beam is 8×10^4 kNm² find the deflection at point C.	8	Applying	CO2

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SHRI SHANKARACHARYA INSTITUTE OF PROFESSIONAL MANAGEMENT AND TECHNOLOGY

DEPARTMENT OF MECHANICAL ENGINEERING

Class Test – II	Session-2022-23		Month- June
Sem- 4th	Subject- Manufacturing Process		
Code – B037414(037)	Time Allowed: 2 Hrs		Max Marks: 40

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
	Unit – I			
1.A	Analyze Write short notes on source of energy for welding process.	4	Analyzing	CO2
1.B	Define welding joints and also explain its types.	8	Remember	CO2
1.C	Explain principle of arc welding. Give a list of equipments required for electric arc welding.	8	Remember	CO2
1.D	Discuss the TIG welding process.	8	Remember	CO2

	Unit – II			
2.A	Analyze and write the advantages and disadvantages of Resistance welding process.	4	Analyzing	CO3
2.B	Describe the projection welding process.	8	Remember	CO3
2.C	Explain the process of thermit welding with regard to its working principle, equipment advantages field of operation.	8	Remember	CO3
2.D	Describe the friction welding and its applications, advantages and disadvantages.	8	Remember	CO3

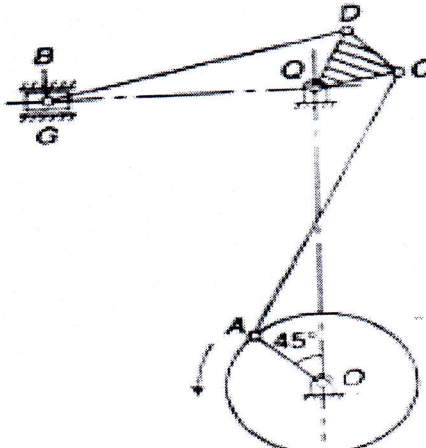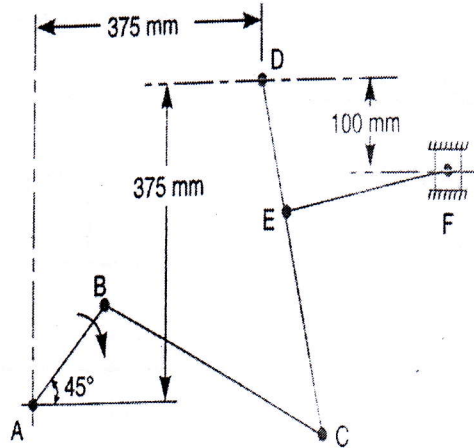| Class Test: II	Session: January- June, 2023	Month: June, 2023
Semester: IV	Subject: Kinematics of Machines	
Code: B037415(037)	Time Allowed: 2 Hours	Max Marks: 40

Note: - Part A of Question 1 and Question 2 is compulsory. Attempt any Two Parts out of B, C and D in Question 1 and Question 2.

Q. No	Questions	Marks	Levels of Bloom's Taxonomy	CO
	Question 1			
1.A	Differentiate between higher pair and lower pair with suitable examples.	4	Understand	CO1
1.B	Analyze the difference between two different types of quick return motion mechanism with diagrams.	8	Analyze	CO1
1.C	The length of various link of mechanism as shown in fig. 1 (c) are as follow OA = 150 mm; AC = 600 mm; CQ = QD= 145 mm; CD = 125 mm; BD=500 mm and OQ= 625 mm. Draw the space and velocity diagrams. Fig. 1 (C)	8	Apply	CO1

1.D	The mechanism shown has dimensions of links as follows: AB=DE=150mm, BC=CD=450mm, EF=375mm. Crank AB makes an angle of 45^0 with the horizontal and rotates about A in clockwise direction at a uniform speed of 120rpm. Lever DC oscillates about fixed point D which is connected to AB by a coupler BC. The block F moves in horizontal guides, being driven by link EF. Draw velocity diagram and find: (i) Velocity of block F (ii) Angular velocity of DC.	8	Apply	CO1

Question 2				
2.A	(i) For a cam and follower mechanism define pressure angle and pitch curve (ii) What are the applications of cam and follower mechanism?	4	Remember	CO3
2.B	Classify cams with suitable diagrams.	8	Understand	CO3
2.C	Draw the profile of a cam operating a roller reciprocating follower with following data: minimum radius of cam= 25mm, lift= 30mm, roller diameter=15mm, The cam lifts the follower for 120^0 with SHM followed by a dwell period of 30^0. Then the follower lowers down during 150^0 of cam rotation with uniform acceleration and deceleration followed by a dwell period. If the cam rotates at a uniform speed of 150rpm, calculate the maximum velocity and acceleration of the follower during the descent period.	8	Apply	CO3
2.D	Draw the displacement, velocity and acceleration diagrams when the follower moves with simple harmonic motion and derive relations for maximum velocity and maximum acceleration during ascent and descent of follower.	8	Apply	CO3

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