

SHRI SHANKARACHARYA INSTITUTE OF PROFESSIONAL MANAGEMENT AND TECHNOLOGY

DEPARTMENT OF MECHANICAL ENGINEERING

Class Test – I

Session- July to Jan, 2023

Month- November

Sem- 7th

Subject- DESIGN OF TRANSMISSION SYSTEM

Code -D037711(037)

Time Allowed: 2 hrs

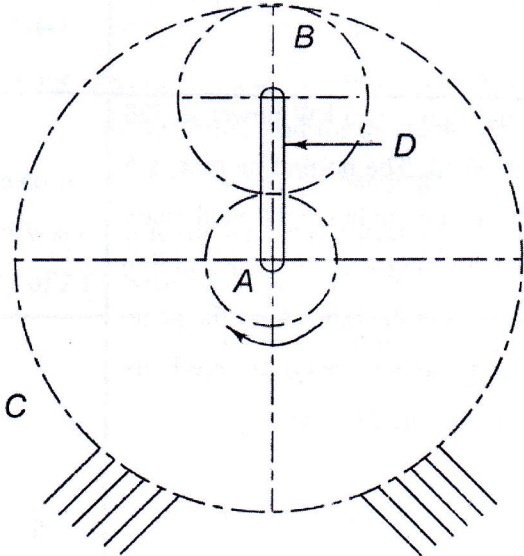
Max Marks: 40

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

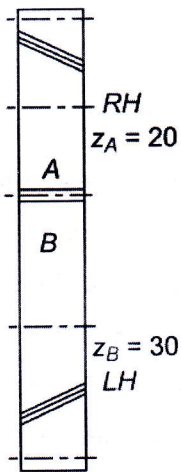
1.A	What is gear train? Analyze and classify gear train.	4	Analyze	CO1
-----	--	---	---------	-----

1.B	<p>A planetary gear train is shown in Figure. The sun gear A rotates in a clockwise direction and transmits 5 kW of power at 1440 rpm to the gear train. The number of teeth on the sun gear A, the planet gear B and the fixed ring gear C are 30, 60 and 150 respectively. The module is 4 mm and the pressure angle is 20°. Draw a free-body diagram of forces and calculate the torque that the arm D can deliver to its output shaft.</p> 	8	Applying	CO2
-----	--	---	----------	-----

1.C	<p>It is required to design a pair of spur gears with 20° full-depth involute teeth based on the Lewis equation. The velocity factor is to be used to account for dynamic load. The pinion shaft is connected to a 10 kW, 1440 rpm motor. The starting torque of the motor is 150% of the rated torque. The speed reduction is 4 : 1. The pinion as well as the gear is made of plain carbon steel 40C8 (Sut = 600 N/mm²). The factor of safety can be taken as 1.5. Design the gears, specify their dimensions and suggest suitable surface hardness for the gears.</p>	8	Applying	CO1
-----	---	---	----------	-----

1.D	<p>It is required to design a two-stage spur gear reduction unit with 20° full-depth involute teeth. The input shaft rotates at 1440 rpm and receives 10 kW power through a flexible coupling. The speed of the output shaft should be approximately 180 rpm. The gears are made of plain carbon steel 45C8 ($S_{ut} = 700 \text{ N/mm}^2$) and heat-treated to a surface hardness of 340 BHN. The gears are to be machined to the requirement, of Grade 6. The service factor can be taken as 1.5.</p> <p>(i) Assuming that the dynamic load to be proportional to the pitch-line velocity, estimate the required value of the module. The factor of safety is 1.5.</p> <p>(ii) Select the first preference value of the module and determine the correct value of factor of safety for bending, using Buckingham's equation.</p> <p>(iii) Determine the factor of safety against pitting.</p> <p>(iv) Give a list of gear dimensions.</p>	8	Applying	CO1
-----	--	---	----------	-----

Unit – II

2.A	Analyze the relation among axial force, tangential force and radial force of a helical gear.	4	Analyze	CO2
2.B	<p>A pair of parallel helical gears is shown in Figure. A 5 kW power at 720 rpm is supplied to the pinion A through its shaft. The normal module is 5 mm and the normal pressure angle is 20°. The pinion has right-hand teeth, while the gear has left-hand teeth. The helix angle is 30°. The pinion rotates in the clockwise direction when seen from the left side of the page. Determine the components of the tooth force and draw a free-body diagram showing the forces acting on the pinion and the gear.</p> 	8	Applying	CO1

2.C	<p>A pair of parallel helical gears consists of a 20 teeth pinion meshing with a 100 teeth gear. The pinion rotates at 720 rpm. The normal pressure angle is 20°, while the helix angle is 25°. The face width is 40 mm and the normal module is 4 mm. The pinion as well as the gear is made of steel 40C8 ($S_{ut} = 600 \text{ N/mm}^2$) and heat treated to a surface hardness of 300 BHN. The service factor and the factor of safety are 1.5 and 2 respectively. Assume that the velocity factor accounts for the dynamic load and calculate the power transmitting capacity of gears.</p>	8	Applying	CO3
2.D	<p>A pair of parallel helical gears consists of 24 teeth pinion rotating at 5000 rpm and supplying 2.5 kW power to a gear. The speed reduction is 4 : 1. The normal pressure angle and helix angle are 20° and 23° respectively. Both gears are made of hardened steel ($S_{ut} = 750 \text{ N/mm}^2$). The service factor and the factor of safety are 1.5 and 2 respectively. The gears are finished to meet the accuracy of Grade 4.</p> <p>(i) In the initial stages of gear design, assume that the velocity factor accounts for the dynamic load and that the face width is ten times the normal module. Assuming the pitch line velocity to be 10 m/s, estimate the normal module.</p> <p>(ii) Select the first preference value of the normal module and calculate the main dimensions of the gears.</p> <p>(iii) Determine the dynamic load using Buckingham's equation and find out the effective load for the above dimensions. What is the correct factor of safety for bending?</p> <p>(iv) Specify surface hardness for the gears, assuming a factor of safety of 2 for wear consideration.</p>	8	Applying	CO2

SHRI SHANKARACHARYA INSTITUTE OF PROFESSIONAL MANAGEMENT AND TECHNOLOGY

DEPARTMENT OF MECHANICAL ENGINEERING

Class Test – I	Session- July – Dec 2023	Month- October
Sem- 7 th	Subject- Machine Tool Technology	
Code – D037731(37)	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	Show the geometry of single point cutting tool by ASA.	4	Remembering	1
1.B	With the help of neat sketch describe the different angles of metal cutting.	8	Understanding	1
1.C	What is chip formation and how many types of chips are formed during metal cutting? Explain them.	8	Understanding	1
1.D	In an orthogonal cutting test with a tool of rake angle 10 degree, the following observations were made : Chip thickness ratio = 0.3 Horizontal component of the cutting force = 1290 N Vertical component of the cutting force = 1650 N Find:- a) Shear Plane Angle b) Coefficient of friction c) Friction angle.	8	Applying	1

Unit – II				
2.A	Define the term machinability.	4	Remembering	2
2.B	Discuss the different mechanisms of tool wear with neat and clean sketch.	8	Understanding	2
2.C	What are cutting fluids? Explain the functions and application of cutting fluid.	8	Remembering	2
2.D	Write the short notes on :- i) Crater Wear of tool ii) Flank Wear of tool iii) Tool life	8	Understanding	2

SHRI SHANKARACHARYA INSTITUTE OF PROFESSIONAL MANAGEMENT AND TECHNOLOGY

DEPARTMENT OF MECHANICAL ENGINEERING

Class Test – I	Session- July – Dec 2023	Month- October
Sem- 7 th	Subject- Automation in Manufacturing	
Code - D037713(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	Define the term Automation.	4	Remembering	1
1.B	Explain the basic elements of automated system.	8	Understanding	1
1.C	What are the different types of automation? Discuss them briefly.	8	Understanding	1
1.D	What is automated material handling? Briefly explain advantages.	8	Understanding	1

Unit – II				
2.A	Give reasons for implementing CAD.	4	Understanding	2
2.B	Explain in brief CAD system hardware and software for graphic system.	8	Understanding	2
2.C	What is database management? What are the features of database management?	8	Understanding	2
2.D	What is meant by product data management? Why it is important in CAD CAM integration.	8	Understanding	2

SHRI SHANKARACHARYA INSTITUTE OF PROFESSIONAL MANAGEMENT AND TECHNOLOGY

DEPARTMENT OF MECHANICAL ENGINEERING

Class Test – I	Session- July – Dec 2023	Month- October
Sem- 7 th	Subject- Technology Management	
Code –DOOO706 (076)	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	Why co-operation between government and industry is important in case of developing nations. Write any 2 points in support of answer	4	Understanding	CO-1
1.B	Explain the importance of Technology management in India in present scenario.	8	Understanding	CO-1
1.C	Explain in brief concept of management of Technology & give classification of Technology.	8	Understanding	CO-1
1.D	Discuss the growth of technology in concern with Indian industries	8	Applying	CO-1

Unit – II				
Q. No	Questions	Marks	Levels of Bloom's taxonomy	CO
2.A	Define Productivity. How it improves standard of living	4	Understanding	CO-2
2.B	Explain the following: i) Role of government in Technology Management ii) Impact of Technology on society	8	Understanding	CO-1
2.C	Being a innovation manager in product based company explain the characteristics of the working environment you will provide at your company to enhance the innovation	8	Applying	CO-2
2.D	Explain the difference between the revolutionary and evolutionary innovations with a suitable example giving the salient time lines	8	Applying	CO-2

SHRI SHANKARACHARYA INSTITUTE OF PROFESSIONAL MANAGEMENT AND TECHNOLOGY

DEPARTMENT OF MECHANICAL ENGINEERING

Class Test – I	Session- July to December 2023	Month- October, 2023
Sem- 7 th	Subject- RAC	
Subject Code – D037712(037)	Time Allowed: 2hr.	Max Marks: 40

**Note: - 1. first Question (A) from both units is compulsory.
2. Solve any two from B,C,D of each unit.**

Q. No	Questions	Marks	Levels of Bloom's taxonomy	CO
-------	-----------	-------	----------------------------	----

Unit – I

1.A	Define terms Refrigerator and Heat Pump	4	R	1																									
1.B	Explain Actual Vapor Compression cycle with T-S Plot.	8	U	1																									
1.C	<p>A vapor compression refrigeration machine, with Freon-12 as a refrigerant, has a capacity of 12 tons of refrigeration operating between a -28°C and 26°C. The refrigerant is subcooled by 40°C before entering the expansion valve and the vapor is superheated by 5°C before leaving the evaporator. The machine has a six-cylinder single-acting compressor with stroke equal to 1.25 times the bore. It has a clearance of 3% of the stroke volume, determine: 1. Theoretical power required; 2. C.O.P.; 3. Volumetric efficiency; 4. Bore and stroke of cylinder. The speed of compressor is 1000 r.p.m. The following properties of Freon-12 may be used.</p> <table border="1"> <thead> <tr> <th rowspan="2">Sat.temp $^{\circ}\text{C}$</th> <th rowspan="2">Pressure, bar</th> <th rowspan="2">Sp.Volume of vapor m^3/kg</th> <th colspan="2">Enthalpy, KJ/Kg</th> <th colspan="2">Entropy, KJ/Kg K</th> </tr> <tr> <th>Liquid</th> <th>Vapor</th> <th>Liquid</th> <th>Vapor</th> </tr> </thead> <tbody> <tr> <td>-28</td> <td>1.093</td> <td>0.1475</td> <td>10.64</td> <td>175.11</td> <td>0.0444</td> <td>0.7153</td> </tr> <tr> <td>26</td> <td>6.697</td> <td>0.0262</td> <td>60.67</td> <td>198.11</td> <td>0.2271</td> <td>0.6865</td> </tr> </tbody> </table> <p>Specific heat of liquid refrigerant = 0.963KJ/Kg K and specific heat of superheated vapor = 0.615KJ/Kg K.</p>	Sat.temp $^{\circ}\text{C}$	Pressure, bar	Sp.Volume of vapor m^3/kg	Enthalpy, KJ/Kg		Entropy, KJ/Kg K		Liquid	Vapor	Liquid	Vapor	-28	1.093	0.1475	10.64	175.11	0.0444	0.7153	26	6.697	0.0262	60.67	198.11	0.2271	0.6865	8	Ap	1
Sat.temp $^{\circ}\text{C}$	Pressure, bar				Sp.Volume of vapor m^3/kg	Enthalpy, KJ/Kg		Entropy, KJ/Kg K																					
		Liquid	Vapor	Liquid		Vapor																							
-28	1.093	0.1475	10.64	175.11	0.0444	0.7153																							
26	6.697	0.0262	60.67	198.11	0.2271	0.6865																							
1.D	<p>A simple saturation cycle using R-12 is designed for taking a load of 10 tonnes. The refrigerator and ambient temperature are -0°C and 30°C respectively. A minimum temperature difference of 5°C is required in the evaporator and condenser for heat transfer. Find 1. Mass flow rate through the system; 2. Power required in kW; 3. C.O.P.; and 4. Cylinder dimensions assuming $L/D = 1.2$, for a single cylinder, single acting compressor if it runs at 300 r.p.m. with volumetric efficiency of 90%.</p>	8	Ap	1																									

P.T.O.

Unit - II

2.A	Explain the Properties of an Ideal Refrigerant.	4	R	3
2.B	Explain the Principle and Working three-fluid absorption system.	8	R	3
2.C	Derive an expression for COP of a Vapor absorption Refrigeration system in terms of Generator Temperature, Condenser temperature and Evaporator temperature.	8	U	3
2.D	In an absorption type refrigerator, the heat is supplied to NH ₃ generator by condensing steam at 2 bar and 90% dry. The temperature in the refrigerator is to be maintained at -5°C. Find the maximum C.O.P. possible. If the refrigeration load is 20 tones and actual C.O.P. is 70% of maximum C.O.P. Find the mass of steam required per hour. Take temperature of atmosphere as 30°C	8	Ap	3

2.179

19/10/23/5-I