
M23BBIOK401

MaharajaEducationTrust(R), Mysuru
MAHARAJAINSTITUTE OFTECHNOLOGY MYSORE
AnAutonomousInstitute,affiliatedVisvesvarayaTechnologicalUniversity,BelagaviBelawadi,
Srirangapatna Taluk, Mandya – 571 477
ApprovedbyAICTE,NewDelhi|RecognizedbyGovt.of Karnataka|

IV Semester B.E Semester End Examinations
MODEL QUESTION PAPER

Duration: 1 hr. **Max. Marks: 50**

Subject: BIOLOGY FOR ENGINEERS

SERIES A

Note: Answer all the questions, each question carries one mark.

SI No.	Questions	CO's
1	What is the basic structural and functional unit of life? a) Organ b) Tissue c) Cell d) Molecule	1
2	Proteins are synthesized in: a) Golgi apparatus b) Ribosomes c) Mitochondria d) Lysosomes	1
3	Carbohydrates are stored in the liver as: a) Starch b) Glycogen c) Glucose d) Sucrose	1
4	The cell membrane is primarily composed of: a) Proteins and carbohydrates b) Lipids and proteins c) DNA and RNA d) Enzymes and vitamins	1
5	The smallest unit of protein structure is: a) Amino acid b) Nucleotide c) Polysaccharide d) Lipid	1
6	Which molecule is responsible for carrying genetic information in cells? a) Proteins b) Carbohydrates c) DNA d) Lipids	1
7	What type of bond joins amino acids in proteins? a) Glycosidic bond b) Peptide bond c) Hydrogen bond d) Ionic bond	1
8	DNA is composed of units called: a) Amino acids b) Nucleotides c) Monosaccharides d) Lipids	1
9	Which molecule is produced during glycolysis? a) Oxygen b) Carbon dioxide c) Glucose d) Pyruvate	1
10	What is the primary function of enzymes in biological systems? a) Transport oxygen b) Regulate cell growth c) Catalyze chemical reactions d) Store genetic information	1
11	The function of the cytoskeleton is to: a) Store genetic material b) Provide structural support to the cell c) Regulate cell division d) Produce proteins	1
12	Which organelle is involved in cellular digestion? a) Lysosome b) Mitochondria c) Chloroplast d) Peroxisome	1
13	Enzymes act as: a) Hormones b) Structural components c) Catalysts d) Energy molecules	1
14	Lipids primarily function as: a) Enzymes b) Energy reserves c) Hormones d) Genetic material	1
15	Nucleic acids are responsible for: a) Storing genetic information b) Providing energy c) Catalyzing reactions d) Forming cell membranes	1
16	Which organelle is known as the "control center" of the cell? a) Nucleus b) Golgi apparatus c) Endoplasmic reticulum d) Lysosomes	1
17	Which organelle is responsible for energy production in cells? a) Nucleus b) Mitochondria c) Golgi apparatus d) Lysosomes	1
18	Which vitamin is essential for blood clotting? a) Vitamin A b) Vitamin D c) Vitamin K d) Vitamin E	1
19	Which organelle modifies and packages proteins? a) Ribosome b) Lysosome c) Golgi apparatus d) Endoplasmic reticulum	1
20	Which type of cell would most likely contain large amounts of smooth endoplasmic reticulum (ER)? a) Muscle cell b) Liver cell c) Nerve cell d) Red blood cell	1
21	Which biomolecule is used as a primary fuel source during cellular respiration? a) Nucleic acids b) Carbohydrates c) Lipids d) Proteins	2
22	What is the primary function of enzymes in food processing? a) Enhance flavor b) Aid in digestion c) Speed up biochemical reactions d) Store nutrients	2

23	Which vitamin is fat-soluble and important for vision? a) Vitamin A b) Vitamin B c) Vitamin C d) Vitamin K	**2**
24	Polyhydroxyalkanoates (PHA) are primarily used for: a) Biodegradable plastics b) Protein synthesis c) Hormone production d) Drug delivery	**2**
25	Which of the following biomolecules is primarily responsible for providing energy to the body? a) Proteins b) Lipids c) Carbohydrates d) Nucleic acids	**2**
26	Which lipid is commonly used as biodiesel? a) Cholesterol b) Saturated fat c) Unsaturated fat d) Vegetable oil	**2**
27	Which biomolecule is used in the formation of hair and nails? a) Carbohydrates b) Proteins c) Lipids d) Nucleic acids	**2**
28	The use of nucleic acids in vaccines is primarily to: a) Provide energy b) Act as a catalyst c) Store genetic information d) Aid in digestion	**2**
29	What is the role of lipids in insulating neurons? a) Transport messages b) Store energy c) Form the myelin sheath d) Synthesize proteins	**2**
30	Which natural polymer is a primary source of bioplastics: a) Cellulose b) Proteins c) Lipids d) Starch	**2**
31	The study of plant burrs has inspired which type of bioengineering product? a) Adhesives b) Water filters c) Bioplastics d) Solar panels	**3**
32	Biodegradable plastics are often inspired by which natural polymer? a) Cellulose b) Spider silk c) Chitin d) Keratin	**3**
33	The echolocation ability of bats inspired the development of: a) Sonar systems b) MRI scanners c) Drug delivery devices d) Artificial photosynthesis	**3**
34	The structure of bird wings has influenced: a) Aircraft aerodynamics b) Insulation materials c) Water purification systems d) Drug development	**3**
35	Spider silk inspires bioengineering materials for: a) High-strength composites b) Solar panels c) Waterproof fabrics d) Prosthetics	**3**
36	Which bioinspired material mimics the water-repellent surface of lotus leaves? a) Self-cleaning fabrics b) Antibacterial coatings c) Biodegradable plastics d) Adhesives	**3**
37	What principle inspired the development of self-healing materials? a) Blood clotting b) Cell division c) Photosynthesis d) Animal regeneration	**3**
38	The structure of honeycombs is applied in bioengineering for: a) Aircraft design b) Biodegradable plastics c) Artificial organs d) Drug delivery systems	**3**
39	Sharkskin's antibacterial surface property is mimicked for: a) Self-cleaning materials b) Lightweight fabrics c) Protective coatings d) Medical implants	**3**
40	Which animal's beak inspired the design of high-speed trains? a) Hummingbird b) Kingfisher c) Penguin d) Falcon	**3**
41	What is one key benefit of scaffolds in tissue engineering? a) Supporting tissue regeneration and growth b) Enhancing oxygen delivery c) Stabilizing artificial organs d) Synthesizing biofuels	**4**
42	Artificial photosynthesis is designed to: a) Convert sunlight into energy b) Replace damaged DNA c) Generate bioelectricity from bacteria d) Improve drug delivery mechanisms	**4**
43	Bioremediation refers to: a) Using microorganisms to clean environmental pollutants b) Developing sustainable plastics c) Enhancing photosynthesis for energy production d) Printing organs for transplantation	**4**
44	Which bioengineering technology is used to create artificial tissues for drug testing? a) Bioprinting b) Bioimaging c) Electrical tongue d) Bioremediation	**4**
45	AI-assisted imaging software in bioengineering improves: a) Accuracy of medical imaging b) Biodegradable plastic production c) Regeneration of damaged tissues d) Protein synthesis in cells	**4**
46	Bioimaging is primarily used for: a) Capturing images of the body's internal structures b) Monitoring environmental changes c) Printing tissues and organs d) Developing prosthetic devices	**4**
47	DNA origami is used for: a) Designing nanoscale structures for drug delivery b) Synthesis of artificial tissues c) Regulating immune responses d) Recycling biological waste	**4**
48	What is the role of bioconcrete in construction? a) Self-repairing cracks b) Reducing building costs c) Improving thermal resistance d) Generating electricity	**4**
49	Bioprinting technologies allow for: a) Manufacturing living tissues and organs b) Synthesizing proteins for medical use c) Producing energy-efficient materials d) Filtering water with microorganisms	**4**
50	Artificial intelligence in bioengineering is applied to: a) Diagnose diseases b) Design energy-efficient buildings c) Perform DNA sequencing d) Generate biofuels	**4**

ANSWER - A

1. c) Cell
2. b) Ribosomes
3. b) Glycogen
4. b) Lipids and proteins
5. a) Amino acid
6. c) DNA
7. b) Peptide bond
8. b) Nucleotides
9. d) Pyruvate
10. c) Catalyze chemical reactions
11. b) Provide structural support to the cell
12. a) Lysosome
13. c) Catalysts
14. b) Energy reserves
15. a) Storing genetic information
16. a) Nucleus
17. b) Mitochondria
18. c) Vitamin K
19. c) Golgi apparatus
20. b) Liver cell
21. b) Carbohydrates
22. c) Speed up biochemical reactions
23. a) Vitamin A
24. a) Biodegradable plastics
25. c) Carbohydrates
26. d) Vegetable oil
27. b) Proteins
28. c) Store genetic information to stimulate immune response
29. c) Form the myelin sheath
30. a) Cellulose
31. c) Bioplastics
32. a) Cellulose
33. a) Sonar systems
34. a) Aircraft aerodynamics
35. a) High-strength composites
36. a) Self-cleaning fabrics
37. a) Blood clotting
38. a) Aircraft design
39. c) Protective coatings
40. b) Kingfisher
41. a) Supporting tissue regeneration and growth
42. a) Convert sunlight into energy
43. a) Using microorganisms to clean environmental pollutants
44. a) Bioprinting
45. a) Accuracy of medical imaging
46. a) Capturing images of the body’s internal structures
47. a) Designing nanoscale structures for drug delivery
48. a) Self-repairing cracks
49. a) Manufacturing living tissues and organs
50. c) Perform DNA sequencing

M23BME402

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IV Semester B.E Semester End Examinations

June /July 2025

Model Question Paper
APPLIED THERMODYNAMICS

Duration: **3 hrs** Max. Marks: **100**

Answer five full questions choosing one complete question from each module.

Sl. No.	Questions	Marks	CO	RBT Level
	Module 1			
1 a)	Derive an expression for the thermal efficiency of an ideal Diesel cycle in terms of the compression ratio, cut-off ratio, and the specific heat ratio.	**10**	**1**	**2**
b)	In a constant volume Otto cycle the pressure at the end of the compression is 15 times that of the start, the temperature of air at the beginning is 38^0C and a maximum temperature attained in the cycle is 1950^0C. Determine a) compression ratio b) thermal efficiency of the cycle c) work done take γ for air as 1.4	**10**	**1**	**3**
	OR			
2 a)	Derive an expression for the thermal efficiency of an ideal Otto cycle in terms of the compression ratio and the specific heat ratio.	**10**	**1**	**2**
b)	The stroke and cylinder diameter of a compression ignition engine are 250mm and 150mm respectively. If the clearance volume is 0.0004 m^3 and fuel injection takes place at constant pressure for 5 percent of stroke volume. find the air standard efficiency of the engine	**10**	**1**	**3**
	Module 2			
3 a)	Explain briefly i) Morse test ii) Willians line method	**10**	**2**	**2**
b)	A four-cylinder four stroke diesel engine has a bore of 212 mm and stroke of 292 mm at full load with 720 rpm, the brake mean effective pressure is 5.93 bar and the specific fuel consumption is 0.226 kg/kW-hr. the air fuel ratio is found to be 25: 1. Calculate the brake thermal efficiency and the volumetric efficiency of the engine. the atmospheric conditions are 1.01 bar and 15^0C, and the calorific value of the fuel used is taken as 44200 kJ/kg	**10**	**2**	**3**
	OR			

4 a)	Obtain an expression for an efficiency of a gas turbine unit in terms of pressure ratio	**10**	**2**	**2**
b)	The compressor turbine units of a simple gas turbine have a isentropic efficiency of 85%. The inlet air temperature is 15^0C and maximum temperature of the cycle is 800^0C. The pressure ranges from 1 bar to 4 bar. Determine a) overall efficiency b) net work output c) work ratio	**10**	**2**	**3**
	Module 3			
5 a)	A newly established thermal power plant aims to enhance its efficiency by implementing a Reheat Rankine Cycle instead of a simple Rankine Cycle. As a consultant, you have been asked to analyze the cycle and provide insights into its efficiency. Explain the working of the Reheat Rankine Cycle with the help of a schematic and h-s diagram. Derive the efficiency of the cycle in terms of enthalpies at different stages. Justify how reheat improves the performance of the power plant compared to the simple Rankine cycle.	**10**	**3**	**2**
b)	In Rankine cycle the steam inlet to turbine is saturated at a pressure of 35 bar and the exhaust pressure is 0.2 bar calculate i) Turbine work ii) Pump work iii) Rankine efficiency v) condensate heat flow v) Dryness fraction at the end of expansion. assume mass flow rate of steam as 9.5 kg/sec	**10**	**3**	**3**
	OR			
6 a)	As a thermal engineer, you have been tasked with recommending methods to enhance the performance of the Rankine cycle used in the plant. Identify and explain any two methods that can increase the efficiency of the Rankine cycle. Support your explanation with h-s diagrams and equations, showing how each method reduces energy losses or improves work output.	**10**	**3**	**2**
b)	A steam power plant operates on a theoretical reheat cycle steam boiler is at 150 bar 550^0C expands through the high-pressure turbine. It is reheated at a constant pressure of 40 bar to 550^0C and expands through the low-pressure turbine to a condenser at 0.1 bar find i) Quality of the steam at turbine exhaust ii) cycle efficiency iii) steam rate in kg/kW-hr	**10**	**3**	**3**
	Module 4			
7a)	State the difference between Vapour compression refrigeration & Vapour absorption refrigeration system	**10**	**4**	**2**
b)	In a Saturated vapour compression refrigeration cycle operating between evaporator -10°C & condenser temp of 40°C. The enthalpy of refrigerant Freon-12 at the End of compression is 220 kJ/kg. Show the cycle on T-S & P-h planes. Calculate i) COP ii) refrigerating capacity & iii) compressor power. Assuming refrigerant flow rate 1kg/min.	**10**	**4**	**3**
	OR			
8 a)	Define the following i) Dry bulb temperature ii) Specific humidity iii) Relative humidity iv) Wet bulb temperature v) Dew point temperature	**10**	**4**	**2**

b)	A sling psychrometer reads 40^0C DBT & 28^0C WBT find the following i) specific humidity ii) Relative humidity iii) Dew point temperature iv) vapour density	**10**	**4**	**3**
	Module 5			
9 a)	Define the following with respect to a compressor i) Isothermal efficiency ii) Adiabatic efficiency iii) mechanical efficiency iv) Overall efficiency v) Volumetric efficiency	**10**	**5**	**2**
b)	An air compressor taken in air at 1 bar and 20^0C and compresses the same according to the law $PV^{1.2}$=C. it is then delivered to a receiver at a constant pressure of 10 bar. If R_{air}=0.287 kJ/kgK. Determine i) temp at the end of compression ii) net work done per kg of air iii) work done & heat transfer during compression per kg of air	**10**	**5**	**3**
	OR			
10a)	Derive an expression for the condition for the minimum work input required for a two-stage compressor with perfect intercooling	**10**	**5**	**2**
b)	A single stage double acting reciprocating compressor delivers 0.25m^3/s of air measured at 1.013bar and 27^0C. the delivery pressure is 7 bar. At the beginning of compression air is at 0.98 bar and 40^0C. The clearance volume is 4% of swept of volume. The stroke to bore ratio is 1.3. Compressor runs at 300rpm. Calculate volumetric efficiency, cylinder dimensions and indicated power. If the index of compression and expansion is 1.3.	**10**	**5**	**3**

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M23BME403

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IVSemester B.E Semester End Examinations

March 2025

Model Question Paper

MACHINING SCIENCE AND METROLOGY

Duration: **3 hrs** Max. Marks: **100**

Answer five full questions choosing one complete question from each module.

Sl. No.	Questions	Marks	CO	RBT Level
	Module 1			
1 a)	**Interpret** the nomenclature of single point cutting tool with neat sketch	**10**	**1**	**L3**
b)	**Illustrate** the construction of engine lathe with neat figure	**10**	**1**	**L3**
	OR			
2 a)	Considering the operations performed on lathe **Interpret** any 5 operations	**10**	**1**	**L3**
b)	In a orthogonal cutting process the following data were obtained. Chip length=24mm, uncut chip length=240mm,rake angle=20^0, depth of cut 0.6mm, horizontal component of cutting force=2400N, vertical component of cutting force=240N. calcute 1)Shear plane angle 2)chip thickness 3) Friction angle 4) Resultant cutting force.	**10**	**1**	**L2,L3**
	Module 2			
3 a)	**Illustrate** with a neat sketch construction of a column and knee type milling machine.	**10**	**2**	**L3**
b)	**Imterpret** crank and slotted link mechanism driving mechanism of shaper.	**10**	**2**	**L3**
	OR			
4 a)	**Illustrate** contruction and working **of a** Radial drilling Machine with a neat sketch	**10**	**2**	**L3**
b)	**Explain** cylindrical and centerless grinding process	**10**	**2**	**L3**
	Module 3			
5 a)	**Interpret** the types of tool wear mechanisms	**10**	**3**	**L3**
b)	**Discuss** the factors effecting tool life	**10**	**3**	**L3**
	OR			

6 a)	**Interpret** any 4 types of cutting tool materials	**10**	**3**	**L3**
b)	**Interpret** any 4 types of of cutting fliuds	**10**	**3**	**L3**
	Module 4			
7a)	**Discuss** the characteristics of line and end standard	**10**	**4**	**L3**
b)	**Illustrate** the principle of working of a Sine bar and sine center	**10**	**4**	**L3**
	OR			
8 a)	With respect to building of slip gauges **Interpret** phenomena of wringing	**10**	**4**	**L3**
b)	Interpret metrology and types of metrology	**10**	**4**	**L3**
	Module 5			
9 a)	**Illustrate** the Taylor's principle used in designing the guages	**10**	**5**	**L3**
b)	**Discuss** any 3 types of gauges used for measurement	**10**	**5**	**L3**
	OR			
10a)	**Interpret** tolerance and types of tolerance	**10**	**5**	**L3**
b)	**Interpret** fit and types of fits	**10**	**5**	**L3**

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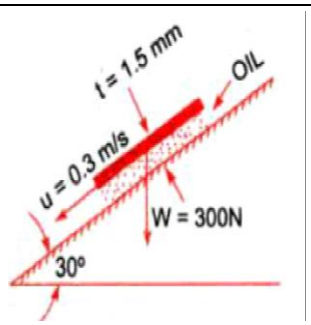
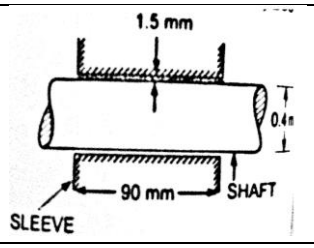
IV Semester B.E Semester End Examinations

June/July 2025

Model Question Paper
FLUID MECHANICS

Duration: **3 hrs.** Max. Marks: **100**

Answer five full questions choosing one complete question from each module.

Sl. No.	Questions	Marks	CO	RBT Level
	Module 1			
1a)	Define the following properties of fluids and mention their SI units: (i) Mass Density (ii) Weight Density (iii) Specific Volume (iv) Specific Gravity (v) Dynamic Viscosity	10	1	3
b)	Calculate the dynamic viscosity of an oil, which is used for lubrication between a square plate of size 0.8 x 0.8 m and an inclined plane with an angle of inclination 30^0 as shown in fig. The weight of the square plate is 300 N and it slides down the inclined plane with a uniform velocity of 0.3 m/s. The thickness of oil film is 1.5 mm. 	10	1	3
	OR			
2a)	Obtain an expression for capillary rise of a liquid.	10	1	3
b)	The dynamic viscosity of oil used for lubrication between a shaft and sleeve is 6 $poise$. The shaft is of diameter 0.4 m and rotates at 190 rpm. Calculate the power lost in the bearing for a sleeve length of 90 mm. The thickness of oil film is 1.5 mm. 	10	1	3
	Module 2			
3a)	Derive an Expression for total pressure force and depth of pressure for a vertical surface submerged in water.	10	2	3
b)	The right limb of a simple U-tube manometer containing mercury is open to the atmosphere while the left limb is connected to a pipe in which the fluid of SG 0.9 is flowing. The centre of the pipe is 12cm below the level of mercury in the right limb. Find the pressure of fluid in the pipe if the difference of mercury level in the two limbs is 20cm.	10	2	3
	OR			

4a)	Define (i) Buoyancy (ii) Centre of Buoyancy (iii) Meta Centre (iv) Meta-Centric height v) Center of pressure	10	2	3
b)	A rectangular plane surface is $2m$ wide and $3m$ deep. It lies in vertical plane in water. Determine the total pressure and position of centre of pressure on the plane surface when its upper edge is horizontal and (i) coincides with water surface (ii) 2.5 m below the free water surface	10	2	3
Module 3				
5a)	Derive continuity equation for three-dimensional fluid flow in Cartesian co-ordinates	10	3	3
b)	The velocity potential function is given by an expression $\emptyset = -\frac{xy^3}{3} - x^2 + \frac{x^3y}{3} + y^2$ i) Find the velocity components in x and y direction ii) Show that φ represents possible case of flow.	10	3	3
OR				
6a)	Derive Euler's equation of motion along a stream line and state and deduce Bernoulli's equation for fluid flow, mention its assumptions	10	3	3
b)	An oil of specific gravity 0.8 is flowing through a Venturimeter having inlet diameter 20cm and throat diameter 10cm. The oil mercury differential manometer shows a reading of 25 cm. Calculate the discharge of oil through the horizontal Venturimeter. Take $C_d = 0.98$	10	3	3
Module 4				
7a)	Derive Darcy-Weisbach equation for determining loss of head due to friction in pipes	10	4	3
b)	Find the head lost due to friction in a pipe of diameter 300mm and length 50m, through which water is flowing at a velocity of 3 m/s using (i) Darcy formula (ii) Chezy's formula for which C=60	10	4	3
OR				
8a)	Derive an expression for drag and lift.	10	4	3
b)	A man weighing 90 kgf descends to the ground from an aeroplane with the help of a parachute against the resistance of air. The velocity with which the parachute, which is hemispherical in shape, comes down is 20 m/s. Find the diameter of the parachute. Assume $C_d = 0.5$ and $density\ of\ air = 1.25\ kg/m^3$, Take kinematic viscosity of water as 0.01 stoke.	10	4	3
Module 5				
9a)	Derive an expression for velocity of sound in a fluid.	10	5	3
b)	An aeroplane flying at a height of 15km, where the temperature is -50^0C. The speed of the plane is corresponding to Mach numbers is 2.0. Assuming $k = 1.4\ and\ R = 287\ J/kg - K$, find the speed of the plane.	10	5	3
OR				
10a)	Define CFD. What are the steps involved in solving a CFD Problem?	10	5	3
b)	Mention the advantages, disadvantages and applications of CFD	10	5	3

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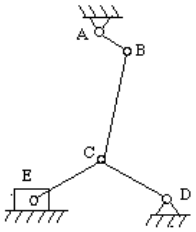
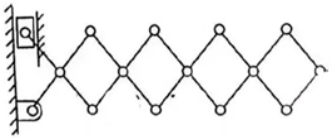
IV Semester B.E Semester End Examinations

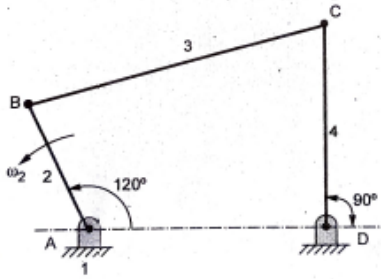
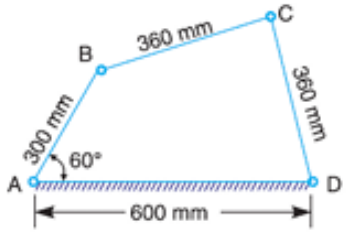
April 2025

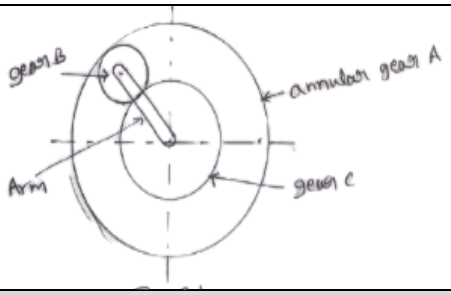
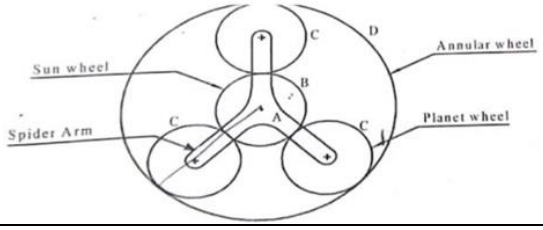
Model Question Paper
KINEMATICS OF MACHINES

Duration: **3 hrs** Max. Marks: **100**

Answer five full questions choosing one complete question from each module.

Sl. No.	Questions	Marks	CO	RBT Level
	Module 1			
1 a)	Outline the definitions of a) Kinematic link b) Kinematic pair c) Kinematic joint d) Kinematic Mechanism e) Machine	**10**	**1**	**L3**
b)	Applying the knowledge of inversion of mechanisms, illustrate with a neat sketch a mechanism to, a) Draw a straight line. b) Draw an ellipse	**10**	**1**	**L3**
	OR			
2 a)	Applying Grubler's criterion calculate mobility of the following mechanisms  	**5**	**1**	**L3**
b)	Classify kinematic pairs according to the relative motion of the links	**15**	**1**	**L3**
	Module 2			
3 a)	What is loop closure equation? Illustrate with a neat sketch loop closure equation for four bar mechanism.	**5**	**1**	**L3**
b)	Apply the concepts of complex algebra method to find the angular velocities of link 3 and 4 for the four-bar mechanism ABCD as shown in the following figure which is driven by link 2 at ω_2=45 rad/s, CCW. Take AB =100mm, CD =300mm, AD=250 mm.	**15**	**1**	**L3**

				
	OR			
4 a)	Illustrate Aronhold-Kennedy theorem of three centers	**5**	**1**	**L3**
b)	In a pin jointed four bar mechanism, as shown in Figure, AB = 300 mm, BC = CD = 360 mm, and AD = 600 mm. The angle BAD = 60°. The crank AB rotates uniformly at 100 rpm. Locate all the instantaneous centres and find the angular velocity of the link BC. 	**10**	**1**	**L3**
	Module 3			
5 a)	State and prove the law of gear tooth action for constant velocity ratio	**10**	**2**	**L3**
b)	Two gear wheels of module pitch 4.5mm have 24 & 33 teeth respectively. Pressure angle 20°. Each wheel has a standard addendum of 1 module. Analyze the length of arc of contact and velocity of sliding, if the speed of smaller wheel is 120 rpm.	**10**	**2**	**L4**
	OR			
6 a)	Derive the expression for length of path of contact and arc of path of contact for involute gears.	**10**	**2**	**L3**
b)	Two gear wheels of module pitch 2.5mm have 40 & 30 teeth respectively. Pressure angle 25°. Each wheel has a standard addendum of 5 module. Analyze the length of arc of contact and velocity of sliding, if the speed of smaller wheel is 1500 rpm.	**10**	**2**	**L4**
	Module 4			
7a)	Illustrate in details simple gear train and reverted gear train with a neat sketch.	**5**	**3**	**L3**
b)	An epicyclic gear train consists of three gears A, B & C as shown in fig. The number of teeth on annular gear A is 74 and on gear C is 34. The gear B meshes with both gears A and C and is carried on an arm F which rotates about the center A at 25 rpm. If the gear A is fixed, find the speed of gear B and C.	**15**	**3**	**L4**

				
	OR			
8 a)	Illustrate in details compound gear train and epicyclic gear train with a neat sketch.	**10**	**3**	**L3**
b)	An epicyclic gear train of sun and planet type is shown in Fig. The pitch diameter of internally ted ring D is approximately 228 mm and the module are 4 mm. When the ring is stationary, the spider A which carries three planet wheels C of equal size is to make one revolution for every five revolutions of the spindle carrying the sun wheel B. Determine suitable number of teeth for the entire wheel and the exact pitch order diameter of ring D. If a torque of 30 Nm is supplied to the sun-wheel B, what will be the torque required to keep the ring stationary? 	**10**	**3**	**L4**
	Module 5			
9)	Design a cam for operating the exhaust valve of an oil engine. It is required to give equal uniform acceleration and, retardation during opening and closing of the valve each of which corresponds to 60° of cam rotation. The valve must remain in the fully open position for 20° of cam rotation. The lift of the valve is 37.5 mm and the least radius of the cam is 40 mm. The follower is provided with a roller of radius 20 mm and its line of stroke passes through the axis of the cam.	**20**	**4**	**L5**
	OR			
10)	Design the profile of a cam operating a knife edge follower when the axis of the follower passes through the axis of cam shaft from the following data: (i) Follower to move outwards through 40 mm during 60° of cam rotation, (ii) Follower to dwell for the next 45°, (iii) Follower to return to its original position during next 90°, (iv) Follower to dwell for the rest of the cam rotation. The displacement of the follower is to take place with simple harmonic motion during both the outward and return strokes. The least radius of cam is 50 mm.	**20**	**5**	**L5**

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M23BME407A

Maharaja Education Trust (R), Mysuru
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Approved by AICTE, New Delhi |Recognized by Govt. of Karnataka|

IV Semester B.E Semester End Examinations

MAY 2025

Model Question Paper
NON-TRADITIONAL MACHINING

Duration: **3 hrs** Max. Marks: **100**

Answer five full questions choosing one complete question from each module.

Sl. No.	Questions	Marks	CO	RBT Level
	Module 1			
1 a)	If a manufacturer needs to machine hard and brittle materials, how would you justify shifting from conventional to unconventional machining? Make a Comparison with application, scope, MRR, accuracy, tool life and limitations.	**10**	1	3
b)	If a company wants to implement a high-precision machining process, how would you apply the classification based on energy sources to select the best NTM process?	**10**	1	3
	OR			
2 a)	What factors (any two) would you consider before selecting an NTM process for machining components with high precision?	**10**	1	3
b)	Justify the need of NTM process in today's industries with appropriate applications	**10**	1	3
	Module 2			
3 a)	How would you integrate amplitude, frequency, and abrasive grain size selection to achieve uniform machining performance in USM? Justify the answer With supporting trends	**10**	2	3
b)	Illustrate constructional feature and working of USM process	**10**	2	3
	OR			
4 a)	Illustrate constructional feature and working of AJM process	**10**	2	3

b)	Illustrate the effect of variables that influence material removal rate in AJM: (i) SoD (ii) Types of abrasives (iii) Carrier gas (iv) Size of abrasive grain	**10**	2	3
Module 3				
5 a)	Illustrate Electrochemical Honing (ECH) and Electrochemical Grinding (ECG) processes, and explain how these processes can be applied to improve the surface finish of hardened steel components	**10**	3	3
b)	Illustrate the principle and construction features of electro chemical machining	**10**	3	3
OR				
6 a)	Select the of different types of maskants and etchants used in the Chemical Machining (CHM) process, and illustrate how they are applied to achieve precise material removal	**10**	3	3
b)	Illustrate how Chemical Blanking and Chemical Milling processes can be applied for precision material removal in industrial applications	**10**	3	3
Module 4				
7a)	Apply the concept of a Relaxation (R–C) circuit to illustrate the metal removal in EDM	**10**	4	3
b)	Apply your understanding to illustrate the electrode feed control mechanism in the EDM process.	**10**	4	3
OR				
8 a)	Illustrate the non-thermal generation of plasma and the mechanism of metal removal in PAM	**10**	4	3
b)	Identify a manufacturing scenario and apply the Wire Cut EDM process to achieve accurate die machining	**10**	4	3
Module 5				
9 a)	Analyze the principle of laser machining and explain how it processes different materials using laser technology	**10**	5	4
b)	Examine the process parameters of Laser Beam Machining (LBM) and analyze how they affect machining quality	**10**	5	4
OR				
10a)	Analyze the generation and control of the electron beam in the Electron Beam Machining (EBM) process and examine how these factors influence performance.	**10**	5	4
b)	Examine the metal removal mechanism in EBM and analyze its advantages, disadvantages, and real-world applications.	**10**	5	4