Hall Ticket Number :										

R-19

Code: 19A364T

III B.Tech. II Semester Supplementary Examinations April 2023

Design of Machine Elements-II

(Mechanical Engineering)

Max. Marks: 70 Time: 3 Hours

Answer *any five full questions* by choosing one question from each unit (5x14 = 70 Marks)

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			Marks
		UNIT–I	
1.	a)	State any four objectives of lubrication.	4M
	b)	A 80 mm long journal bearing supports a load of 2800 N on a 50 mm diameter shaft. The bearing has a radial clearance of 0.05 mm and the viscosity of the oil is 0.021 kg / m-s at the operating temperature. If the bearing is capable of dissipating 80 J/s, determine the maximum safe speed.	10M
		OR	
2.	a)	What are the assumptions made in Petroff's equation?	4M
	b)	Following data refer to a 3600 hydrodynamic journal bearing Load = 3.2 kN, speed =1490 rpm, diameter = 50 mm, length = 50 mm, radial clearance = 0.05 mm, Viscosity= 25 cP. Assume heat generated is carried away by oil flow. Calculate coefficient of friction, power lost in friction, minimum oil film thickness, flow and temperature rise.	10M
		UNIT–II	
3.		A bearing for an axial flow compressor is to carry a radial load of 2500 N and thrust of 1500 N. The service imposes light shock and the bearing will be in use for 40 hours/week in 5 years. The speed of the shaft is 1000 rpm. Select suit able ball bearing for the purpose and give the required tolerances on the shaft and the housing. Diameter of the shaft is 50mm.	14M
		OR	
4.		A ball bearing is operating on a work cycle consisting of three parts—a radial load of 3000 N at 1440 rpm for one quarter cycle, a radial load of 5000 N at 720 rpm for one half cycle, and radial load of 2500 N at 1440 rpm for the remaining cycle. The expected life of the bearing is 10 000 h. Calculate the dynamic load carrying capacity of the bearing.	14M
		UNIT–III	
5.		Determine the dimensions of an I-section connecting rod for a petrol engine from the following data: Diameter of the piston = 110 mm; Mass of the reciprocating parts = 2 kg; Length of the connecting rod from centre to centre = 325 mm; Stroke length = 150 mm; R.P.M. = 1500 with possible overspeed of 2500; Compression ratio = 4 : 1; Maximum explosion pressure = 2.5 N/mm2.	14M
		OR	
6.	a)	Explain the various types of crankshafts with neat sketches.	4M
	b)	Describe the strength and proportions of overhung crankshaft.	10M
		UNIT–IV	
7.		An open belt connects two flat pulleys. The pulley diameters are 300 mm and 450 mm and the corresponding angles of lap are 160° and 210°. The smaller pulley runs at 200 r.p.m. The coefficient of friction between the belt and pulley is 0.25. It is found that the belt is on the point of slipping when 3 kW is transmitted. To increase the power transmitted two alternatives are suggested, namely (i) increasing the initial tension by 10%, and (ii) increasing the coefficient of friction by 10% by the application of a suitable dressing to the belt. Which of these two methods would be more effective? Find the percentage increase in power possible in each case.	14M
		OR	

8. a) Discuss the materials and practical applications for the various types of springs. 4M

   b) 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 30mm. 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 81370N/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; and (v) free length of spring 10M

UNIT–V

9. It is required to design a pair of spur gears with 20^0 full-depth involute teeth based on 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 (S_{ut}=600 MPa). The factor of safety can be as 1.5.Design the gears, specify their dimensions and suggest suitable surface hardness for the gears. 14M

OR

10. a) Explain design procedure for spur gears. 8M

    b) Derive the Lewis equation for the beam strength of a gear tooth. 6M

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Hall Ticket Number :										

R-19

Code: 19A362T

III B.Tech. II Semester Supplementary Examinations April 2023

Engineering Metrology

(Mechanical Engineering)

Max. Marks: 70 Time: 3 Hours

Answer *any five full questions* by choosing one question from each unit (5x14 = 70 Marks)

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			Marks	CO	BL
		UNIT–I			
1.		A hole and mating shaft are to have a nominal assembly size of 50 mm. The assembly is to have a maximum clearance of 0.15 mm and a minimum clearance of 0.05mm. The hole tolerance is 1.5 times the shaft tolerance. Determine the limits for hole and shaft by using Hole basis system and Shaft basis System.	14M	CO1	L3
		OR			
2.	a)	Define Tolerance. Explain its types	7M	CO1	L1
	b)	Discuss about the types of limit gauges	7M	CO1	L1
		UNIT–II			
3.		Differentiate between Line standard and End standard with an industrial application	14M	CO2	L2
		OR			
4.		Describe the working principle of Dial indicator with a neat sketch	14M	CO2	L2
		UNIT–III			
5.		Describe the working of Talysurf instrument with a neat Sketch.	14M	CO3	L2
		OR			
6.		With a neat sketch, discuss the working of Sigma Comparator	14M	CO3	L2
		UNIT–IV			
7.		Derive the formula for measuring effective diameter by Two-Wire method and Three-wire method.	14M	CO4	L6
		OR			
8.	a)	What is best wire size for effective diameter measurement	7M	CO4	L1
	b)	Explain about the pitch errors in screw thread	7M	CO4	L2
		UNIT–V			
9.		Write short notes on statistical quality control. Where do you use control charts and how are they classified. Explain them	14M	CO5	L1
		OR			
10.		Explain R chart, P chart, C charts with examples	14M	CO5	L2

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Hall Ticket Number :										

R-19

Code: 19A361T

III B.Tech. II Semester Supplementary Examinations April 2023

Heat Transfer

(Mechanical Engineering)

Max. Marks: 70 Time: 3 Hours

Answer *any five full questions* by choosing one question from each unit (5x14 = 70 Marks)

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			Marks	CO	BL
		UNIT–I			
1.		Derive the general heat conduction equation in cylindrical coordinates.	14M	1	3
		OR			
2.		The temperatures on the faces of a plane wall 15 cm thick are 375oC and 85oC. The wall is constructed of a special glass with the following properties: k =0.78 W/moC, ρ=2700 kg/m3, Cp=0.84kJ/kgoC. What is the heat flow through the wall at steady-state conditions?	14M	1	3
		UNIT–II			
3.		Derive the temperature distribution equation for a lumped heat system in terms of Fourier and Biot numbers.	14M	2	3
		OR			
4.		A 50 x 50 cm2 aluminium slab of 6 mm thick is at 400^0C initially and it is suddenly immersed in water, so its surface temperature is lowered to 50^0C. Determine the time required for the slab to reach 120^0C. Take heat transfer co-efficient, h = 100W/m2K.	14M	2	3
		UNIT–III			
5.		Show that Nu=f (Re, Pr) for forced convection by the use of dimensional analysis	14M	3	2
		OR			
6.		Calculate the average co-efficient of heat transfer for natural convection over a vertical plate 30cm high at 50^0C. The surrounding air is at 30^0C. Also calculate the boundary layer thickness at the trailing edge of plate.	14M	3	3
		UNIT–IV			
7.		Water at atmospheric pressure is boiled in a kettle made of copper. The bottom of the kettle is flat, 30 cm in diameter and is maintained at a temperature of 118ºC. Calculate the rate of heat required to boil water. Also estimate the rate of evaporation of water from the kettle.	14M	4	3
		OR			
8.	a)	Write short notes on Black body radiation.	4M	4	2
	b)	Calculate the net radiant heat exchange per m2 area for two large parallel plates at temperatures of 427^0C and 27^0C. Є (hot plate) = 0.9 and Є (cold plate) = 0.6.If a polished aluminum shield(Є=0.4) is placed between them, find the % reduction in the heat transfer	10M	4	3
		UNIT–V			
9.	a)	What is LMTD? When is the LMTD method most applicable to heat-exchanger calculations?	10M	5	2
	b)	Define effectiveness of heat exchanger	4M	5	2
		OR			
10.		Hot oil at 100ºC is used to heat air in a shell-and-tube heat exchanger. The oil makes six tube passes and the air makes one shell pass; 2.0 kg/s of air are to be heated from 20ºC to 80ºC. The specific heat of the oil is 2100 J/kgºC, and its flow rate is 3.0 kg/s. Calculate the area required for the heat exchanger for U =200 $W/m^2 \cdot {}^0C$	14M	5	3

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Hall Ticket Number :										

R-19

Code: 19A36CT

III B.Tech. II Semester Supplementary Examinations April 2023

Instrumentation and Control Systems

(Mechanical Engineering)

Max. Marks: 70 Time: 3 Hours

Answer *any five full questions* by choosing one question from each unit (5x14 = 70 Marks)

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			Marks	CO	BL
		UNIT–I			
1.		Explain the Dynamic characteristics of measuring instruments.	14M	1	2
		OR			
2.		Explain about the Generalized measurement system and its functional elements	14M	1	2
		UNIT–II			
3.		Describe the principle of operation of an Ionization gauge with a neat sketch and mention its applications, merits and demerits.	14M	2	2
		OR			
4.		Explain working principle of thermocouples. State the three laws of thermocouples. Interpret their application.	14M	2	2
		UNIT–III			
5.		Explain briefly about the different types of torsion meters.	14M	3	2
		OR			
6.		Explain the function of a dummy gauge in a strain gauge load cell	14M	3	2
		UNIT–IV			
7.		Explain briefly about resistance strain gauges.	14M	4	2
		OR			
8.		Describe the working principles of strain gauge bridge with sketch. Indicate their arrangements for measurement of torque on a circular shaft.	14M	4	2
		UNIT–V			
9.	a)	Represent the mathematical models for thermal systems with an example.	7M	5	2
	b)	Sketch and explain Mason's rule?	7M	5	4
		OR			
10.	a)	Compare gain margin and phase margin	7M	5	5
	b)	Represent the Mathematical models for Mechanical systems with an example	7M	5	2

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Hall Ticket Number :										

R-19

Code: 19A56IT

III B.Tech. II Semester Supplementary Examinations April 2023

Artificial Intelligence

(Common to CE and ME)

Max. Marks: 70 Time: 3 Hours

Answer *any five full questions* by choosing one question from each unit (5x14 = 70 Marks)

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			Marks	CO	BL
		UNIT–I			
1.	a)	State and explain Water Jug Problem with an example?	10M	CO1	L4
	b)	Illustrate the four types of agents?	4M	CO1	L2
		OR			
2.	a)	What are AI Problems?	4M	CO1	L1
	b)	Explain state space approach for solving any AI problem?	10M	CO1	L2
		UNIT–II			
3.	a)	Give A* Algorithm with an example? What are the limitations of A* algorithm?	10M	CO2	L1
	b)	Compare and contrast DES versus BFS?	4M	CO2	L4
		OR			
4.	a)	Demonstrate constraint satisfaction problem with a suitable example.	7M	CO2	L4
	b)	Compare the six search strategies in terms of the following criteria: time, space, optimal, complete.	7M	CO2	L2
		UNIT–III			
5.	a)	Explain the syntax and semantics of first order logic in detail?	7M	CO3	L2
	b)	What is a horn clause? Explain inference with horn clause?	7M	CO3	L2
		OR			
6.	a)	Write the forward chaining algorithm for first order definite clauses?	7M	CO3	L2
	b)	Explain the resolution inference rule for first-order clauses?	7M	CO3	L2
		UNIT–IV			
7.	a)	Describe the organization of objects into categories as part of knowledge representation?	7M	CO4	L1
	b)	Explain the planning with state space search with examples?	7M	CO4	L2
		OR			
8.	a)	Describe with examples how objects are organized into categories?	10M	CO1	L2
	b)	Illustrate the concept of ontology with an example	4M	CO1	L4
		UNIT–V			
9.	a)	Demonstrate joint probability distribution with a suitable example?	10M	CO5	L4
	b)	Write short notes on Fuzzy logic?	4M	CO5	L2
		OR			
10.	a)	Discuss the method for constructing belief networks.	7M	CO5	L4
	b)	Explain the Baye's rule and its use in uncertain knowledge and reasoning?	7M	CO5	L2

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Hall Ticket Number :										

R-19

Code: 19A363T

III B.Tech. II Semester Supplementary Examinations April 2023

Applied Thermodynamics-III

(Mechanical Engineering)

Max. Marks: 70 Time: 3 Hours

Answer *any five full questions* by choosing one question from each unit (5x14 = 70 Marks)

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			Marks	CO	BL
		UNIT–I			
1.	a)	Classify the gas turbine cycles?	4M	CO1	L4
	b)	A Gas turbine plant works between the temperature limits of 11520 K and 2880K. Isentropic efficiency for compressor and turbines are 0.85 and 0.8 respectively. Determine the optimum pressure ratio for maximum work output and also for maximum Cycle thermal efficiency.	10M	CO1	L3
		OR			
2.	a)	Explain with neat sketch open cycle gas turbine plant.	7M	CO1	L2
	b)	Enumerate the differences between open cycle gas turbine plant & closed Cycle turbine plant.	7M	CO1	L2
		UNIT–II			
3.	a)	An air refrigerator of 10 ton capacity operates on a Bell-Coleman cycle. The temperature of air entering the compressor is 10^0C and that of entering the expander is 32^0C. The quantity of air circulated is 50kg/min. The compression and expansion follow the law $PV^{1.3}$=constant. Find COP of the system and the power required to run the system.	10M	CO2	L3
	b)	What is the function of a throttle valve in vapour compression refrigeration system?	4M	CO2	L1
		OR			
4.	a)	Explain Bootstrap air cooling system with suitable diagram.	8M	CO2	L2
	b)	List the merits and demerits of an air refrigeration system.	6M	CO2	L1
		UNIT–III			
5.	a)	With the help of neat diagram, explain the working of a Lithium bromide-water absorption refrigeration system.	10M	CO3	L2
	b)	Illustrate the properties of ideal absorbent used in vapour absorption system.	4M	CO3	L2
		OR			
6.	a)	Prove the equation of maximum C.O.P of a vapour absorption system with common notations.	8M	CO3	L3
	b)	Make a comparative list between a vapour - absorption Refrigeration system and a vapour compression Refrigeration system.	6M	CO3	L4
		UNIT–IV			
7.	a)	Define Air-conditioning. Classify air-conditioning systems.	6M	CO4	L1
	b)	The atmospheric air has a dry bulb temperature of 21°C and wet bulb temperature 18°C. If the barometer reads 750 mm of Hg, determine i) partial pressure of water vapour ii) Relative humidity and iii) Dew point temperature.	8M	CO4	L3
		OR			
8.	a)	Describe the working of summer air-conditioning system with a neat sketch.	7M	CO4	L2
	b)	List out the various equipment used in Air Conditioning systems and explain their functions.	7M	CO4	L1
		UNIT–V			
9.	a)	Draw the 'Water to water Heat Pump' circuit and explain its working.	7M	CO5	L2
	b)	With the aid of simple sketch, explain the working of a centrifugal dust collector.	7M	CO5	L2
		OR			
10.	a)	Describe Lithium bromide absorption type dehumidifier system with a diagram.	7M	CO5	L2
	b)	Illustrate the operation of any one type of dehumidifier used during different seasons of the year.	7M	CO5	L2

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