

SHRI SHANKARACHARYA INSTITUTE OF PROFESSIONAL MANAGEMENT AND TECHNOLOGY

DEPARTMENT OF MECHANICAL ENGINEERING

Class Test – II	Session- July to Jan, 2022	Month- January
Sem- 7 th	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
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Unit – I

1.A	Analyze the relation among axial force, tangential force and radial force of a helical gear.	4	Analyze	CO1
1.B	Design a pair of helical gears to transmit 10 kW at 1000 rpm of the pinion, Reduction ratio of 5 is required and helix angle is 15°. Both gears are made of 40NizCr, Mo28 steel. Give details of the drive in a tabular form.	8	Applying	CO2
1.C	Design a helical gear to transmit 75kW at 1200 rpm. Transmission ratio is 3; assume suitable material and find out stresses.	8	Applying	CO1
1.D	A pair of bevel gears, with 20° pressure angle, consists of a 20 teeth pinion meshing with a 30 teeth gear. The module is 4 mm, while the face width is 20 mm. The material for the pinion and gear is steel 50C4 ($S_{ut} = 750 \text{ N/mm}^2$). The gear teeth are lapped and ground (Class-3) and the surface hardness is 400 BHN. The pinion rotates at 500 rpm and receives 2.5 kW power from the electric motor. The starting torque of the motor is 150% of the rated torque. Determine the factor of safety against bending failure and against pitting failure.	8	Applying	CO1

Unit – II

2.A	What is function of spring, explain shot peening of spring.	4	Remembering	CO2
2.B	A Single –row deep groove ball bearing has a dynamic load capacity of 40500 N and operates on the following work cycle: I. Radial load of 500 N at 500 rpm for 25% of the time; II. Radial load of 10000 N at 700 rpm for 50% of the time; and III. Radial load of 7000 N at 400 rpm for the remaining 25% of the time.	8	Applying	CO1

	Calculate the expected life of the bearing in hours.			
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 diameter of the shaft is 75 mm and Bearing No. 6315 ($C = 112\,000\text{ N}$) is selected for this application.</p> <p>(i) Estimate the life of this bearing, with 90% reliability. (ii) Estimate the reliability for 20000 h life.</p>	8	Applying	CO3
2.D	<p>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 N/mm^2. The permissible shear stress for the spring wire should be taken as 50% of the ultimate tensile strength. Design the spring.</p>	8	Applying	CO2

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SHRI SHANKARACHARYA INSTITUTE OF PROFESSIONAL MANAGEMENT AND TECHNOLOGY

DEPARTMENT OF MECHANICAL ENGINEERING

Class Test – II	Session- July to Dec 2022	Month - Jan		
Sem- 7 th	Subject – MTT			
Code –D037731(037)	Time Allowed: 2 hrs	Max Marks: 40		
Note: Question (a) from each question is compulsory of 4marks and solve Any two question form (b), (c),(d) each of 8 marks.				
Q. No	Questions	Marks	Levels of Bloom's taxonomy	CO
Unit – IV				
A	Define ray diagram and structure diagram.	4	A	CO5
B	Explain the rules for selection of optimum ray diagram. Why is GP preferred over AP while designing speed gearbox.	8	U,A	CO6
C	Design a 6 speed gearbox having speeds ranging from 90 to 500 rpm. The speed of motor is 1440 rpm. Draw the best ray diagram and calculate the number of teeth on all the gear. Take $\phi=1.41$	8	C	CO6
D	A machine spindle is to operate on ferrous metal at 30m/min and is required to have 6 speeds. The spindle can accommodate H.S.S .cutter ranging from 10 to 60 mm diameter. Determine the following : i) Spindle speeds ii) Plot a graph between cutting velocity and cutter diameter for each spindle speed and calculate the range of cutting velocity for: i) 12mm diameter ii) 36 mm diameter cutter.	8	U	CO6
Unit – V				
A	Described machine tool maintenance.	4	U	CO8
B	Discuss the following i) Feed gear box of meander type ii) Norton gearbox	8	C	CO7
C	Explain the importance of feed gearbox in lathe. Design a feed gear box for cutting Metric threads of 12 different pitches ranging from 1.5 mm to 9.0 mm. Take pitch of lead screw = 6mm.	8	U,C	CO7
D	Described the importance of acceptance test in machine tools.	8	U	CO8

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DEPARTMENT OF MECHANICAL ENGINEERING

Class Test: II	Session: July-January 2022	Month: December
Sem- 7 th Sem	Subject: AIM	
Code – D037713(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
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Unit – III

1.A	Difference between a microprocessor and micro controller?	4	Remembering	CO1
1.B	Explain adaptive control technology?	8	Creating	CO2
1.C	What is PLC? Explain in detail?	8	Apply	CO1
1.D	Explain CNC technology? Also explain G & M codes?	8	Analyzing	CO2

Unit – IV

2.A	What is Low-cost automation?	4	Analyzing	CO2
2.B	Explain in detail considering a case study for automation of Arc Welding Process?	8	Apply	CO1
2.C	Explain the role of pneumatic systems and hydraulic systems in LCA?	8	Apply	CO3
2.D	What do you understand by batch process management?	8	Creating	CO2

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DEPARTMENT OF MECHANICAL ENGINEERING

Class Test – II	Session- 2022- 2023	Month- January
Sem- 7 th	Subject- Technology Management	
Code - D000706(076)	Time Allowed: 2 Hrs	Max Marks: 40

*Note: - 1) Part 'A' is compulsory in both questions
2) Attempt any two questions from part 'B', 'C', and 'D'*

Q. No	Questions	Marks	Levels of Bloom's taxonomy	CO
Unit – III				
1.A	Who can be a "technology Champion" in an organization?	4	U	CO 3
1.B	Explain the "S" curve for floppy disc/CD with an estimated timeline.	8	A	CO 3
1.C	What steps will you consider for technology diffusion in an innovation-based product organization	8	A	CO 3
1.D	What competition is faced when a product is in the mature stage?. Lay down the strategies for the product sales enhancement in this stage.	8	A	CO 3

Unit – IV and V

2.A	What is technology intelligence and technology audit?	4	U	CO 4
2.B	What is technology forecasting? Explain the difference between normative and exploratory methods.	8	U	CO 4
2.C	Write a brief note on GATT	8	U	CO 4
2.D	Explain the steps involved in Technology transfer from foreign nation	8	U	CO 4

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DEPARTMENT OF MECHANICAL ENGINEERING

Class Test – II

Session- July-December, 2022

Month- January, 2023

Sem- 7th

Subject- RAC

Subject Code –
D3037712(037)

Time Allowed: 2hr.

Max Marks: 40

**Note: - 1.first Question (A) from both unit are 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	Explain the layout of Bell-Coleman Refrigeration Cycle.	4	R	2
1.B	A dense air refrigeration cycle operates between pressures of 4 bar and 16 bar. The air temperature after heat rejection to surroundings is 37°C and air temperature at exit of refrigerator is 7°C. The isentropic efficiencies of turbine and compressor are 0.85 and 0.8 respectively. Determine compressor and turbine work per TR: C.O.P.; and power per TR. Take $\gamma = 1.4$ and $c = 1.005$ kJ/kg K.	8	Ap	2
1.C	Describe boot-strap cycle of air refrigeration system. With a schematic diagram and show the cycle on T-S diagram.	8	U	2
1.D	The following data refer to a boot strap air cycle evaporative refrigeration system used for an aeroplane to take 20 tonnes of refrigeration load: Ambient air temperature = 15°C Ambient air pressure = 0.8 bar Mach number of the flight = 1.2 Ram efficiency = 90% Pressure of air bled off the main compressor = 4 bar Pressure of air in the secondary compressor = 5 bar Isentropic efficiency of the main compressor = 90% Isentropic efficiency of the secondary compressor = 80% Isentropic efficiency of the cooling turbine = 80% Temperature of air leaving the first heat exchanger = 170°C Temperature of air leaving the second heat exchanger = 155°C Temperature of air leaving the evaporator = 100°C Cabin temperature = 25°C Cabin pressure = 1 bar Find:1. Mass of air required to take the cabin load, 2. Power required for the refrigeration system, and 3. C.O.P. of the system.	8	Ap	2

Unit – II

2.A	Define Bypass factor and Efficiency of Cooling Coil.	4	R	4
2.B	A room 7 m x 4 m x 4 m is occupied by an air-water vapour mixture at 38°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 condensed.	8	Ap	4
2.C	The atmospheric air at 760 mm of Hg, dry bulb temperature 15° C and wet Bulk temperature 11° C enters a heating coil whose temperature is 41° C. Assuming by-pass factor of heating coil as 0.5, determine dry bulb temperature: wet bulb temperature and relative humidity of the air leaving the coil. Also determine the sensible heat added to the air per kg of dry air	8	Ap	4
2.D	The saturated air leaving the cooling section of an air conditioning system at 14°C at the rate of 50 m ³ /min is mixed adiabatically with the outside air at 32°C and 60% relative humidity at a rate of 20 m ³ /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	Ap	4

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