Code: 19A334T

II B.Tech. I Semester Supplementary Examinations November 2023

Kinematics of Machinery

(Mechanical Engineering)

Max. Marks: 70   Time: 3 Hours

Answer *any five full questions* by choosing one question from each unit (5x14 = 70 Marks)

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		Marks	CO	BL

UNIT–I

1. Discuss various types of constrained motion — 14M, 1, 2

OR

2. Explain the term kinematic link. Give the classification of kinematic link and joints in chain. — 14M, 1, 2

UNIT–II

3. In a slider crank mechanism, the length of crank OB and connecting rod AB are 125 mm and 500 mm respectively. The centre of gravity G of the connecting rod is 275 mm from the slider A. The crank speed is 600 r.p.m. clockwise. When the crank has turned 45° from the inner dead centre position, determine: 1. velocity of the slider A, 2. velocity of the point G, and 3. angular velocity of the connecting rod AB. — 14M, 2, 3

OR

4. The engine mechanism shown in Fig. has crank OB = 50 mm and length of connecting rod AB= 225 mm. The centre of gravity of the rod is at G which is 75 mm from B. The engine speed is 200r.p.m. For the position shown, in which OB is turned 45° from OA, Find 1. the velocity of G and the angular velocity of AB, and 2. the acceleration of G and angular acceleration of AB.

— 14M, 2, 3

UNIT–III
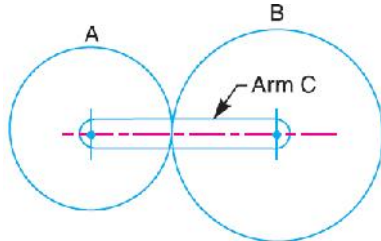
5. Determine the greatest permissible angle between the axes of the two shafts which are connected by a Hooke's joint if the maximum variation in the speed of the driven shaft is 8% of the mean speed. The driving shaft is rotating at a uniform speed of 500 r.p.m. Also find the maximum and the minimum speeds of the driven shaft. — 14M, 3, 3

OR

6. Derive an expression for the velocity of the driven shaft in a Hook's coupling — 14M, 3, 6

UNIT–IV

7. In an epicyclic gear train, an arm carries two gears A and B having 36 and 45 teeth respectively. If the arm rotates at 150 r.p.m. in the anticlockwise direction about the centre of the gear A which is fixed, determine the speed of gear B. If the gear A instead of being fixed, makes 300 r.p.m. in the clockwise direction, what will be the speed of gear B?

— 14M, 4, 3

OR

8. State and prove the law of gearing — 14M, 4, 5

UNIT–V

9. How are the cams classified? Describe in detail. — 14M, 5, 4

OR

10. What is a displacement diagram? Draw and illustrate the displacement diagram when the follower moves with Simple Harmonic Motion and Uniform acceleration retardation. — 14M, 5, 4

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II B.Tech. I Semester Supplementary Examinations November 2023
Life Sciences for Engineers
(Common to CE, ME & CSE)

Max. Marks: 70   Time: 3 Hours

Answer *any five full questions* by choosing one question from each unit (5x14 = 70 Marks)

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			Marks	CO	BL

UNIT–I

1.		Describe meant by classification? Write the importance of Classification?	14M	CO1	2
		OR			
2.	a)	Explain the five kingdom classification of living organisms?	7M	CO1	2
	b)	Describe is Endoplasmic reticulum? Write their structure and important functions and draw the labelled diagram?	7M	CO1	2

UNIT–II

3.		Describe the mechanism of enzyme action?	14M	CO2	2
		OR			
4.		Define the antibodies and Write the types and functions of antibodies?	14M	CO2	1

UNIT–III

5.		Explain the Glycolysis pathway and importance?	14M	CO3	2
		OR			
6.		Discuss the mechanism of photosynthesis in plants?	14M	CO3	4

UNIT–IV

7.		Define the genetics? Explain the Mendel's Laws?	14M	CO4	1
		OR			
8.		Describe the meiosis cell division process?	14M	CO4	2

UNIT–V

9.	a)	Write short notes on restriction enzymes?	7M	CO5	1
	b)	Explain the Microbes in Human Welfare?	7M	CO5	2
		OR			
10.		Explain the various process of recombinant DNA technology?	14M	CO5	2

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R-19

Code: 19A332T

II B.Tech. I Semester Supplementary Examinations November 2023
Metallurgy and Material Science
(Mechanical Engineering)

Max. Marks: 70   Time: 3 Hours
Answer *any five full questions* by choosing one question from each unit (5x14 = 70 Marks)
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Marks

UNIT–I

1.	Define Solid Solution. Classify and explain types of solid solutions with neat sketches	14M

OR

2.	State and explain Hume Rothery's rules for the formation of Substitutional solid solution.	14M

UNIT–II

3.	a)	Classify Equilibrium diagrams	7M
	b)	Define Liquidus line, Solidus line and Solvus line.	7M

OR

4.	Explain the phase diagram for "Two components completely soluble in Liquid state and completely soluble in solid state"	14M

UNIT–III

5.	a)	Explain the microstructure, properties and applications of Grey cast iron	7M
	b)	Discuss about malleable cast iron mentioning its properties and applications	7M

OR

6.	a)	Discuss about Hadfield manganese steels	7M
	b)	What do you understand by Season cracking and how it can be prevented	7M

UNIT–IV

7.	Elaborate the diffusion and mechanical coating process	14M

OR

8.	a)	What is Surface treatment? Mention its characteristics	7M
	b)	Briefly explain Sheradising process.	7M

UNIT–V

9.	Explain any two methods of manufacture of composites	14M

OR

10.	Describe the basic steps in powder metallurgy process	14M

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II B.Tech. I Semester Supplementary Examinations November 2023
Mechanics of Solids
(Mechanical Engineering)

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. a) Explain various types of stresses and strains.   7M

    b) An aluminium bar 60mm diameter when subjected to an axial tensile load 100KN
        elongates 0.20mm in a gauge length 300mm and the diameter is decreased by 0.012mm.
        Calculate the modulus of elasticity and the poisson's ratio of the material.   7M

OR

2. a) Derive the relationship between young's modulus, modulus of rigidity and bulk modulus. 7M

    b) Draw Mohr's circle when the component is subjected to mutually perpendicular tensile
        stresses.   7M

UNIT–II

3. a) What are the different types of beams?   5M

    b) A cantilever of length 2 m carries a of 1 kN/m run over a length of 1.5 m from the free
        end. Draw the shear force and bending moment diagrams for the cantilever.   9M

OR

4. a) Define point of contra flexure.   3M

    b) Draw the shear force and B.M diagram for a simply supported beam of length 8m and
        carrying a uniformly distributed load of 12KN/m for a distance of 4m from the left end. Also
        calculate the maximum B.M on the section.   11M

UNIT–III

5. a) Prove that for a rectangular section the maximum shear stress is 1.5times the average
        stress. Sketch the variation of shear stress.   8M

    b) Derive the section modules for (a) rectangular section and (b) circular section   6M

OR

6. a) Derive the section modules for a hollow rectangular section   4M

    b) A timber beam 120m wide and 185mm deep supports a u.d.l of intensity w KN/m length
        over a span of 2.7m. If the safe stresses are 29Mpa in bending and 3Mpa in shear,
        calculate the safe intensity of the load which can be supported by the beam.   10M

UNIT–IV

7. a) Derive an expression for slope and deflection at free end of a cantilever beam subjected
        to UDL over entire span.   7M

    b) Define Macaulay's method? And find out Deflection of a simply supported beam with an
        Eccentric point load   7M

OR

8.   A rectangular reinforced concrete simply supported beam of length 2 m and cross section
        100 mm x 200 mm is carrying an uniformly distributed load of 10 kN/m through its span.
        Find the maximum slope and deflection. Take E=2 x 10^4 N/mm^2.   14M

UNIT–V

9.   State and explain Lame's theory for thick cylindrical shells. Derive the Lame's equations. 14M

OR

10.   Determine the maximum and minimum hoop stress across the section of a pipe of 400mm
        internal diameter and 100 mm thick, when the pipe contains a fluid at a pressure of 8N/mm^2.
        Also sketch the radial pressure distribution and hoop stress distribution across the section. 14M

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R-19

Code: 19AC41T

II B.Tech. II Semester Supplementary Examinations November 2023
Numerical Methods & Probability and Statistics
(Common to CE & ME)

Max. Marks: 70   Time: 3 Hours

Answer *any five full questions* by choosing one question from each unit (5x14 = 70 Marks)
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			Marks	CO	BL

UNIT–I

1. Find a real root of the equation $x \log_{10}^{x} = 1.2$ by regula -falsi method correct to 4 decimal places — 14M CO1 L3

OR

2. From the following table:

x^o	10	20	30	40	50	60	70	80
$\cos x$	0.9848	0.9397	0.8660	0.7660	0.6428	0.5000	0.3420	0.1737

Estimate the values of $\cos 25^o \ and \ \cos 73^o$ using Newton's formulae. — 14M CO1 L2

UNIT–II

3. Evaluate $\int_{0}^{1} \frac{1}{1+x} dx$ by using

(i) Trapezoidal rule (ii) Simpson's 1/3 rule and (iii) Simpson's 3/8 rule. — 14M CO2 L2

OR

4. Given that $\frac{dy}{dx} = x + y, y(1) = 0.$ Find an approximate value of y(0.3) taking h=0.1 by using modified Euler's method. — 14M CO2 L3

UNIT–III

5. If Probability density of a random variable is given by

$$f(x) = \begin{cases} k(1-x^2), & for \ 0 < x < 1 \\ 0, & otherwise \end{cases}$$

then find (i) k (ii) P(0.1<X<0.2) (iii) P(x>0.5) — 14M CO3 L1

OR

6. If the variance of a Poisson variate is 3, then find the probability that

(i) x=0   (ii) 0<x 3   (iii) x>3   (iv) 1 x<4. — 14M CO3 L3

UNIT–IV

7. Random samples of 400 men and 600 women were asked whether they would like to have a flyover near their residence. 200 men and 325 women were in favour of the proposal. Test the hypothesis that proportions of men and women in favour of the proposal are same at 5% level. — 14M CO4 L4

OR

8. The means of two large samples of sizes 1000 and 2000 members are 67.5 inches and 68.0 inches respectively. Can the samples be regarded as drawn from the same population of S.D. 2.5 inches? — 14M CO4 L1

UNIT–V

9. Two horses A and B were tested according to the time (in seconds) to run a particular track with the following results.

Horse A	28	30	32	33	33	29	34
Horse B	29	30	30	24	27	29	----

Test whether the two horses have the same running capacity.   14M   CO5   L4

OR

10. 1000 students at college level were graded according to their I.Q. and the economic conditions of their home. Use chi-square test to find out whether there is any association between condition at home and I.Q (= 0.05).

Economic Condition	High	Low	Total
Rich	460	140	600
Poor	240	160	400
Total	700	300	1000

14M   CO5   L4

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Code: 19AC31T

II B.Tech. I Semester Supplementary Examinations November 2023
Partial Differential Equations and Complex Variables
(Common to CE, EEE, ME & ECE)

Max. Marks: 70   Time: 3 Hours
Answer *any five full questions* by choosing one question from each unit (5x14 = 70 Marks)
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| | | Marks | CO | BL |

UNIT–I

1. a) Evaluate $L\{t\ \sin 3t\}$ 7M CO1 L2

   b) Find the L.T of $L\{t\ e^{-2t}\cos t\}$ 7M CO1 L1

OR

2. a) Find $L\left\{\int_0^t\int_0^t \cosh at\ dt\ dt\right\}$ 7M CO1 L1

   b) Using L.T, Evaluate $\int_0^\infty te^{-t}\sin t\ dt$ 7M CO1 L3

UNIT–II

3. a) Find the inverse L.T of $\log\left(\dfrac{s^2+4}{s^2+9}\right)$ 7M CO2 L1

   b) Find $L^{-1}\left\{\log\left(\dfrac{s+a}{s+b}\right)\right\}$ 7M CO2 L1

OR

4. Using L.T, solve $\left(D^2+4D+5\right)y=5$, given that
   $Y(0)=0, Y'(0)=0$ 14M CO2 L3

UNIT–III

5. Expand $f(x)=x^2,\ 0<x<2f$ as a Fourier series.   14M CO3 L2

OR

6. Find the Fourier Series of periodicity 3 for
   $f(x)=2x-x^2$ in $0<x<3$ 14M CO3 L1

7. Use separation of variables to solve $\dfrac{\partial^2 u}{\partial x \partial t} = e^{-t} \cos x,$

given that $u = 0$ when $t = 0$ and $\dfrac{\partial u}{\partial t} = 0$ when $x = 0.$ **14M** CO4 L3

OR

8. A tightly stretched string with fixed end points $x = 0 \ \ and \ \ x = l$ is initially in a position given by $y(x,0) = y_0 \sin^3\left(\dfrac{f\,x}{l}\right).$ If it is released from rest from this position, Find the displacement y at any time and at any distance from the end $x = 0$. **14M** CO4 L3

UNIT–V

9. Prove that z^n (n is a positive integer) is analytic and hence find its derivative. **14M** CO5 L5

OR

10. a) Evaluate $\displaystyle\int_c \dfrac{\log z}{(z-1)^3} dz \ \ where \ \ c : |z - 1| = \dfrac{1}{2}$. Using Cauchy's integral formula. **7M** CO5 L5

b) Evaluate $\displaystyle\int_c \dfrac{dz}{z^3(z+4)}$ where $C \ is \ |z| = 2$ using Cauchy's integral formula. **7M** CO5 L5

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II B.Tech. I Semester Supplementary Examinations November 2023
Basic Electrical and Electronics Engineering
(Mechanical Engineering)

Max. Marks: 70   Time: 3 Hours
Answer *any five full questions* by choosing one question from each unit (5x14 = 70 Marks)
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		Marks	CO	BL

UNIT–I

1. a) Derive the expression for an equivalent resistance if any two resistors R1, R2 are connected in parallel — 7M CO1 L6

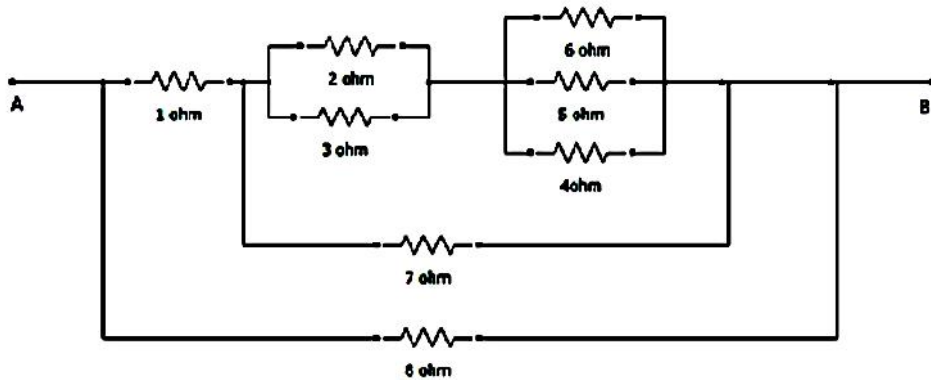   b) Calculate the equivalent Resistance between terminals a and b for the below circuit

   Fig.3 — 7M CO1 L3

OR

2. a) Explain about the following elements
   i) Resistance ii) Inductance iii) Capacitance — 7M CO1 L2

   b) For the circuit below, calculate the current drawn from the battery and the current in the 6 ohms resistor.
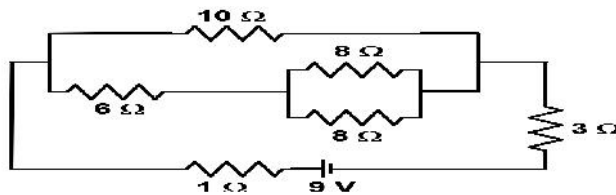

   Fig.4 — 7M CO1 L3

UNIT–II

3. a) Discuss the procedure for evaluating the efficiency of the Dc motor by applying brake test — 10M CO2 L3

   b) Find the torque in N-m exerted by a 4-pole series motor whose armature has 1200 conductors connected up in a 2-circuit winding. The motor current is 10A and the flux per pole is 0.02 Wb. — 4M CO2 L2

OR

4. List out the various types of D.C machine and explain construction and working principle on which a generator works. — 14M CO2 L2

UNIT–III

5. a) Derive the EMF equation of a single-phase transformer and explain the voltage transformation ratio — 10M CO3 L6

b) Establish the relationship between number of poles, frequency and synchronous speed for a 3- phase alternator.   4M   CO3

OR

6. Draw the Equivalent Circuit of Single-phase transformer of rating 5kVA, 200V/400V, 50Hz, the data available from the test is as follows.
   O.C test from LV side: 200V 1.25A 150W
   S.C test from HV side: 20V 12.5A 175W   14M   CO3   L6

UNIT–IV

7. a) Explain the concept of Rectifier and its application.   4M   CO4   L2

   b) An Ac supply of 230 V is applied to a half-wave rectifier circuit through a transformer of turn ratio 10: 1.

   Calculate (i) the output d.c. voltage (ii) the peak inverse voltage. iii) ripple factor and iv) Transformer utilization factor Assume the diode to be ideal.
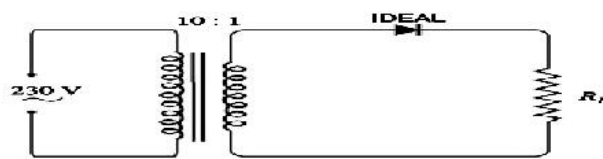

   Fig.1   10M   CO4   L3

OR

8. Briefly Explain the operation of Bridge Rectifier with necessary diagrams and derive the following terms
   i) Dc Output voltage ii) Peak Inverse Voltage iii) Ripple Factor   14M   CO4   L2

UNIT–V

9. a) List out the various applications of CRO in Laboratories.   4M   C05   L1

   b) Draw a basic block diagram of a CRO and explain the features of CRO in details.   10M   C05   L2

OR

10. a) Explain the theory of dielectric heating. State its advantages and industrial applications   7M   C05   L2

    b) List out some of the applications of induction heating   7M   C05   L1

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II B.Tech. I Semester Supplementary Examinations November 2023
Basic Thermodynamics
(Mechanical Engineering)

Max. Marks: 70   Time: 3 Hours
Answer *any five full questions* by choosing one question from each unit (5x14 = 70 Marks)
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Marks

UNIT–I

1. a) What is meant by displacement work? Explain the same with reference to the Quasi-static process.   7M
   b) Classify the types of thermodynamic systems with the help of suitable example.   7M

OR

2. a) Prove that Internal energy is a property of the system.   6M
   b) A mass of gas is compressed in a quasi-static process from 80KPa, $0.1m^3$ to 0.4 MPa, $0.03m^3$. Assuming that pressure and volume are related by PV^n= constant. Find the work interaction during the process. Identify whether it a work producing system or work absorbing system.   8M

UNIT–II

3. a) Write short notes on Second law of Thermodynamics.   7M
   b) Bring out the concept of entropy and importance of T-s diagram.   7M

OR

4. a) Calculate the entropy change of the universe as a result of the following processes:

   i) A copper block of 750 g mass and with Cp of 150 J/kg K at 100°C is placed in a lake at 9°C.
   ii) The same block at 9°C is dropped from a height of 100 m into the lake.
   iii) Two such blocks at 100 and 0°C are joined together.   14M

UNIT–III

5. a) Explain the concept of Triple point.   7M
   b) Draw and explain P-T diagram for pure substance   7M

OR

6. a) Find the internal energy and enthalpy of unit mass of steam of a pressure of 7 bar when (i) its quality is 80% (ii) it is dry saturated (iii) Superheated the degree of superheat being 65 ^{0}C.   14M

UNIT–IV

7. a) Explain Throttling process and Free expansion process.   10M
   b) A spherical shaped balloon of 10 m diameter contains hydrogen at 33 ^{0}C and 1.3 bar. Find the mass of hydrogen in the balloon.   4M

OR

8. a) A constant volume chamber of 0.3 m^3 capacity contains 2 kg of this gas at 5^{0}C. Heat is transferred to the gas until the temperature is100^{0}C. Find the work done, the heat transferred and the changes in internal energy, enthalpy and entropy.   10M
   b) Write a short note on compressibility factor.   4M

UNIT–V

9. a) Write a short note on the Gravimetric Analysis.   6M
   b) Explain Mass fraction .Mole fraction, Internal energy and specific heat of gas mixtures   8M

OR

10. a) A Vessel of 5 m^3 capacity contains two gases A and B in proportion of 40% and 60% respectively at 25^{0}C .If the value of R for the gases is 0.288 kj/kgK and 0.295kj/kgK and if the total weight of the mixture is 2 kg calculate (i) partial pressure (ii) total pressure (iii) the mean value of gas constant for the mixture.   14M

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