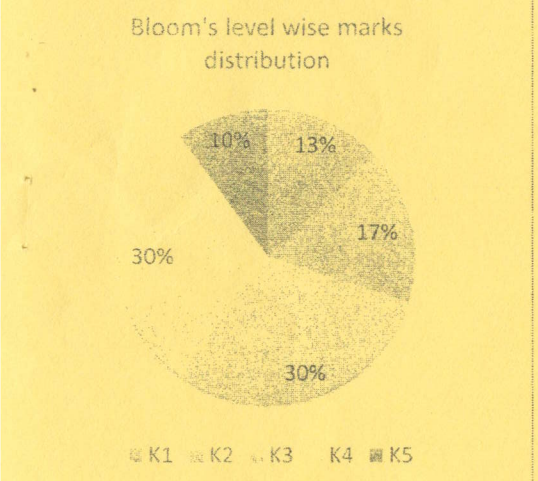
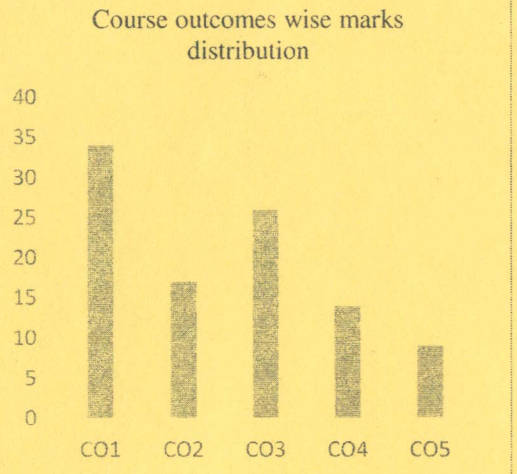
M 14/06/24 · 165

CO- Course Outcomes, **KL**- Knowledge Level, **PO** – Program Outcome

Course Outcomes	CO1	Understand the basic heat transfer fundamentals and their practical relevance in Planes, Cylinders and Spherical components.
	CO2	Analyse the Fin heat transfer concepts.
	CO3	Understand the basic of free and forced convection.
	CO4	Analyse the performance of heat exchanger.
	CO5	Formulate radiation mode of heat transfer for the surfaces.

GRAFICAL REPRESENTATION





ARKA JAIN University Jharkhand — NAAC GRADE A

END SEM EXAMINATION
School of Engineering & IT

Branch	Mechanical Engineering	Program	Diploma
Subject Name	Heat Transfer	Semester	IV
		Year	June 2024

Time: 3 Hour
Max. Marks : 70

- Start writing from 2nd page onwards; **don't Write on the 1st Page Backside**
- **Answer all Questions of Section A (Compulsory)**
- **Answer Any Four out of Six of Section B**
- **Answer Any Three out of Five of Section C**
- **Possession of Mobile Phone** or any kind of **Written Material, Arguments with the Invigilator or Discussion with Co-Student** will comes under **Unfair Means** and will **Result** in the **Cancellation of the Paper(s)**.

Knowledge Level (KL)			
	K1 : Remembering	K3 : Applying	K5 : Evaluating
	K2 : Understanding	K4 : Analysing	K6 : Creating

Section A (Each question Carry 02 Marks from Q1-i to x – 20 Marks)

Q. N 1	QUESTIONS	Marks	COs	KL
i	State Fourier law of conduction with its assumptions.	2	CO1	K2
ii	State Newtons law of cooling.	2	CO3	K2
iii	What are the applications of heat exchangers?	2	CO4	K1
iv	Write down the expression of LMTD for Parrel flow.	2	CO5	K1
v	Define Nusselt number with its physical significance.	2	CO3	K1
vi	Explain the concept of thermal diffusivity.	2	CO1	K2
vii	What do you mean by natural or free convective?	2	CO3	K2
viii	Define fins or extended surfaces.	2	CO2	K2
ix	Explain Fouling Factor or scaling of heat exchanger.	2	CO4	K1
x	What is Stefan-Boltzmann law?	2	CO5	K2

Section B (Answer any FOUR out of SIX) – 20 Marks
(Each question Carry 05 Marks)

Q. No.	QUESTIONS	Marks	COs	KL
2	Define: Reynolds number and Prandtl number with its physical significance.	05	CO3	K1
3	How does turbulent flow differ from laminar flow? For which flow is the heat transfer coefficient higher?	05	CO3	K4
4	Calculate the rate of heat transfer per unit area through a copper plate 50mm thick, whose one face is maintained at 320°C and the other face at 70°C. Take thermal conductivity of copper is 320W/m°C.	05	CO1	K4
5	Explain the thermal analysis of heat exchanger.	05	CO5	K2
6	Derive the expression for heat conduction equation for plane wall.	05	CO1	K5
7	What is critical radius of insulation? Calculate the critical radius if insulation for asbestos [k= 0.178 W/mk] surrounding a pipe and exposed to room air at 303K with h=3.2W/mk.	05	CO2	K5

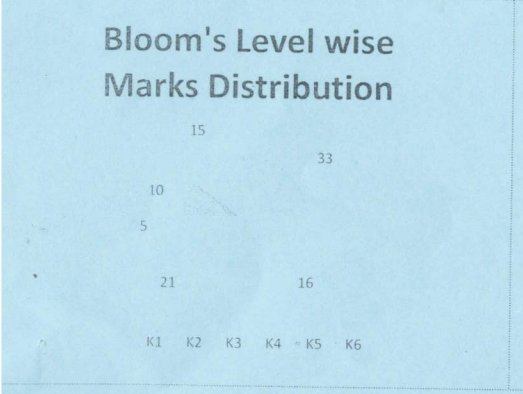
Section C (Answer any THREE out of FIVE) – 30 Marks-
(Each question Carry 10 Marks)

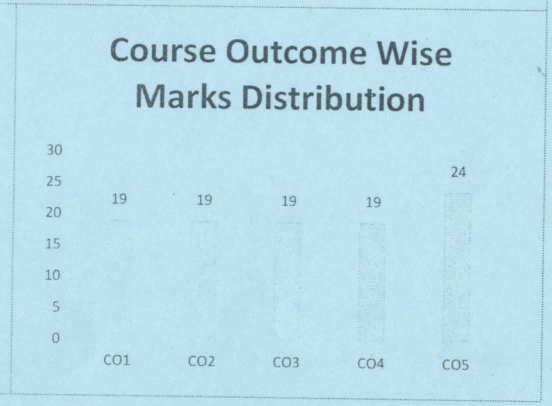
Q. No.	QUESTIONS	Marks	COs	KL
8	Calculate the rate of heat loss through the vertical walls of a boiler furnace of size 4 m× 3 m × 3 m high. The walls are constructed from an inner fire brick wall 25 cm thick of thermal conductivity 0.4 W/mK, a layer of ceramic blanket insulation of thermal conductivity 0.2 W/mK and 8 cm thick, and a steel protective layer of thermal conductivity 55 W/mK and 2 mm thick. The inside temperature of the fire brick layer was measured at 600°C and the temperature of the outside of the insulation 60°C.	10	CO1	K3
9	A long 45mm diameter copper rod (k = 3700W/m°C) extends horizontally from a plane heated wall at 130°C. The temperature of the surrounding is 20°C and the convective heat transfer coefficient is 11.0W/m²°C. Determine the heat loss. [Consider: The fin is infinite long]	10	CO2	K3
10	An oil cooler for a lubrication system has to cool 1000kg/h of oil (cp= 2.09kJ/kg°C) from 80°C to 40°C by using a cooling flow of 1000kg/h at 30°C. Give your choice for a parallel flow or counter flow heat exchanger with reasons. Calculate the surface area of the heat exchanger, if the overall heat transfer coefficient is 24W/m²°C. [take; Cp of water = 4.18kJ/kg°C	10	CO3	K3
11	What is boundary layer thickness? What do you mean by laminar and turbulent boundary layers? What is laminar sublayer?	10	CO3	K4
12	Derive general heat conduction equation for Cartesian Coordinates.	10	CO1	K4

CO- Course Outcomes, **KL**- Knowledge Level, **PO** – Program Outcome

Course Outcomes	[CO1]	Identify the components of an automobile with their working
	[CO2]	Explain the concepts of cooling and lubricating systems.
	[CO3]	Identify different suspension systems and their applications.
	[CO4]	Explain the concepts of Ignition and Transmission and steering systems.
	[CO5]	Differentiate the special vehicles according to the usage.

GRAFICAL REPRESENTATION





M 19/06/24 160

JGi ARKA JAIN University Jharkhand — NAAC GRADE A — ACCREDITED UNIVERSITY

END SEM EXAMINATION
School of Engineering & IT

Branch	Mechanical Engineering	Program	Diploma
Subject Name	Refrigeration and Air Conditioning	Semester	IV
		Year	June 2024

Time: 3 Hour
Max. Marks : 70

- Start writing from 2nd page onwards; **don't Write on the 1st Page Backside**
- **Answer all Questions of Section A (Compulsory)**
- **Answer Any Four out of Six of Section B**
- **Answer Any Three out of Five of Section C**
- **Possession of Mobile Phone or any kind of Written Material, Arguments with the Invigilator or Discussion with Co-Student will comes under Unfair Means and will Result in the Cancellation of the Paper(s).**

Knowledge Level (KL)	**K1** : Remembering	**K3** : Applying	**K5** : Evaluating
	K2 : Understanding	**K4** : Analysing	**K6** : Creating

Section A (Each question Carry 02 Marks from Q1-i to x) – 20 Marks

Q. N 1	QUESTIONS	Marks	COs	KL	PO
i	What is meant by air conditioning?	2	CO1	K1	PO2
ii	Why Co-efficient of Performance is greater than 1?	2	CO1	K2	PO1
iii	Differentiate between C.O.P. and efficiency.	2	CO2	K1	PO2
iv	Describe the closed or dense air refrigeration systems.	2	CO2	K2	PO3
v	Define ram efficiency.	2	CO3	K3	PO1
vi	What is meant by refrigeration? Illustrates the necessity and application of refrigeration systems?	2	CO3	K1	PO2
vii	Explain the term "Ton of refrigeration".	2	CO4	K3	PO2
viii	Differentiate between heat engine, refrigerator and heat pump.	2	CO4	K1	PO3
ix	Write the refrigeration needs of air crafts.	2	CO5	K2	PO2
x	What are the merits and demerits in air refrigeration system?	2	CO5	K3	PO1

Section B (Answer any FOUR out of SIX) – 20 Marks
(Each question Carry 5 Marks)

Q. No.	QUESTIONS	Marks	COs	KL	PO
2	Describe the open-air refrigeration systems with its T-s diagram.	5	CO1	K4	PO2
3	Refrigerator working on Bell-Coleman cycle operates between pressure limits of 2 bar and 10 bar. Air is drawn from the cold chamber at 5°C, compressed and, then it is cooled by 20°C before entering the expansion cylinder. The expansion and compression follow the law PV^{γ}= Constant. Determine the theoretical C.O.P of the system?	5	CO2	K3	PO3
4	In refrigerating plant, water at 20°C is producing ice at -5°C at 5000kg per day. The temperature range in the compressor is 20°C and -5°C. Calculate the power required to drive the compressor. Latent heat of ice is 350 KJ/kg, specific heat of ice is 2.6KJ/kgK.	5	CO3	K6	PO1
5	What are the various methods of air refrigeration system in air craft? Draw a T-S diagram of reduced ambient air-cooling system.	5	CO4	K1	PO3
6	Describe the closed refrigeration systems. Draw the schematic of a boot-strap cycle of air refrigeration system, and show the cycle on T-S diagram.	5	CO5	K1	PO1
7	Explain with a flow diagram, the working of aqua-ammonia vapour absorption refrigeration system.	5	CO5	K1	PO3

Section C (Answer any THREE out of FIVE) – 30 Marks
(Each question Carry 10 Marks)

Q. No.	QUESTIONS	Marks	COs	KL	PO
8	Derive the expression for COP of air refrigeration system working on Bell-Coleman cycle.	10	CO1	K5	PO1
9	A cold storage is to be maintained at -50C while the surroundings are at 350C. The heat leakage from the surroundings into the cold storage is estimated to be 29KW. The actual C.O.P. of the refrigeration plant is one third of an ideal plant working between the same temperatures. Find the power required to drive the plant?	10	CO2	K6	PO3
10	Refrigerator working on Bell-Coleman cycle operates between pressure limits of 1.05 bar and 8.5 bar. Air is drawn from the cold chamber at 100C, compressed and, then it is cooled to 300C before entering the expansion cylinder. The expansion and compression follow the law PV1.3 = Constant. Determine the theoretical C.O.P of the system?	10	CO3	K2	PO2
11	Derive the expression for air refrigeration system working on reversed Carnot cycle.	10	CO4	K3	PO2
12	Explain the influence of various parameters on refrigeration system performance.	10	CO5	K1	PO1

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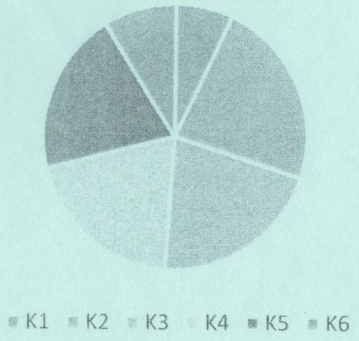
CO- Course Outcomes, **KL**- Knowledge Level, **PO** – Program Outcome

Course Outcomes	CO1	[CO1] Understand phenomena occurring in high speed compressible flows.
	CO2	[CO2] Apply various practical power cycles and heat pump cycles.
	CO3	[CO3] Analyze energy conversion in various thermal devices such as combustors, air coolers, nozzles, diffusers, steam turbines and reciprocating compressors
	CO4	[CO4] Evaluate the air quality after humidification or dehumidification using psychometric chart.
	CO5	
	CO6	

GRAFICAL REPRESENTATION

Bloom's level wise Marks Distribution



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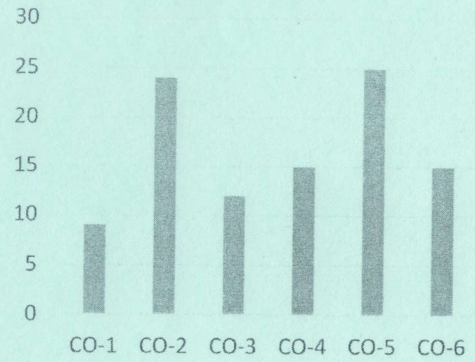

ARKA JAIN University Jharkhand — NAAC GRADE A — ACCREDITED UNIVERSITY

END SEM EXAMINATION
School of Engineering & IT

Branch	**Mechanical Engineering**	**Program**	**Diploma**
Subject Name	**Thermal Engineering II**	**Semester**	**IV**
		Year	**June 2024**

Time: 3 Hour
Max. Marks : 70

- Start writing from 2nd page onwards; **don't Write on the 1st Page Backside**
- **Answer all Questions of Section A (Compulsory)**
- **Answer Any Four out of Six of Section B**
- **Answer Any Three out of Five of Section C**
- **Steam table (data book) may accepted**
- **Possession of Mobile Phone** or any kind of **Written Material, Arguments with the Invigilator or Discussion with Co-Student** will comes under **Unfair Means** and will **Result** in the **Cancellation of the Paper(s).**

Knowledge Level (KL)			
	K1 : Remembering	**K3 :** Applying	**K5 :** Evaluating
	K2 : Understanding	**K4 :** Analysing	**K6 :** Creating

Section A (Each question Carry 02 Marks from Q1-i to x – 20 Marks)

Q. N 1	QUESTIONS	Marks	COs	KL
i	Enumerate the various uses of gas turbines.	2	co1	KL1
ii	What is a triple point ?	2	co1	KL 1
iii	How Dryness fraction of steam is defined	2	co1	KL 1
iv	How are boilers classified ?	2	co 2	KL 2
v	List the primary requirements of steam generators.	2	co 1	KL 1
vi	What do you mean by the term 'gas turbine' ? How are gas turbines classified ?	2	co 2	KL 2
vii	State the merits of gas turbines over I.C. engines and steam turbines	2	co 1	KL 1
viii	What is Latent heat of steam	2	co 2	KL 2
ix	How are boilers classified ?	2	co 2	KL 2
x	What is sensible heat of steam	2	co 2	KL 3

Section B (Answer any FOUR out of SIX) – 20 Marks
(Each question Carry 05 Marks)

Q. No.	QUESTIONS	Marks	COs	KL
2	State the differences between the following boilers : (i) Externally fired and internally fired. (ii) Forced circulation and natural circulation. (iii) High pressure and low pressure. (iv) Stationary and portable. (v) Single tube and multi-tube.	05	co2	KL 2
3	Explain the following boiler terms: Shell, setting, grate, furnace, water space and steam space, mountings, accessories, water level, foaming, scale, blowing off, lagging, refractory.	05	co 2	KL 2
4	Determine the amount of heat, which should be supplied to 2 kg of water at 25°C to convert it into steam at 5 bar and 0.9 dry. At 5 bar : From steam tables, hf = 640.1 kJ/kg ; hfg = 2107.4 kJ/kg	05	co 3	KL 3
5	What amount of heat would be required to produce 4.4 kg of steam at a pressure of 6 bar and temperature of 250°C from water at 30°C ? Take specific heat for superheated steam as 2.2 kJ/kg K.	05	co 3	KL 3
6	Draw a neat sketch of throttling calorimeter and explain how dryness fraction of steam is determined	05	Co2	KL2
7	Give the comparison between 'Fire-tube and Water-tube' boilers.	05	Co1	KL1

Section C (Answer any THREE out of FIVE) – 30 Marks-
(Each question Carry 10 Marks)

No.	QUESTIONS	Marks	COs	COs
8	Draw a neat sketch of a locomotive boiler and label the parts. Explain also its working	10	co 3	KL 3
9	Explain with neat sketches any two of the following boiler accessories : (i) Injector (ii) Superheater (iii) Air preheater (iv) Economiser	10	co 4	KL4
10	Explain the working difference between propeller-jet, turbo-jet and turbo-prop.	10	co 4	KL 4
11	Describe with neat diagram, the construction and working of a babcock and wilcox water tube boiler	10	co 4	KL 4
12	Explain with neat sketches any three of the following mountings : (i) Water level indicator (ii) Pressure gauge (iii) Feed check valve (iv) Blow-off cock (v) High steam and low water safety valve (vi) Junction or stop valve.	10	co 3	KL 3

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ARKA JAIN University, Jharkhand — NAAC GRADE A, ACCREDITED UNIVERSITY			END SEM EXAMINATION School of Engineering & IT
Branch	Mechanical Engineering	Program	Diploma
Subject Name	Manufacturing Technology -II	Semester	IV
		Year	June 2024
Time: 3 Hour Max. Marks : 70	• Start writing from 2nd page onwards; **don't Write on the 1st Page Backside** • **Answer all Questions of Section A (Compulsory)** • **Answer Any Four out of Six of Section B** • **Answer Any Three out of Five of Section C** • **Possession of Mobile Phones** or any kind of **Written Material, Arguments with the Invigilator or Discussing with Co-Student** will comes under **Unfair Means** and will **Result** in the **Cancellation of the Papers.**		
Knowledge Level (KL)	**K1** : Remembering	**K3** : Applying	**K5** : Evaluating
	K2 : Understanding	**K4** : Analysing	**K6** : Creating

Section A (Each question Carry 02 Marks from Q1- i to x) – 20 Marks

Q. N 1	QUESTIONS	Marks	COs	KL	PO
i	Enlist the name of different types of chip formed during operation?	2	CO1	K1	PO2
ii	Explain the metal removing process with suitable diagram?	2	CO1	K1	PO2
iii	Define taper turning methods?	2	CO1	K1	PO3
iv	Explain tool life?	2	CO1	K1	PO3
v	Explain surface grinding?	2	CO1	K1	PO4
xi	Define a Tapping Operation?	2	CO1	K1	PO3
xii	Define centre less grinding?	2	CO1	K1	PO2
xiii	Explain single point cutting tool?	2	CO1	K1	PO3
ix	Define Orthogonal metal cutting?	2	CO1	K1	PO2
x	What do you understand by machining?	2	CO1	K1	PO3

Section B (Answer any FOUR out of SIX) – 20 Marks
(Each question Carry 5 Marks)

Q. No.	QUESTIONS	Marks	COs	KL	PO
3	Write a short note on tool wear and tool life.	5	CO1	K2	PO3
4	Enlist different operation that can be performed on lathe machine. Explain any one of them with neat sketch?	5	CO1	K3	PO2
5	Differentiate between orthogonal cutting or oblique cutting?	5	CO1	K4	PO3
6	Enlist different operation that can be performed on Milling machine. Explain any one of them with neat sketch?	5	CO1	K4	PO4
7	Explain Shielded Metal Arc Welding Process with neat sketch?	5	CO1	K4	PO3
8	Draw a schematic diagram of Shaper machine with all main parts?	5	CO1	K5	PO4

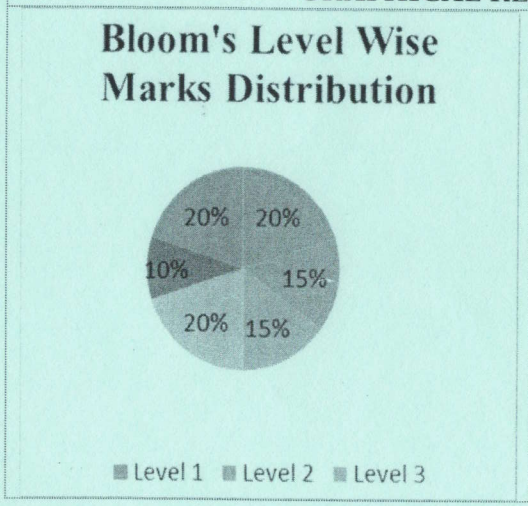
Section C (Answer any THREE out of FIVE) – 30 Marks-
(Each question Carry 10 Marks)

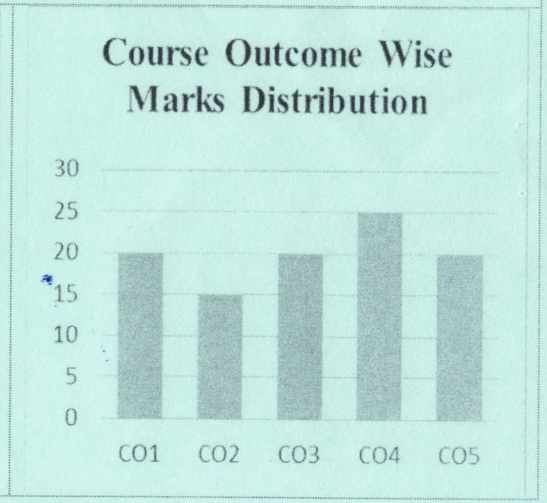
Q. No.	QUESTIONS	Marks	COs	KL	PO
9	Write the Working Principle of Shaper Machine with net sketch	10	CO1	K5	PO3
10	Write the Working Principle of Centre lathe Machine with net sketch	10	CO1	K2	PO4
11	What are drilling, boring and reaming operations? Explain different types of drilling machines.	10	CO1	K3	PO3
12	What is milling operation? Also explain different types of milling Process with diagram.	10	CO1	K5	PO4
13	What are CNC machines? Enlist different components, advantages and limitations of CNC machines.	10	CO1	K1	PO5

CO- Course Outcomes, **KL**- Knowledge Level, **PO** – Program Outcome

Course Outcomes	CO1	Apply the specific manufacturing process for getting the desired type of output.
	CO2	Evaluate the entire manufacturing process involved in manufacturing components.
	CO3	Analyse the process of casting, forging and welding required for specific condition
	CO4	Understand the basic manufacturing processes for manufacturing different components.
	CO5	Apply the specific manufacturing process for getting the desired type of output.

GRAPHICAL REPRESENTATION





M 21/06/24 160

ARKA JAIN University, Jharkhand — NAAC GRADE A, ACCREDITED UNIVERSITY				END SEM EXAMINATION School of Engineering & IT
Branch	Mechanical Engineering		Program	Diploma
Subject Name	Measurement & Metrology		Semester	IV
			Year	June 2024
Time: 3 Hour Max. Marks : 70	• Start writing from 2nd page onwards; **don't Write on the 1st Page Backside** • **Answer all Questions of Section A (Compulsory)** • **Answer Any Four out of Six of Section B** • **Answer Any Three out of Five of Section C** • **Possession of Mobile Phones** or any kind of **Written Material, Arguments with the Invigilator or Discussing with Co-Student** will comes under **Unfair Means** and will **Result** in the **Cancellation of the Papers**.			
Knowledge Level (KL)	**K1 :** Remembering	**K3 :** Applying	**K5 :** Evaluating	
	K2 : Understanding	**K4 :** Analysing	**K6 :** Creating	

Section A (Each question Carry 02 Marks from Q1-i to Q1-x) – 20 Marks

Q. N 1	QUESTIONS	Marks	COs	KL	PO
i	Define the term of measurement?	2	CO2	KL1	PO1
ii	What do you understand by the term of metrology?	2	CO3	KL5	PO3
iii	How can you control the quality using measuring tools?	2	CO3	KL1	PO1
iv	What is the error in measurements?	2	CO5	KL1	PO1
v	Define the term Sensitivity.	2	CO5	KL1	PO1
vi	What is difference between accuracy and precision.	2	CO3	KL5	PO2
vii	What is the exact meaning of calibration?	2	CO3	KL1	PO3
viii	What is the Sine Bar?	2	CO1	KL1	PO1
ix	Explain the term Random errors.	2	CO1	KL1	PO1
x	What is the Repeatability?	2	CO1	KL1	PO1

Section B (Answer any FOUR out of SIX) – 20 Marks
(Each question 5 Marks)

Q. No.	QUESTIONS	Marks	COs	KL	PO
2	What is metrology and types of metrology?	5	CO3	KL2	PO3
3	Differentiate between open loop and close loop control system.	5	CO3	KL2	PO2
4	What is error and classify the errors in measurement system.	5	CO4	KL4	PO4
5	Define measurement, Explain Significance of measurement, Define calibration	5	CO2	KL4	PO1
6	Explain any one type of gear profile measuring instrument	5	CO4	KL2	PO2
7	Calculate the least count of Vernier calliper. Enlist the name of different types of errors in measurement	5	CO3	KL2	PO2

Section C (Answer any THREE out of FIVE) – 30 Marks-
(Each question Carry 10 Marks)

Q. No.	QUESTIONS	Marks	COs	KL	PO
8	Explain Standards of measurements: Primary & Secondary, Define accuracy and precision	10	CO2	KL3	PO1
9	Explain Factors influencing selection of measuring instruments, Explain Significance of measurement.	10	CO1	KL2	PO1
10	What is bevel protector and explain its working principle with neat & clean diagram	10	CO5	KL4	PO4
11	What is comparators explain any one types of comparator with neat and clean diagram	10	CO5	KL3	PO4
12	Define transducer, Explain Types and working of transducer. Explain Selection factor of transducer	10	CO5	KL1	PO4

CO- Course Outcomes, **KL**- Knowledge Level, **PO** – Program Outcome

Course Outcomes	CO1	Define accuracy, precision, calibration, sensitivity, repeatability and such relevant terms in metrology
	CO2	Distinguish between various types of errors.
	CO3	Understand the principle of operation of an instrument and select suitable measuring device for a particular application.
	CO4	Explain the concept of calibration of an instrument.
	CO5	Analyse and interpret the data obtained from the different measurements processes and present it in the graphical form, statistical form.

GRAFICAL REPRESENTATION