

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

**DEPARTMENT OF MECHANICAL ENGINEERING**

Class Test – II

Session- July to Jan, 2023

Month- December

Sem- 7<sup>th</sup>

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
<b>Unit – I</b>				
1.A	Explain Nipping and derive the relation for Nipping of leaf spring.	4	Analyze	CO3
1.B	A semi-elliptical leaf spring consists of two extra full- length leaves and ten graduated length leaves including the master leaf. The centre-to-centre distance between the two eyes of spring is 1.2 m. The leaves are made of steel 55 Si 2 Mo 90 ( $S_y = 1500 \text{ N/mm}^2$ and $E = 207000 \text{ N/mm}^2$ ) and the factor of safety is 2.5. The spring is to be designed for a maximum force of 30 kN. The leaves are prestressed so as to equalize stresses in all leaves. Determine cross section of the spring and deflection at the end of spring.	8	Applying	CO3
1.C	It is required to design a helical compression spring subjected to a maximum force of 1250 N. The deflection of the spring corresponding to the maximum force should be approximately 30 mm. The spring index can be taken as 6. The spring is made of patented and cold-drawn steel wire. The ultimate tensile strength and modulus of rigidity of the spring material are 1090 and 81370 $\text{N/mm}^2$ respectively. The permissible shear stress for the spring wire should be taken as 50% of the ultimate tensile strength. Design the spring and calculate: (i) wire diameter; (ii) mean coil diameter; (iii) number of active coils; (iv) total number of coils; (v) free length of the spring; and pitch of the coil.	8	Applying	CO3
1.D	A helical compression spring is made of circular wire, is subjected to an axial force that varies from 2.5 kN to 3.5 kN. The deflection of the spring over this range of the load is approx 5 mm. The spring index can be taken as 5. The spring has square and ground ends. The spring is made of patented and cold drawn steel wire with $S_{ut}=1050 \text{ N/mm}^2$ and modulus of rigidity of 81370 $\text{N/mm}^2$ . The permissible shear stress for the spring wire should be taken as 50% of the ultimate tensile strength. Design the spring.	8	Applying	CO3

**P.T.O.**

**Unit – II**

2.A	Analyze and explain hydrostatic and hydrodynamic lubrication in bearing	4	Analyzing	CO4															
2.B	<p>A Single –row deep groove ball bearing has a dynamic load capacity of 40500 N and operates on the following work cycle:</p> <p>I. Radial load of 500 N at 500 rpm for 25% of the time;</p> <p>II. Radial load of 10000 N at 700 rpm for 50% of the time; and</p> <p>III. Radial load of 7000 N at 400 rpm for the remaining 25% of the time.</p> <p>Calculate the expected life of the bearing in hours.</p>	8	Applying	CO4															
2.C	<p>A single-row deep groove ball bearing is subjected to a radial force of 8 kN and a thrust force of 3 kN. The values of X and Y factors are 0.56 and 1.5 respectively. The shaft rotates at 1200 rpm. The minimum acceptable diameter of the shaft is 75 mm. Select a suitable ball bearing for this application.</p>	8	Applying	CO4															
2.D	<p>A single row deep groove ball bearing is subjected to a 30 seconds work cycle that consists of the following two parts:</p> <table style="margin-left: auto; margin-right: auto;"> <thead> <tr> <th></th> <th>Part I</th> <th>Part II</th> </tr> </thead> <tbody> <tr> <td><b>Duration (Sec.)</b></td> <td>10</td> <td>20</td> </tr> <tr> <td><b>Radial Load (kN)</b></td> <td>45</td> <td>15</td> </tr> <tr> <td><b>Axial load (kN)</b></td> <td>12.5</td> <td>6.25</td> </tr> <tr> <td><b>Speed (RPM)</b></td> <td>720</td> <td>1440</td> </tr> </tbody> </table> <p>The static and dynamic load capacities of ball bearings are 50 kN and 68 kN respectively: Calculate the expected life of the bearing in hours.</p>		Part I	Part II	<b>Duration (Sec.)</b>	10	20	<b>Radial Load (kN)</b>	45	15	<b>Axial load (kN)</b>	12.5	6.25	<b>Speed (RPM)</b>	720	1440	8	Applying	CO4
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**SHRI SHANKARACHARYA INSTITUTE OF PROFESSIONAL MANAGEMENT AND TECHNOLOGY**

**DEPARTMENT OF MECHANICAL ENGINEERING**

Class Test – II

Session- July – December 2023

Month- December

Sem- 7<sup>th</sup>

Subject- Machine Tool Technology

Code –D037731(037)

Time Allowed: 2 hrs

Max Marks: 40

Note: - 1. Students are required to focus on question and marks columns only.

2. In Unit III & IV, Question A is compulsory and attempt any two from B, C & D.

Q. No	Questions	Marks	Levels of Bloom's taxonomy	CO
<b>Unit – III</b>				
1.A	What is slideway and guidway?	4	Remembering	3
1.B	Discuss the common types of guideways used and what are the basic requirements of guideways?	8	Understanding	3
1.C	Analysis and explain the forces acting on the bed under the Headstock and Tailstock.	8	Understanding	3
1.D	Enlist basic features of a machine tool.	8	Remembering	3

**Unit – IV**

2.A	Define machine tool drive. Explain ray diagram.	4	Remembering	4
2.B	How can you change speed of a gear box?	8	Understanding	4
2.C	State the basic rules for layout of gear boxes having sliding clusters.	8	Remembering	4
2.D	A solid steel gear having 24 teeth is to transmit a maximum torque of 17 kg-m. Determine the module and width of gear.	8	Applying	4

**SHRI SHANKARACHARYA INSTITUTE OF PROFESSIONAL MANAGEMENT AND TECHNOLOGY****DEPARTMENT OF MECHANICAL ENGINEERING**

Class Test – II

Session- July – Dec 2023

Month- December

Sem- 7<sup>th</sup>

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 III& IV, Question A is compulsory and attempt any two from B, C & D.**

Q. No	Questions	Marks	Levels of Bloom's taxonomy	CO
<b>Unit – III</b>				
1.A	Briefly explain Micro controller.	4	Remembering	3
1.B	Describe Adaptive control system with its types.	8	Understanding	3
1.C	Briefly explain the principle and function that are expected to be served by numerical control in machine tools.	8	Understanding	3
1.D	Describe application of PLC in control drives and power systems.	8	Applying	3

**Unit – IV**

2.A	Describe Low Cost Automation.	4	Understanding	4
2.B	What are avenues of low cost automation?	8	Understanding	4
2.C	Explain low cost automation for a case study on pneumatic grippers for pick and place type.	8	Applying	4
2.D	What are the important pneumatic components used in automated system? Discuss briefly.	8	Understanding	4

SHRI SHANKARACHARYA INSTITUTE OF PROFESSIONAL MANAGEMENT AND TECHNOLOGY				
DEPARTMENT OF MECHANICAL ENGINEERING				
Class Test – II	Session- July to December 2023	Month- December		
Semester- 7 <sup>th</sup>	Subject- Technology Management			
Code – D000706 (076)	Time Allowed: 2 Hrs	Max Marks: 40		
<i>Note: - 1) Part 'A' is compulsory in both questions 2) Attempt any two questions from part 'B', 'C', and 'D'</i>				
Q. No	Questions	Marks	Levels of Bloom's taxonomy	CO
Unit – III				
1.A	Who is “technology Champion”?	4	Understanding	CO 3
1.B	Define and explain the technology life cycle curve.	8	Understanding	CO 3
1.C	Explain the process of technology diffusion.	8	Understanding	CO 3
1.D	Comment on the type of competition in the mature phase of technology.	8	Applying	CO 3

Unit – IV				
Q. No	Questions	Marks	Levels of Bloom's taxonomy	CO
2.A	What are external and internal factors in technology intelligence?	4	Understanding	CO 4
2.B	What is meant by technology forecasting? Explain the difference between normative and exploratory methods.	8	Understanding	CO 4
2.C	Explain the Ford model of technology strategy formulation.	8	Understanding	CO 4
2.D	Explain the technology intelligence process with an example.	8	Understanding	CO 4

## SHRI SHANKARACHARYA INSTITUTE OF PROFESSIONAL MANAGEMENT AND TECHNOLOGY

## DEPARTMENT OF MECHANICAL ENGINEERING

Class Test – II

Session- 2023-24

Month- December, 2023

Sem- 7<sup>th</sup>

Subject- RAC

Subject Code –  
D037712(037)

Time Allowed: 2hr.

Max Marks: 40

**Note: - 1. Firstpart (A) from both questionsis compulsory.****2. Solve any two from B,C,D of eachquestion.****3.Students are required to focus on question and marks column only.**

Q. No	Questions	Marks	Levels of Bloom's taxonomy	CO
<b>Question 1</b>				
1.A	Explain any four parameters which affect the Optimum Effective Temperature.	4	Remembering	4
1.B	The saturated air leaving the cooling section of an air conditioning system at 14°C at the rate of 50 m <sup>3</sup> /min is mixed adiabatically with the outside air at 32°C and 60% relative humidity at a rate of 20 m <sup>3</sup> /min. Assuming that the mixing process occurs at a pressure of 1 atmosphere, determine the specific humidity, relative humidity, dry bulb temperature and the volume flow rate of the mixture.	8	Applying	4
1.C	A room 7m× 4m × 4 m is occupied by an air-water vapour mixture at 38 <sup>0</sup> C The atmospheric pressure is 1 bar and the relative humidity is 70%. Determine the humidity ratio, dew point, mass of dry air and mass of water vapour. If the mixture of air-water vapour is further cooled at constant pressure until the temperature is 10°C, find the amount of water vapourcondensed.	8	Applying	4
1.D	Explain Thermodynamic web bulb temperature.	8	Understan ding	4

P.T.O.

## Question 2

2.A	<p>Explain the Followings:</p> <p>(i) RSHF</p> <p>(ii) GSHF</p> <p>(iii) ERSHF</p> <p>(iv) Cooling load estimation.</p>	4	Remembering	5
2.B	<p>The following data refer to summer air conditioning of a building:</p> <p>Outside design conditions = 43°C DBT, 27°C WBT</p> <p>Inside design conditions = 25 °C DBT ,50% RH</p> <p>Room sensible heat gain = 84 000 kJ/h</p> <p>Room latent heat gain = 21000 kJ / h</p> <p>By-pass factor of the cooling coil used = 0.2</p> <p>The return air from the room is mixed with the outside air before entry to cooling coil in the ratio of 4: 1 by mass. Determine: (a) Apparatus dew point of the cooling coil; (b) Entry and exit conditions of air for cooling coil; (c) Fresh air mass flow rate; and (d) Refrigeration load on the cooling coil.</p>	8	Applying	5
2.C	<p>A conference room for seating 100 persons is to be maintained at 22°C dry bulb temperature and 60% relative humidity. The outdoor conditions are 40°C dry bulb temperature and 27°C wet bulb temperature. The various loads in the auditorium are as follows: Sensible and latent heat loads per person, 80 W and 50 W respectively; lights and fans, 15 000 W; sensible heat gain through glass, walls, ceiling etc., 15 000 W.</p> <p>The air infiltration is 20 m<sup>3</sup>/min and fresh air supply is 100 m<sup>3</sup>/min. Two-third of recirculated room air and one-third of fresh air are mixed before entering the cooling coil. The by-pass factor of the coil is 0.1.</p> <p>Determine apparatus dew point, the grand total heat load and effective room sensible heat factor.</p>	8	Applying	5
2.D	<p>Explain the working of Summer Air Conditioning system with neat sketch.</p>	8	Remembering	5