

E 19/06/24 60



ARKA JAIN
University
Jharkhand



END SEM EXAMINATION
School of Engineering & IT

Branch	Mechanical Engineering	Program	B. Tech
Subject Name	Mechanical Measurement and Control	Semester	IV
		Year	June 2024
Time: 3 Hour Max. Marks : 70	<ul style="list-style-type: none"> 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 <u>Mobile Phones</u> or any kind of <u>Written Material, Arguments with the Invigilator or Discussing with Co-Student</u> will come under <u>Unfair Means</u> and will <u>Result in the Cancellation of the Papers.</u> 		
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	Write difference between Resolution and Static sensitivity.	2	CO1	K1	PO2	
ii	Enlist different Pressure measuring devices.	2	CO2	K3	PO2	
iii	What are RTDs?	2	CO2	K4	PO3	
iv	Write difference between accuracy and precision.	2	CO3	K2	PO3	
v	Enlist different Torque measuring devices.	2	CO5	K3	PO2	
vi	Write a model equation for extension of helical Spring?	2	CO4	K3	PO2	
vii	Enlist components of a pneumatic control system.	2	CO2	K1	PO3	
viii	What are the advantages of close loop control system.	2	CO3	K3	PO3	
ix	What is feedforward control system?	2	CO5	K4	PO4	
x	Explain inverting amplifiers.	2	CO4	K2		

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

CO- Course Outcomes,

KL- Knowledge Level,

PO – Program Outcome

Q.No.	QUESTIONS	Marks	COs	KL	PO
2	Explain working of linear and rotary potentiometers with the help of neat diagram.	5	CO1	K4	PO2
3	What is Strain Gauge? How strain gauges are used for force measurement. Explain with suitable diagrams.	5	CO2	K2	PO2
4	Define the term 'transducer'. Explain active and passive transducers with example.	5	CO2	K3	PO3
5	Explain working of any one flow measuring device which gives output in electrical form.	5	CO3	K3	PO3
6	Write difference between open loop and close loop control system with diagram.	5	CO5	K1	PO3
7	What factors should be considered for system modeling? Derive an equation for variation in height of liquid in a tank. Assume suitable data.	5	CO4	K2	PO4

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

Q.No.	QUESTIONS	Marks	COs	KL	PO
8	What are proximity/ displacement sensors? Explain construction and working of LVDT as displacement sensor.	10	CO2	K4	PO3
9	What do you understand by Thermocouple, Thermistors and RTDs? Explain working of thermocouple and also write Different Laws of Thermocouple.	10	CO3	K2	PO2
10	Write a note on signal conditioning and explain roles of amplifiers, filters and bridges in signal conditioning.	10	CO5	K3	PO2
11	What do you understand by strain gauges? Explain working of half Poisson bridge and full bridge configuration of strain gauges.	10	CO4	K3	PO3
12	Explain Following controllers i) Proportional (P) controller ii) proportional integral (PI) controller iii) Proportional Differential (PD) Controller and iv) Proportional Integral differential (PID) Controller.	10	CO2	K1	PO3

Course Outcomes	CO1	CO2	CO3	CO4	CO5
Remember the measurement systems, units and dimensions, calibration and correction.					
Understand the concept of interchangeability and explain the various linear and angular measurement systems.					
Apply the working principle of auto collimator, CMM and list the applications of them					
Apply the various form measurements like thread, gear, straightness, flatness, roundness and surface finish					
Analyze the working of miscellaneous measuring equipment for measuring temperature, velocity, pressure.					

GRAFICAL REPRESENTATION

Bloom's Level wise Marks Distribution

Course Outcome Wise Marks Distribution



K1 K2 K3 K4 K5 K6
CO1 CO2 CO3 CO4 CO5



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GRADE A
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END SEM EXAMINATION
School of Engineering & IT

Branch	Mechanical Engineering	Program	B. Tech
Subject Name	Fluid Mechanics and Machinery	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 come under Unfair Means and will Result in the Cancellation of the Paper(s).

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

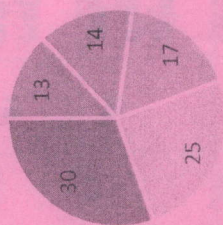
Section A (Each question Carry 02 Marks from Q1-i to x - 20 Marks)			
Q. N1	QUESTIONS	Marks	COs
i	Define Newton's law of viscosity.	2	CO1
ii	Define Buckingham's π -Theorem used in dimension analysis.	2	CO5
iii	Which property of the fluid accounts for the major losses in pipes?	2	CO2
iv	Write difference between Laminar and Turbulent Flow.	2	CO4
v	Write statement for Bernoulli's theorem. Also write mathematical equation for same.	2	CO3
vi	Make a list of minor losses in Pipes?	2	CO3
vii	Which of the two, bubble or liquid jet, will have greater pressure difference on the inside and outside. Justify your answer.	2	CO1
viii	Write difference between centrifugal and reciprocating pump.	2	CO2
ix	How to calculate force exerted by the jet on the plate in the direction of jet?	2	CO1
x	Write difference between impulse turbine and reaction turbine?	2	CO2

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

CO1	Remember various properties of fluids in solving the problems
CO2	Understand working of pumps and turbines.
CO3	Apply Bernoulli's equation for solutions in fluids
CO4	Analyse fluid forces - drags and lift on immersed bodies
CO5	Evaluate the dimensionless parameters.

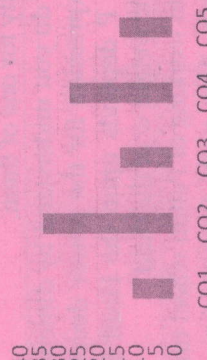
GRAFICAL REPRESENTATION

Bloom's level wise Marks Distribution



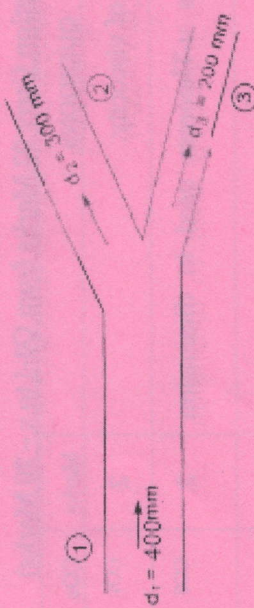
■ K1 ■ K2 ■ K3 ■ K4 ■ K5

Course outcome wise Marks Distribution

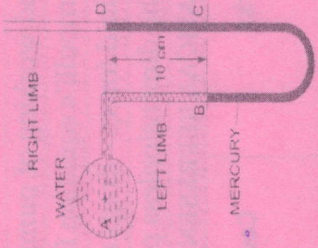


CO1 CO2 CO3 CO4 CO5

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

Q. No.	QUESTIONS	Marks	COs	KL
2	Define these terms a) Density b) Specific Gravity c) Specific Weight d) specific volume. Also calculate Sp. Weight and Sp. Gravity for cruid oil which wight 9.4 N for one litre.	05	CO1	K1
3	A pipe (1) 400 mm in diameter branches into two pipes (2) and (3) of diameters 300 mm and 200 mm respectively. If the average velocity in 400 mm diameter pipe is 3.5 m/s. Find (i) Discharge through 450 mm dia. Pipe and (ii) velocity in 200 mm diameter pipe if the average velocity in 300 mm pipe is 2.5 m/s.	05	CO1	K3
				
4	Define surface tension. Also write expression for pressure inside a soap bubble, droplet and jet of liquid.	05	CO3	K4
5	Find the expression using dimensional analysis for the power P, developed by a pump when P depends upon the head H, the discharge Q and Specific weight w of the fluid.	05	CO5	K3
6	Draw a schematic diagram of reciprocating pump and explain its working principle.	05	CO2	K2
7	Draw Velocity Triangle for inward flow reaction turbine and name each components. Also derive equation for work done by unite weight of water flowing through the turbine. Assume suitable data if needed.	05	CO2	K5

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

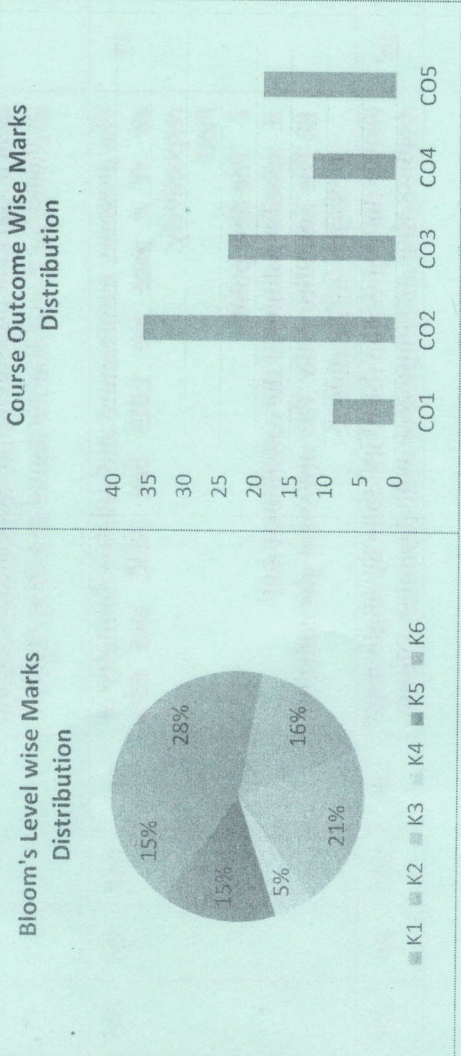
Q. No.	QUESTIONS	Marks	COs	KL
8	Define Absolute pressure, Gauge Pressure and Vacuum Pressure with help of sketch. Calculate the gauge pressure and absolute pressure inside the pipe for shown in fig. Take atmospheric pressure as 101.325KPa.	10	CO1	K3
				
9	Explain the principle of venturimeter, Orifice meter and Pitot Tube with diagram. Derive equation for flow velocity for one of them.	10	CO3	K4
10	What do you understand by dimensional analysis? Find the expression for the power developed, P by a pump when P depends upon the Head H, Discharge Q and specific weight w of the fluid.	10	CO5	K4
11	Explain working of Pelton wheel turbine with schematic diagram. Also write formula for different efficiencies involved in calculation of performance of a turbine.	10	CO2	K3
12	Define the term manometry efficiency, mechanical efficiency and overall efficiency in context of centrifugal pump. The internal and external diameters of the impeller of a centrifugal pump are 150mm and 300mm respectively. The pump is running at 1200 rpm. The vane angle of the impeller at inlet and outlet are 20° and 30° respectively. The water enters the impeller radially and velocity of flow is constant. Determine the work done by the impeller per unit weight of water.	10	CO4	K5

Branch	Mechanical Engineering	Program	B. Tech
Subject Name	Applied Thermodynamics	Semester	IV
		Year	June 2024
Time: 3 Hour Max. Marks: 70	<ul style="list-style-type: none"> 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 / Refrigeration Table/ Gas Table is allowed Possession of Mobile Phones or any kind of Written Material, Arguments with the Invigilator or Discussing with Co-Student will come under <u>Unfair Means</u> 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. N1	QUESTIONS	Marks	COs	KL	PO
i	What is enthalpy of formation (ΔH_f) = ?	2	CO1	K1	PO2
ii	What is a chemical fuel?	2	CO1	K2	PO1
iii	Define specific steam consumption of an ideal Rankine cycle.	2	CO2	K1	PO2
iv	What is meant by isentropic efficiency?	2	CO2	K2	PO3
v	Define air standard cycle efficiency.	2	CO2	K3	PO1
vi	Define tonne of refrigeration.	2	CO3	K1	PO2
vii	Define refrigerant.	2	CO3	K3	PO2
viii	Define moist air.	2	CO4	K1	PO3
ix	Define specific humidity.	2	CO5	K2	PO2
x	Classify the various types of air compressors.	2	CO5	K3	PO1

CO- Course Outcomes,	KL- Knowledge Level,	PO – Program Outcome
CO1	Understand phenomena of energy conversion in various thermal devices, occurring in high-speed compressible flows.	
CO2	Apply various practical vapor, power cycles and refrigeration cycles.	
CO3	Evaluate the air quality after humidification or dehumidification using psychometric chart.	
CO4	Analyse the Stagnation properties of choked flow, subsonic and supersonic flows and normal shocks	
CO5	Analyze energy conversion in reciprocating compressors	

GRAFICAL REPRESENTATION



Section B (Answer any FOUR out of SIX) - 20 Marks

(Each question Carry 5 Marks)

Q. No.	QUESTIONS	Marks	COs	KL	PO
2	The percentage composition of sample of liquid fuel by weight is, $C = 84.8$ per cent, and $H_2 = 15.2$ per cent. Calculate (i) the weight of air needed for the combustion of 1 kg of fuel; (ii) the volumetric composition of the products of combustion if 15 per cent excess air is supplied.	5	CO1	K4	PO2
3	A steam power plant uses steam as working fluid and operates at a boiler pressure of 5 MPa, dry saturated and a condenser pressure of 5 kPa. Determine the cycle efficiency for (a) Carnot cycle (b) Rankine cycle. Also show the T-s representation for both the cycles.	5	CO2	K3	PO3
4	Draw the Diesel cycle on p-v and T-s diagram. Also derive expression for air standard efficiency with usual notations for the cycle	5	CO2	K6	PO1
5	Explain the different methods of improving the COP of simple vapour compression refrigeration cycle.	5	CO3	K1	PO3
6	Mention the chemical formula and the refrigerant number of following refrigerants: (i) Dichloro difluoro methane, (ii) Dichloro tetrafluoro ethane, (iii) propylene, (iv) ethylene (v) sulphur dioxide	5	CO3	K1	PO1
7	List out the various psychrometric properties of air and explain each.	5	CO5	K5	PO2

Section C (Answer any THREE out of FIVE) - 30 Marks-

(Each question Carry 10 Marks)

Q. No.	QUESTIONS	Marks	COs	KL	PO
8	A steam power plant works on an ideal reheat cycle utilizes steam at 100 bar & 400°C expanded in the high-pressure turbine to 15 bars. After this, it is reheated to 350°C at 15 bar and then expanded in the low-pressure turbine to the condenser pressure of 0.5 bar. Determine the thermal efficiency and steam rate	10	CO2	K5	PO1

9	An engine of 250 mm bore and 375 mm stroke works on constant volume cycle. The clearance volume is 0.00263 m ³ . The initial pressure and temperature are 1 bar and 50°C. If the maximum pressure is 25 bar, determine (i) The air standard efficiency of the cycle and (ii) The mean effective pressure.	10	CO2	K6	PO3
10	A vapour compression refrigerator uses R-12 as refrigerant and the liquid evaporates in the evaporator at -15°C. The temperature of this refrigerant at the delivery from the compressor is 150C when the vapour is condensed at 10°C. Find the coefficient of performance if the liquid is cooled by 5°C before expansion by throttling. Take specific heat at constant pressure for the superheated vapour as 0.64kJ/kg K and that for liquid as 0.94 kJ/kg K.	10	CO3	K2	PO2
11	The pressure, temperature and relative humidity of air at a pace are 1.013 bar, 320C and 65% respectively. Find i. The dew point. ii. specific volume of the constituent and iii. The humidity ratio. The universal gas constant. $R = 8.3143 \text{ kJ/kg mole K.}$	10	CO4	K3	PO2
12	Derive the expression for Work done by single stage reciprocating air compressor with clearance volume.	10	CO5	K1	PO1

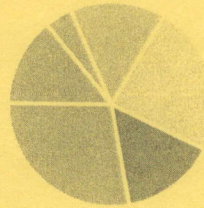
Branch	Mechanical Engineering	Program	B. Tech
Subject Name	Theory of Machine	Semester	IV
		Year	June 2024
Time: 3 Hour Max. Marks : 70	<ul style="list-style-type: none"> Start writing from 2nd page onwards; don't Write on the 1st Page Backside Answer all Questions of Section A (Compulsory) Answer Any Four out of Six of Section B Answer Any Three out of Five of Section C Possession of <u>Mobile Phone</u> or any kind of <u>Written Material, Arguments with the Invigilator or Discussion with Co-Student</u> will come under <u>Unfair Means</u> and will <u>Result</u> in the <u>Cancellation of the Paper(s)</u>. 		
Knowledge Level (KL)	K1 : Remembering	K3 : Applying	K5 : Evaluating
	K2 : Understanding	K4 : Analysing	K6 : Creating

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

CO1	To make the student conversant with commonly used mechanism for industrial application.
CO2	To develop competency in drawing velocity and acceleration diagram for simple and complex mechanism.
CO3	To develop analytical competency in solving kinematic problems using complex algebra method.
CO4	To develop competency in graphical and analytical method for solving problems in static and dynamic force analysis.
CO5	To develop competency in conducting laboratory experiments for finding moment of inertia of rigid bodies.

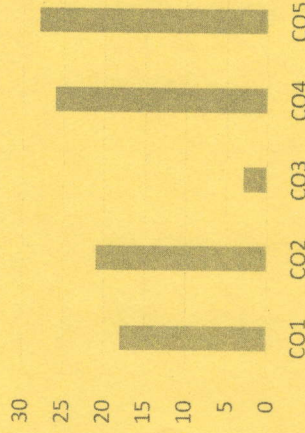
GRAFICAL REPRESENTATION

Bloom's Level wise Marks Distribution



■ K1 ■ K2 ■ K3 ■ K4 ■ K5 ■ K6

Course Outcome Wise Marks Distribution



Q. N1	QUESTIONS	Marks	COs	KL
i	What is the function of flywheel?	2	CO1	K2
ii	What do you mean by sensitiveness and stability of governor?	2	CO1	K2
iii	Explain the superposition theorem applicable to a system of forces acting on a mechanism?	2	CO2	K3
iv	What do you mean by degree of freedom?	2	CO2	K2
v	How are Kinematic pair classified?	2	CO1	K1
vi	Write a short note on gyroscope.	2	CO3	K3
vii	What is the function of Dynamometers?	2	CO2	K1
viii	Name the different types of brake.	2	CO5	K2
ix	Define coefficient of fluctuation of energy.	2	CO5	K1
x	What is the function of a governor?	2	CO4	K2

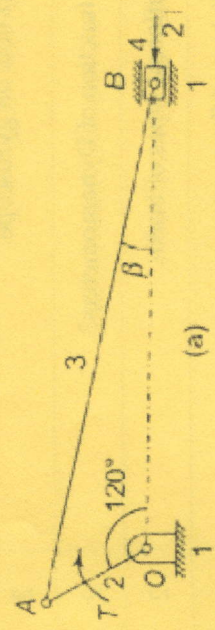
Section A (Each question Carry 02 Marks from Q1-i to x – 20 Marks)

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

No.	QUESTIONS	Mar ks	COs	KL
2	Discuss the gyroscopic effect on sea vessels.	05	CO2	K3
3	Explain the difference between mechanism and machine.	05	CO3	K3
4	What is meant by a self-locking and a self-energised brake.	05	CO3	K2
5	What do you mean by spin, precession and gyroscopic planes?	05	CO4	K3
6	What is the function of a governor? How does it differ from that of a flywheel?	05	CO5	K2
7	What is meant by piston effort and crank effort?	05	CO4	K3

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

No.	QUESTIONS	Mar ks	COs	KL
8	A slider crank mechanism with the following dimensions is acted upon by a force $F=2\text{kN}$ at B as shown in figure below. $OA=100\text{ mm}$, $AB=450\text{ mm}$. Determine the input torque T on the link OA for the static equilibrium of the mechanism for the given configuration.	10	CO3	K4



9	Each arm of a Proell governor is 240 mm long and each rotating ball has a mass of 3 kg. The central load acting on the sleeve is 30 kg. The pivots of all the arms are 30 mm from the axis of rotation. The vertical height of the governor is 190 mm. The extension links of the lower arms are vertical and the governor speed is 180 rpm when the sleeve is in the mid-position. Determine the	10	CO4	K4
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10	lengths of the extension links and tension in the upper arms. Describe the function of a Proell governor with the help of a neat sketch. Establish a relation among various forces acting on the bent link.	10	CO5	K5
11	A leather faced conical clutch has a cone angle of 30° . If the intensity of pressure between the contact surfaces is limited to 0.35 N/mm^2 and the breadth of the conical surface is not to exceed one-third of the mean radius, find the dimensions of the contact surfaces to transmit 22.5 kW at 2000 r.p.m. Assume uniform rate of wear and take coefficient of friction as 0.15 .	10	CO5	K5
12	Describe the construction and operation of a prony brake or rope brake absorption dynamometer.	10	CO5	K5



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END SEM EXAMINATION
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Branch	ME and EEE	Program	B. Tech
Subject Name	Biology for Engineers	Semester	IV
		Year	June 2024
Time: 3 Hour Max. Marks : 70	<ul style="list-style-type: none"> 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 <u>Mobile Phone</u> or any kind of <u>Written Material, Arguments with the Invigilator or Discussion with Co-Student</u> will come under <u>Unfair Means</u> and will <u>Result</u> in the <u>Cancellation of the Paper(s)</u>. 		
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. N1	QUESTIONS	Marks	COs	KL
i	Define biology?	2	CO1	K1
ii	Write any four functions of proteins? *	2	CO1	K2
iii	Define lithotrophs with proper example.	2	CO2	K2
iv	Define photosynthesis with the help of chemical reaction.	2	CO6	K2
v	What do you understand by Mendel's 1 st law.	2	CO2	K2
vi	List some important organic compounds present in living organisms?	2	CO1	K1
vii	What do you understand by lock and key of enzyme?	2	CO1	K3
viii	Write any two name of enzyme present in human body.	2	CO1	K1
ix	What is Monosaccharide?	2	CO4	K2
x	Give any one example of bio mimicry by human made application.	2	CO2	K1

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

(Each question Carry 05 Marks)

Q. No.	QUESTIONS	Marks	COs	KL
2	Write Short Notes on: a) Prokaryotes and Eukaryotes b) Unicellular and Multicellular	05	CO4	K3
3	What are lipids? Classify and explain different types of lipids.	05	CO2	K1
4	Explain the Laws of Thermodynamics in biological systems.	05	CO1	K1
5	Define buffer solution. Discuss the Role of Buffer Solution in human body giving proper mechanism.	05	CO2	K2
6	Discuss about the Concept of Gene, Gene regulation.	05	CO3	K2
7	Give an account on protein as enzymes.	05	CO6	K3

Section C (Answer any THREE out of FIVE) – 30 Marks

(Each question Carry 10 Marks)

Q. No.	QUESTIONS	Marks	COs	KL
8	Define Biosensor. What are the components of biosensor explain with proper diagrammatic explanation? Write applications of biosensor.	10	CO4	K2
9	What are Nucleotides? Explain role of RNA, DNA and Nucleotide in living organism.	10	CO5	K2
10	Discuss the function of protein in human body. What is meant by the structure of protein?	10	CO2	K2
11	Explain about hierarchy classification of living organism.	10	CO1	K3
12	Write a note on biosafety and various techniques used.	10	CO3	K4

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

Course Outcomes	CO1	CO2	CO3	CO4	CO5	CO6
Understand the biological concepts from an engineering perspective						
Understand the concepts of biological sensing and its challenges						
Understand development of artificial systems mimicking human action						
Integrate biological principles for developing next generation technologies.						
To provide an insight into latest (R&D oriented) topics, to enable the engineering student upgrade the existing technologies and pursue further research.						
To enhance the thinking capabilities in line with the modern trends in engineering and technology.						

GRAPHICAL REPRESENTATION

