III B.Tech. II Semester Supplementary Examinations December 2022
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	CO	Blooms Level

UNIT–I

1. a) Derive the Petroff's equation for hydrodynamic bearing and state its limitations. — 6M | 1 | L6

   b) A Journal bearing of 50 mm diameter and 80 mm long has a bearing pressure of 6 N/mm^2.The speed of the journal is 1000 rpm. The ratio of journal diameter to the diametral clearance is 1000.The bearing is lubricated with oil, whose absolute viscosity at the operating temperature of 75^{0}C may be taken as 0.015kg/m-s. The room temperature is 25^{0}C.Determine i) the amount of artificial cooling required and ii) the mass of the coolant oil required, if the difference between the outlet and inlet temperatures of the oil is 10^{0}C.The specific heat of the oil is 1900 J/kg/^{0}C and heat dissipation coefficient is 500 W/m^2/^{0}C. — 8M | 1 | L3

OR

2. a) Explain briefly about the bearing materials used in Sliding contact bearings. — 4M | 1 | L2

   b) Following data is given for a 360^0 hydrodynamic bearing.
   Journal diameter = 100 mm, bearing length = 100 mm, radial load = 50 kN, Journal speed = 1440 rpm, radial clearance = 0.12 mm, viscosity of lubricant=16Cp.Calculate (i) Minimum oil film thickness (ii) Coefficient of friction and (iii) Power lost in friction. — 8M | 1 | L3

UNIT–II

3. a) Derive Stribeck's equation. — 6M | 1 | L6

   b) A single row deep groove ball bearing No.6002 is subjected to an axial thrust of 1000 N and a radial load of 2200 N. Calculate the expected life that 50 % of the bearings will complete under this condition. — 8M | 1 | L3

OR

4. a) Explain the static load and dynamic load rating of an antifriction bearings. — 6M | 1 | L2

   b) The rolling contact bearing is to be selected to support the overhung countershaft. The shaft speed is 720 rpm. The bearings are to have 99% reliability corresponding to a life of 24000 hours. The bearing is subjected to an equivalent radial load of 1Kn.Consider life adjustment factors for operating condition and materials as 0.9 and 0.85 respectively. Calculate the basic dynamic load rating of the bearing from manufacturer's catalogue, specified at 90% reliability. — 8M | 1 | L3

UNIT–III

5. Design a Cast Iron piston for a single acting four stroke engine for the following data: Cylinder bore = 100 mm, Stroke = 125 mm, Maximum gas pressure= 5N/mm^2, Indicated mean effective pressure = 0.75 N/mm^2, Mechanical efficiency= 80%.fuel consumption = 0.15 kg/brake power/hour, higher calorific value of fuel = 42 X10^3 kj/kg, speed = 2000 rpm, Any other data required for the design may be assumed. — 14M | 2 | L6

OR

6. a) Explain briefly about whipping stress in the design of Connecting rod.   4M 2 L2

   b) Design a Connecting rod for a petrol engine from the following data:
   Diameter of piston110mm, Mass of reciprocating parts 2kg,length of connecting rod 325 mm, Stroke 150 mm, speed 1500 rpm with possible over speed upto 2500 rpm, Compression ratio 4:1,Maximum explosion pressure 2.5 MPa.   10M 2 L6

   UNIT–IV

7. A spring loaded safety valve for a boiler is required to blow off at a pressure of 1.5 N/mm^2.The diameter of the valve is 60 mm. Design a suitable compression spring for the safety valve, assuming spring index to be 6 and 25mm initial compression. The maximum lift of the valve is 15 mm. The shear stress in the spring material is to be limited to 450 MPa. The Modulus of rigidity of spring material is 84 GPa.   14M 3 L6

   OR

8. a) What are the advantages of 'V' belts over flat belts?   4M 4 L1

   b) It is required to select a V-belt drive to connect a 20 Kw, 1440 rpm motor to a compressor running at 480 rpm for 15 hr per day. Space is available for a centre distance of approximately 1.2 m. Determine (i) the specifications of the belt (ii) diameters of motor and compressor pulleys (iii) the correct centre distance and (iv) the number of belts.   10M 4 L3

   UNIT–V

9. A gear drive is required to transmit a maximum power of 22.5 kW. The velocity ratio is 1:2 and rpm of the pinion is 200.The approximate centre distance between the shafts may be taken as 600 mm. The teeth has 20^0 stub involute profiles. The static stress for the gear material (which is Cast Iron) may be taken as 60 MPa and face width is 10 times the module. Calculate the module, face width and number of teeth on each gear. Check the design for dynamic and wear loads. The deformation or dynamic factor C in the Buckingham equation may be taken as 80 and the material combination factor for the wear as 1.4.   14M 5 L3

   OR

10. a) Derive the Lewis equation for beam strength of gear teeth.   6M 5 L6

    b) Describe the procedure for design of helical gears.   8M 5 L2

    END

Code: 19A362T

R-19

III B.Tech. II Semester Supplementary Examinations December 2022
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

UNIT–I

1. a) With the help of neat sketches state the essential conditions for
   i) Clearance fit ii) Interference fit iii)Transition fit — 7M — CO1

   b) A 50mm diameter shaft is made to rotate in the bush. The tolerance for both shaft and bush are 0.05mm. Determine the dimensions of shaft and bush to give a maximum clearance of 0.075mm with the hole basis system. — 7M — CO1

OR

2. Design the general type GO and NO-GO gauge for the components having 20H7/f8 fit. Given

   i) $i(microns) = 0.45(D)^{\frac{1}{3}} + 0.001D$ ii) Upper deviation of 'f' Shaft=-0.55D$^{0.41}$

   iii) 20mm falls in the diameter step of 18mm to 30mm

   iv) IT7=16i   v) IT8=25i   vi) Wear allowance is 10% of gauge allowance. — 14M — CO1

UNIT–II

3. a) Draw a neat sketch to illustrate the use of sine bar for measurement of Taper plug gauge and explain it briefly. — 7M — CO2

   b) Explain the principle and use of a Spirit level — 7M — CO2

OR

4. Explain with help of neat sketches the principle and construction of Auto – collimator — 14M — CO2

UNIT–III

5. a) With help of neat sketch explain working of Tomlinson surface meter — 7M — CO3

   b) In the measurement of surface roughness heights of successive 10 peaks and troughs measured from a datum and were 33, 25, 30, 19, 22, 18, 27,29 and 20 microns. If these measurements were obtained on 10mm length, determine CLA and RMS values of surface roughness. — 7M — CO3

OR

6. Describe the construction and working of a sigma comparator with the help of neat sketch — 14M — CO3

UNIT–IV

7. a) Describe with the neat sketches two – wire method of measuring the effective diameter of a screw thread. — 7M — CO4

   b) What is the best size wire? Derive the expression for the same in terms of the pitch and angle of the thread. — 7M — CO4

OR

8. a) Describe a gear tooth vernier caliper and explain its use for checking tooth thickness and depth of tooth. — 7M — CO4

   b) Name the various types of errors in gears. — 7M — CO4

UNIT–V

9. Describe with neat sketch working of CMM and state sources of errors in CMM — 14M — CO5

OR

10. Describe various methods of diffusion coating with neat sketches — 14M — CO5

END

III B.Tech. II Semester Supplementary Examinations December 2022
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	Blooms Level

UNIT–I

1. How would you apply what you learned to develop the general heat conduction equation in spherical coordinates? — 14M — 1 — 3

OR

2. a) Describe various modes of heat transfer with suitable examples and governing laws. — 8M — 1 — 2

   b) Calculate the rate of heat transfer per unit area through a copper plate of 45mm thick, whose one face is maintained at 350° C and the other face at 50° C. Take thermal conductivity of copper as $370 W/m^o$ C. — 6M — 1 — 3

UNIT–II

3. Derive the expression for one-dimensional steady state heat conduction systems without heat generation through a hollow sphere. — 14M — 2 — 3

OR

4. Derive the temperature distribution equation for a lumped heat system in terms of Fourier and Biot numbers. — 14M — 2 — 3

UNIT–III

5. a) Examine by dimensional analysis that the Nusselt number for a forced convection is a function of Reynolds and Prandtl number? — 7M — 3 — 3

   b) Determine the convection heat transfer coefficient for a flow of air at 10 m/s and 20° C across the cylinder of diameter 2.5 cm at a temperature of 80° C and also estimate the rate of convection heat transfer? — 7M — 3 — 3

OR

6. Calculate the rate of heat loss from human body which may be considered as a vertical cylinder of 28 cm diameter and 180 cm high in still air at 15° C. The skin temperature is 35° C and emissivity at skin surface is 0.4. Neglecting other effects Nu=0.13(Gr.Pr)$^{0.33}$.
    Given =15.53x10^{-6} m^2/sec, k=0.0263W/mK, Pr = 0.7 — 14M — 3 — 3

UNIT–IV

7. Water is boiled at a rate of 30 kg/h in a copper pan, 30 cm in diameter, at atmospheric pressure. Estimate the temperature of the bottom surface of the pan assuming nucleate boiling conditions. Also determine the burnout (peak) heat flux. 14M 4 3

OR

8. a) Derive an expression of shape factor for the radiation heat exchange between two surfaces. 8M 4 3

   b) It is observed that the intensity of the radiation emitted by the sun is maximum at a wavelength of 0.5µ. Assuming the sun to be a black body, estimate its surface temperature and emissive power. 6M 4 3

UNIT–V

9. In a counter flow double pipe heat exchanger, water is heated from 25° C to 65° C by an oil with a specific heat of 1.45 kJ/kgK and mass flow rate of 0.9 kg/s. The oil is cooled from 230° C to 160° C. If the overall heat transfer coefficient is 420 W/m^{2}K. Calculate the following: (i) The rate of heat transfer (ii) The mass flow rate of water and (iii) The surface area of the heat exchanger. 14M 5 3

OR

10. Derive an expression for the NTU method of Parallel flow heat exchangers? 14M 5 3

END

Code: 19A36CT

III B.Tech. II Semester Supplementary Examinations December 2022

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	Blooms Level
		UNIT–I			
1.	a)	Explain generalized measurement system and its functional elements	7M	CO1	L2
	b)	Write short notes on transducers classification	7M	CO1	L2
		OR			
2.		Write about static and dynamic characteristics of measuring instruments	14M	CO1	L2
		UNIT–II			
3.	a)	Describe the principle of a McLeod gauge	7M	CO2	L3
	b)	Illustrate the operation of Magnetic flow meter	7M	CO2	L3
		OR			
4.	a)	Explain Classification of flow measurement techniques	7M	CO2	L3
	b)	Describe the principle of operation of optical Pyrometer	7M	CO2	L3
		UNIT–III			
5.	a)	Explain Basic force measurement methods	8M	CO3	L3
	b)	Describe the working principle of Piezoelectric accelerometer with a neat sketch	6M	CO3	L3
		OR			
6.	a)	IIustrate different types of torsion meters	7M	CO3	L3
	b)	Describe the working principle of accelerometer	7M	CO3	L3
		UNIT–IV			
7.	a)	Explain Strain measuring techniques	8M	CO4	L3
	b)	Compare bonded and unbonded strain gauges	6M	CO4	L3
		OR			
8.	a)	Describe strain gauge bonding techniques	7M	CO4	L3
	b)	Explain concept of temperature compensation in strain gauges	7M	CO4	L3
		UNIT–V			
9.	a)	Write about classification of control systems	7M	CO5	L3
	b)	What is transfer function? Explain with block diagram	7M	CO5	L3
		OR			
10.	a)	Represent the Mathematical model for thermal system	7M	CO5	L3
	b)	Discuss briefly about the Signal flow graphs.	7M	CO5	L3

END

Code: 19A16HT

III B.Tech. II Semester Supplementary Examinations December 2022

Water Resources and Conservation

(Common to ME & CSE)

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. Write a note on India's water resources, scenario of water use   14M

OR

2. Explain in detail the purposes of water resources development & to write the classification of water resources development projects.   14M

UNIT–II

3. How does evaporation takes place? What are the factors that effects the evaporation process? How are you going to reduce evaporation from a nearby tank?   14M

OR

4. What do you understand by routing of a flood? Write the basic equations in hydrologic reservoir routings. How is hydrologic routing different from hydraulic routing?   14M

UNIT–III

5. What are common problems in project planning?   14M

OR

6. What are the objectives of integrated water resources management? Explain in detailed water conservation methods in urban areas.   14M

UNIT–IV

7. What do you understand thick globally, act locally on water resources with practical example.   14M

OR

8. Explain the need of world water organizations. Explain in brief WWC.   14M

UNIT–V

9. Discuss in brief various methods of surface irrigation. Write a note on sprinkler method of irrigation   14M

OR

10. What do you understand by crop rotation? What are its advantages? Discuss various methods of assessment of irrigation water.   14M

END

Code: 19A56IT

III B.Tech. II Semester Supplementary Examinations December 2022
Artificial Intelligence
(Common to CE & 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	Blooms Level

UNIT–I

1.	a)	Discuss about PEAS representation for an agent.	7M	CO1	L2
	b)	Discuss the various Problem characteristics in detail.	7M	CO1	L1

OR

2.	a)	What is state space search of a problem? Illustrate with an example.	7M	CO1	L1
	b)	Discuss about the structure of Intelligence agents.	7M	CO1	L2

UNIT–II

3.	a)	Define Heuristic function. Explain the Hill Climbing heuristic search.	7M	CO2	L1
	b)	Write short notes on BFS.	7M	CO2	L1

OR

4.	a)	Illustrate Crypt Arithmetic problem with an example.	7M	CO2	L2
	b)	Write short notes on Iterative Deepening method.	7M	CO2	L1

UNIT–III

5.	a)	Write short notes on Unification algorithm	7M	CO3	L1
	b)	Discuss briefly about Backward Chaining.	7M	CO3	L1

OR

6.	a)	How Professional logic is related with AI, discuss.	7M	CO3	L2
	b)	Discuss about the Inferences in FOL.	7M	CO3	L2

UNIT–IV

7.	a)	Write short notes on Full Joint Distributions.	7M	CO4	L4
	b)	Write about categories and objects in knowledge engineering.	7M	CO4	L1

OR

8.	a)	Write short notes on Ontological engineering in knowledge engineering.	7M	CO4	L1
	b)	What is Conditional Planning, discuss.	7M	CO4	L1

UNIT–V

9.	a)	What is uncertainty in knowledge and engineering, explain.	7M	CO5	L1
	b)	Write short notes on Belief Networks.	7M	CO5	L1

OR

10.		What are the uses of Bayes' rules in Uncertain knowledge and reasoning, discuss in detail.	14M	CO5	L1

END

III B.Tech. II Semester Supplementary Examinations December 2022
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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Use of refrigeration and air-conditioning tables are allowed
Use of psychrometric chart is allowed

		Marks	CO	Blooms Level

UNIT–I

1. a) Summarize the merits and demerits of closed gas turbine cycle compared to open gas turbine cycle?   **7M** CO1 L2

   b) Air enters a closed gas turbine cycle at a temperature of 26oC and 1.01 bar. It is compressed in a compressor with an isentropic efficiency of 80% and compression ratio 7. Heat is then added at constant pressure so that maximum temperature in the cycle reaches to 400oC and expanded in a turbine with an isentropic efficiency of 90%, to 1.01 bar. If mass flow rate of air is equal to 1.2 kg/s, Calculate

   (i) Network input to the cycle, and ii) Efficiency of the cycle.   **7M** CO1 L3

OR

2. a) Describe the working of a turbo prop engine with a neat schematic diagram.   **7M** CO1 L1

   b) Differentiate between turbojet and turboprop engines.   **7M** CO1 L2

UNIT–II

3. Atmospheric air at 0.2 bar and 5oC enters an aircraft moving with 850 km/h speed. After ramming it is compressed in the main compressor and cooled to 45oC in a heat exchanger using rammed air. It is then expanded to cabin pressure in an expander and finally receives heat at constant pressure in the cabin before leaving to atmosphere. Considering ramming, compressor and expander efficiencies as 100%, 90% and 92% respectively, determine

    (i) Network input to the cycle, (ii) COP of the cycle, and

    (iii) Mass flow rate of air if the refrigeration effect in the cabin is 10 TOR.   **14M** CO2 L3

OR

4. a) Discuss the effect of sub-cooling and superheating on the performance of a VCR system with *P-h* diagram.   **6M** CO2 L2

b) A VCR system working with *R*-12 as refrigerant operates between -10ºC and 30ºC. Condition of the refrigerant before compression and after condensation is saturated. Assuming, Specific heat of refrigerant vapour at 30ºC is 2.1 kJ/kgK, calculate i) Work input to the cycle, ii)Refrigeration effect for a refrigerant flow rate 0.25 kg/s, and iii) COP of the cycle. 8M CO2 L3

UNIT–III

5. a) List the merits and demerits of VAR system over VCR system. 4M CO3 L1

b) Explain the working of a three fluid Electrolux VAR system with a neat schematic diagram. 10M CO3 L2

OR

6. a) What is a refrigerant? How is it represented? 4M CO3 L1

b) Discuss in detail about the effect of refrigerants on global warming and ozone depletion. How it is rectified? 10M CO3 L2

UNIT–IV

7. a) Explain the following terms/processes
    (i) Relative humidity, (ii) Sensible cooling,
    (iii) Cooling and humidification. 6M CO4 L2

b) In an air-conditioning process, 2 kg/s of air at 15ºC and 30% RH mixes adiabatically with another 3 kg/s stream of air at 20ºC and 60% RH. The air mixture then flows across a heating coil and exits at 25ºC. Determine
(i) Condition of air after adiabatic mixing of two air streams,
(ii) Amount of heat added in the sensible heating process.
Use psychrometric chart. 8M CO4 L3

OR

8. a) Discuss the requirements of human comfort in detail. 7M CO4 L2

b) Describe the working of a summer air-conditioning system with a neat schematic diagram and represent the process on psychrometric chart. 7M CO4 L2

UNIT–V

9. a) Explain the working of dehumidifier with a neat sketch. 7M CO5 L2

b) Classify air blowers and describe the working of air blower. 7M CO5 L2

OR

10. a) Draw a neat heat pump circuit and describe its working principle. 7M CO5 L2

b) Discuss in detail about the various latent heat sources in an air-conditioning system. 7M CO5 L2