Hall Ticket Number :										

R-19

Code: 19A362T

III B.Tech. II Semester Regular Examinations July 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)

****

			Marks	CO
		UNIT–I		
1.	a)	Differentiate between Hole basis system and shaft basis system of fits.	7M	CO1
	b)	Find the type of fit for the following Hold and Shaft assembly. Hold : $50^{+0.25}_{+0.00}$ mm Shaft : $50^{+0.05}_{+0.005}$ mm	7M	CO1
		OR		
2.		Design the General type 'GO' and 'NO-GO' plug gauges for checking the hole of $30^{+0.05}_{-0.03}$ mm. Assume wear allowance and gauge tolerance as 10% of work tolerance.	14M	CO1
		UNIT–II		
3.	a)	Explain why sine bar is not preferred to use for measuring angles more than 45^0?	7M	CO2
	b)	Distinguish between 'Line Standard' and 'End Standard' with examples.	7M	CO2
		OR		
4.		Explain with help of neat sketches the principle and construction of NPL flatness Interferometer.	14M	CO2
		UNIT–III		
5.	a)	Describe the principles and operation of : Taylor-Hobson Talysurf surface roughness instrument	7M	CO3
	b)	In the measurement of surface roughness, heights of 20 successive peaks and valleys were measured from a datum as follows: 35, 25, 40, 22, 35, 18, 42, 25, 35, 22, 36, 18, 42, 22, 32, 21, 37, 18, 35, 20 microns. If these measurements were obtained over length of 20 mm, determine the C.L.A. and R.M.S. values of the surface.	7M	CO3
		OR		
6.		How a comparator is different from an instrument? Describe with neat sketch working principle of Pneumatic Comparator.	14M	CO3
		UNIT–IV		
7.	a)	Describe with the neat sketches three – 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.		Describe the Parkinson's gear tester and state its limitations.	14M	CO4
		UNIT–V		
9.		Describe the operation of CMM with neat sketch. State its advantages.	14M	CO5
		OR		
10.		Explain the following thermal coating process with neat sketches. i) Plasma Arc Spraying ii) Vapour Coating	14M	CO5

END

Hall Ticket Number :										

R-19

Code: 19A361T

III B.Tech. II Semester Regular Examinations July 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)

****

		Marks	CO	Blooms Level
	UNIT–I			
1. a)	Can you explain in detail about mechanism of heat transfer in different modes?	8M	1	2
b)	A hot plate 1.5m^2 is maintained at 300^oC. Air at 20^oC blows over the plate. If the convective heat transfer coefficient is 20$W/m^2\ ^oC$, calculate the rate of heat transfer.	6M	1	3
	OR			
2.	Derive general heat conduction equation in cylindrical coordinate system**.**	14M	1	3
	UNIT–II			
3.	How would you model the expression for the temperature distribution and heat transfer rate through a short fin.	14M	2	3
	OR			
4.	A 6mm thick stainless-steel plate (ρ = 7800 kg/m^3, c=460J/kg^oC, k = 55W/m^oC) is used to form the nose section of missile. It is held initially at a uniform temperature of 30^o C. When the missile enters the denser layers of the atmosphere at a very high velocity the effective temperature of air surrounding the nose region attains the value 2150^o C, the surface convective heat transfer coefficient is estimated as 3395$W/m^2\ ^oC$. If the maximum metal temperature is not to exceed 1100 ^oC, determine: (i) Maximum permissible time in these surroundings. (ii) Inside surface temperature under these conditions.	14M	2	3
	UNIT–III			
5.	What is meant by Buckingham theorem? Can you explain the various parameters used in natural convection? Using dimensional analysis obtain an expression for nusselt number in term of groshoff & prandtl numbers.	14M	3	2
	OR			

6.		A 30 cm long glass plate is hung vertically in the air at 27^{o} C while its temperature is maintained at 77^{o} C. Calculate the boundary layer thickness at the trailing edge of the plate. If a similar plate is placed in a wind tunnel and air is blown over it at a velocity of 4 m/s, estimate the boundary layer thickness at its trailing edge. Determine the average heat transfer coefficient, for natural and forced convection.	14M	3	2

UNIT–IV

7.		A vertical tube, 40 mm diameter and 1m long is used for condensing dry saturated steam at atmospheric pressure. The tube surface temperature is 60^{o} C. Determine the condensation heat transfer coefficient and the mass flow rate of condensate.	14M	4	3

OR

8.	a)	Briefly explain the concept of Heat exchange between gray bodies.	8M	4	3
	b)	Explain in detail about use of electrical analogy for solving radiation network problems.	6M	4	2

UNIT–V

9.		Derive an expression for the LMTD method of counter flow heat exchangers?	14M	5	3

OR

10.		Saturated steam at 100^{o} C is condensing on the shell side of a shell- and- tube heat exchanger. The cooling water enters the tubes at 30^{o} C and leaves at 70^{o} C. Calculate the effective log mean temperature difference if the arrangement is (i) counter flow, (ii) parallel flow and (iii) cross flow.	14M	5	3

END

Hall Ticket Number :										

R-19

Code: 19A36CT

III B.Tech. II Semester Regular Examinations July 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)

****

			Marks	CO	Blooms Level
		UNIT–I			
1.	a)	Explain classification of instruments	7M	CO1	L2
	b)	Describe the working principle of photo electric transducer	7M	CO1	L2
		OR			
2.	a)	Discuss briefly about the error classification	7M	CO1	L2
	b)	What is variable resistance transducer? Explain	7M	CO1	L2
		UNIT–II			
3.	a)	Describe the principle of operation of a Bourdon gauge	8M	CO2	L3
	b)	Illustrate Ultrasonic flow meter	6M	CO2	L3
		OR			
4.	a)	How resistance gauge works? Explain	7M	CO2	L3
	b)	Explain Temperature measurement instruments	7M	CO2	L3
		UNIT–III			
5.	a)	Explain the working principle of Pneumatic load cell with a neat sketch	7M	CO3	L3
	b)	Illustrate piezo electric accelerometer	7M	CO3	L3
		OR			
6.	a)	Explain briefly about the different types of torsion meters with figures	8M	CO3	L3
	b)	Describe the elements of a vibrometer	6M	CO3	L3
		UNIT–IV			
7.	a)	Describe the requirement of strain gauges	7M	CO4	L3
	b)	Explain method of temperature compensation using an adjacent arm compensating gauge	7M	CO4	L3
		OR			
8.	a)	Explain briefly about the resistance strain gauge	7M	CO4	L3
	b)	Illustrate strain gauge alloys and materials	7M	CO4	L3
		UNIT–V			
9.	a)	Describe control system terminology	7M	CO5	L3
	b)	Explain the differences between Open loop and Closed loop systems	7M	CO5	L3
		OR			
10.		Represent the Mathematical model for Mechanical systems with an example	14M	CO5	L3

END

Hall Ticket Number :										

R-19

Code: 19A16HT

III B.Tech. II Semester Regular Examinations July 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)

****

Marks

UNIT–I

1. Explain in detail global water resources. Write an essay on history of irrigation developments in India. 14M

OR

2. Define hydrologic cycle. Sketch the cycle and tabulate the various processes and storages involved in the system. 14M

UNIT–II

3. List of least ten engineering activities where hydrological studies are essential. 14M

OR

4. Explain causes of pollution & control measures of pollution for any three pollution 14M

UNIT–III

5. Outline the steps required to prepare a plan for water resources development 14M

OR

6. Discuss the rainwater harvesting and its importance in urban arrears. 14M

UNIT–IV

7. Explain efforts on water conservation measures in developed & developing countries. 14M

OR

8. Discuss environmental discourse consideration in dam construction. 14M

UNIT–V

9. Write a short notes on use of modern irrigation methods. 14M

OR

10. Define Runoff and discuss the various remedial measures to reduce surface runoff. 14M

END

Hall Ticket Number :										

R-19

Code: 19A561T

III B.Tech. II Semester Regular Examinations July 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)

****

			Marks	CO	Blooms Level
		UNIT–I			
1.	a)	Define Agent. Discuss about the different types of it.	7M	CO1	L1
	b)	Discuss the various Problem characteristics in detail.	7M	CO1	L2
		OR			
2.		How to represent a problem as a state space search, explain with water-jug problem.	14M	CO1	L1
		UNIT–II			
3.	a)	Explain the DFS technique in detail.	7M	CO2	L1
	b)	Explain any one Constraint Satisfaction Problem (CSP) with an example.	7M	CO2	L2
		OR			
4.		Write and explain the A* algorithm.	14M	CO2	L2
		UNIT–III			
5.		Write short notes on:			
		a) Inference in FOL.	7M		
		b) Forward chaining.	7M	CO3	L2
		OR			
6.		Discuss about Universal, Existential and Nested quantifiers in First-Order Logic	14M	CO3	L2
		UNIT–IV			
7.	a)	What is Ontological engineering in knowledge engineering, explain.	7M	CO4	L1
	b)	Write short notes on Hierarchical planning.	7M	CO4	L2
		OR			
8.	a)	Explain about Mental Events and Objects in knowledge engineering.	7M	CO4	L2
	b)	How to do planning with state space search, explain.	7M	CO4	L1
		UNIT–V			
9.		What are the uses of Bayes' rules in Uncertain knowledge and reasoning, discuss in detail.	14M	CO5	L1
		OR			
10.		Write short notes on:			
		a) Axioms of Probability.	7M		
		b) Fuzzy Logic.	7M	CO5	L1

END

Hall Ticket Number :										

R-19

Code: 19A363T

III B.Tech. II Semester Regular Examinations July 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)

****

Use of refrigeration and air-conditioning tables are allowed
Use of psychrometric chart is allowed

		Marks	CO	Blooms Level

UNIT–I

1. Describe the following methods which are used to improve the performance of a gas turbine cycle, with the help of neat sketches and *T-s* diagrams.
   (i) Intercooling, (ii) Reheating and (iii) Regeneration — 14M — CO1 — L1

OR

2. a) Describe the working of a turbojet engine with neat schematic diagram and represent the cycle on a *T-s* diagram. — 7M — CO1 — L2
   b) Explain the working of a rocket engine with a neat sketch. — 7M — CO1 — L2

UNIT–II

3. a) Atmospheric air enters a Bell-Coleman cycle at a temperature 10^{o}C and pressure 0.5 bar. It is then compressed in an isentropic process to 6.5 bar and cooled in a constant pressure process to 42^{o}C. It is then finally expanded in an isentropic process to 0.5 bar. Considering mass flow rate of air as 2 kg/s, determine i) Network in the cycle, ii) COP of the cycle. — 7M — CO1 — L3
   b) Explain the working of a bootstrap aircraft cooling system with a neat schematic diagram and represent the cycle on *T-s* diagram. — 7M — CO1 — L2

OR

4. a) Discuss the effect of condenser and evaporator pressure on the performance of a VCR system with *P-h* diagram. — 6M — CO2 — L2
   b) A VCR system working with NH_3 as refrigerant operates between -5^{o}C and 40^{o}C. Condition of the refrigerant after the compression is dry saturated and it is subcooled by 5^{o}C in the condenser. Assuming, Specific heat of refrigerant liquid is 2 kJ/kgK, calculate
   (i) Work input to the cycle,
   (ii) Refrigeration flow rate for a refrigeration effect of 2 TOR,
   (iii) COP of the cycle. — 8M — CO2 — L3

UNIT–III

5.	a)	Derive an expression for COP of a simple VAR system.	6M	CO3	L1
	b)	Explain the working of a 2-shell LiBr-H_2O vapour absorption refrigeration system with a neat schematic diagram.	8M	CO3	L2

OR

6.		List out the desirable properties of an ideal refrigerant. Explain each in detail.	14M	CO3	L2

UNIT–IV

7.	a)	Explain the following terms/processes (i) Specific humidity, (ii) Degree of saturation, (iii) Cooling and dehumidification.	6M	CO4	L2
	b)	In an air-conditioning process, air at 20°C and 40% RH enters and initially flow across a heating element. It then flows across an adiabatic humidifier and exits at 30°C and 60% RH. Considering volume flow rate of air equals to 10m^3/min, determine (i) Amount of heat added, and (ii) Amount of water vapour added. Use psychrometric chart.	8M	CO4	L3

OR

8.	a)	Discuss the method of calculation to find the following (i) Heat load by an in-filtered air, and (ii) RSHF.	7M	CO4	L2
	b)	Describe the working of a winter 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 any one dehumidifier with a neat sketch.	7M	CO5	L2
	b)	Classify air filters and describe the working of air filter.	7M	CO5	L2

OR

10.	a)	Draw a neat sketch for heat pump circuit and describe its working principle.	7M	CO5	L2
	b)	Discuss in detail about the various sensible heat sources in an air-conditioning system.	7M	CO5	L2

END

Hall Ticket Number :										

R-19

Code: 19A364T

III B.Tech. II Semester Regular Examinations July 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)

****

			Marks	CO	Blooms Level
		UNIT–I			
1.		Design a Journal bearing for a Centrifugal pump from the following data: Load on the Journal = 20000 N, Speed of the journal = 900 rpm, type of oil is SAE10, for which the absolute viscosity at 55^0C= 0.017 kg/m-s, ambient temperature of oil = 15.5^0C, Maximum bearing pressure for the pump = 1.5 N/mm^2.Calculate also mass of the lubricating oil required for artificial cooling, if rise of temperature of oil be limited to 10^0C, Heat dissipation coefficient = 1232 W/m^2/^{0}C.	14M	1	L6
		OR			
2.	a)	Explain the selection parameters for the design of Journal bearings.	6M	1	L2
	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.	8M	1	L3
		UNIT–II			
3.		Design a self-aligning ball bearing for a radial load of 7000 N and a thrust load of 2100 N. The desired life of the bearing is 160 millions of revolutions at 300 rpm. Assume uniform and steady load.	14M	1	L6
		OR			
4.	a)	Write the advantages and disadvantages of rolling contact bearings over sliding contact bearings.	4M	1	L1
	b)	A system involves four identical ball bearings, each subjected to a radial load of 2500 N. The reliability of the system i.e one out of four bearings failing during the lifetime of five million revolutions, is 82%.Determine the dynamic load carrying capacity of the bearing, so as to select it from the manufacturer's catalogue based on 90% reliability.	10M	1	L3
		UNIT–III			
5.		Design an aluminium alloy piston for a single acting four stroke engine from the following data : Piston diameter = 90 mm, Speed = 1500 rpm, length of the stroke = 100 mm, Mean effective pressure = 0.7 N/mm^2, brake specific fuel consumption = 0.26 kg/kWh, L/r ratio = 4, Heat conducted through the piston crown = 10% of heat generated during combustion, Calorific value of fuel = 42 MJ/kg, Assume mechanical efficiency of engine as 80%.	14M	2	L6
		OR			
6.		Design a Connecting rod for a petrol engine from the following data : Diameter of the piston = 120 mm, Weight of the reciprocating parts = 2kg, Length of the connecting rod = 300 mm, Stroke length = 140 mm, Speed = 2000 rpm, Maximum explosion pressure = 2.25 N/mm^2.	14M	2	L6

UNIT–IV

7.	Design a helical spring for a spring loaded safety valve for the following conditions : Diameter of valve seat = 65 mm Operating pressure = 0.7 N/mm^2 Maximum pressure when the valve blows off freely = 0.75 N/mm^2 Maximum lift of the valve when the pressure rises from 0.7 to 0.75 N/mm^2 = 3.5 mm Maximum allowable stress =550 MPa Modulus of rigidity = 84 kN/mm^2 Spring index = 6	14M	3	L6

OR

8.	In an Open belt drive, a leather belt transmits 20 hp at a belt speed of 18m/s. The smaller pulley, the driver, rotates at 1000 rpm and the speed ratio is 2.5 :1.The density of the belt material is given as 0.95 gm/cc and the coefficient of friction is 0.35.The design should be such that the stress in the belt should not exceed 2.5 N/mm^2.If the belt thickness is 6 mm and the centre distance is 2.5 times the diameter of the larger pulley. Calculate the pulley diameters, the belt tensions, and the width and the total length of the belt required for the installation.	14M	4	L3

UNIT–V

9.	The following data is given for a pair of spur gears with 20^0 full depth involute teeth: Number of teeth on pinion = 24,Number of teeth on gear = 56,Speed of pinion = 1200 rpm, module = 3mm,service factor = 1.5,face width = 30 mm, Both gears are made of steel with an ultimate tensile strength of 600N/mm^2.Using the velocity factor to account for the dynamic load. Calculate: (i) beam strength (ii) velocity factor and (iii) rated power that the gears can transmit without bending failure, if the factor of safety is 1.5.	14M	5	L3

OR

10.	A helical Cast steel gear with 30^0 helix angle has to transmit 35 kw at 1500rpm.If the gear has 24 teeth, determine the necessary module, pitch diameter and face width for 20^0 full depth teeth. The static stress for cast steel may be taken as 56 MPa. The width of face may be taken as 3 times the normal pitch. What would be end thrust on the gear? The tooth is of 20^0 full depth involute.	14M	5	L3

END