Hall Ticket Number :										

R-19

Code: 19A334T

II B.Tech. I Semester Supplementary Examinations March/April 2023

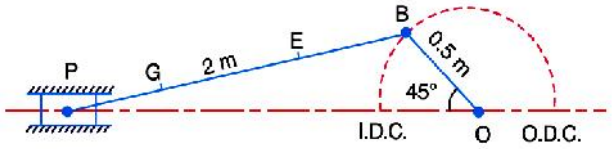
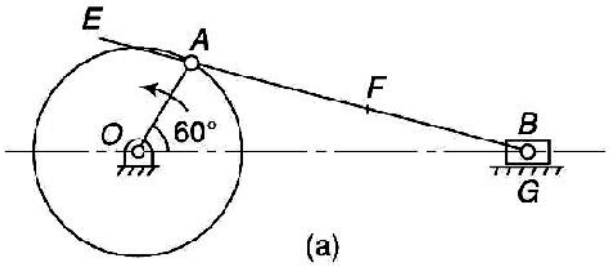
Kinematics of Machinery

(Mechanical Engineering)

Max. Marks: 70 Time: 3 Hours

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

****

		Marks	CO	BL
	UNIT–I			
1.	Explain with a neat sketch crank and slotted mechanism	14M	1	2
	OR			
2.	Define and explain the following terms: mechanism, machine, link, kinematic pair, analysis and synthesis of mechanisms.	14M	1	2
	UNIT–II			
3.	The crank and connecting rod of a theoretical steam engine are 0.5 m and 2 m long respectively. The crank makes 180 r.p.m. in the clockwise direction. When it has turned 45° from the inner dead centre position, determine : 1. velocity of piston, 2. angular velocity of connecting rod, 3. velocity of point E on the connecting rod 1.5 m from the gudgeon pin, 4. velocities of rubbing at the pins of the crank shaft, crank and crosshead when the diameters of their pins are 50 mm, 60 mm and 30 mm respectively, 5. position and linear velocity of any point G on the connecting rod which has the least velocity relative to crank shaft. 	14M	2	3
	OR			
4.	In a slider crank mechanism, the crank is 480 mm long and rotates at 20 rad/s in the counter-clockwise direction. The length of the connecting rod is 1.6 m. When the crank turns 60^o from the inner-dead centre, determine the (i) velocity of the slider (ii) velocity of a point E located at a distance 450 mm on the connecting rod extended (iii) position and velocity of a point F on the connecting rod having the least absolute velocity. (iv) angular velocity of the connecting rod.  (a)	14M	2	3
	UNIT–III			
5.	Draw a neat sketch of a Davis steering gear, and show that it satisfies the condition for correct steering in all positions.	14M	3	4
	OR			
6.	How can we ensure that a Tchebicheff mechanism traces an approximate straight line?	14M	3	1

UNIT–IV

7.	Calculate (i) length of path of contact, (ii) arc of contact and (iii) the contact ratio when a pinion having 23 teeth drives a gear having teeth 57. The profile of the gears is involute with pressure angle 20^0, module 8 mm and addendum equal to one module.	14M	4	3

OR

8.	Two mating gears with 6 mm module have 30 teeth and 75 teeth. The addendum is standard one module. Pressure angle is 20°. Find: i) pitch diameters, ii) center distance iii) length of path of contact, iv) length of arc of contact and v) contact ratio.	14M	4	3

UNIT–V

9.	A cam operating a knife-edged follower has the following data : (a) Follower moves outwards through 40 mm during 60° of cam rotation. (b) Follower dwells for the next 45°. (c) Follower returns to its original position during next 90°. (d) Follower dwells for the rest of the 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 the cam is 50 mm. Draw the profile of the cam when the axis of the follower passes through the cam axis.	14M	5	6

OR

10.	Discuss various types of followers.	14M	5	2

***

Hall Ticket Number :										

R-19

Code: 19AC34T

II B.Tech. I Semester Supplementary Examinations March/April 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)

****

			Marks	CO	BL
		UNIT–I			
1.		Describe meant by classification? Write the importance of Classification?	14M	CO1	2
		OR			
2.		Write the structure of animal cell with labelled diagram?	14M	CO1	1
		UNIT–II			
3.		Describe nucleic acids? Write the structure and functions of nucleic acids?	14M	CO2	2
		OR			
4.		Describe the mechanism of enzyme action?	14M	CO2	2
		UNIT–III			
5.		Explain the reaction of Electron Transport Chain?	14M	CO3	2
		OR			
6.	a)	Explain the Neuromuscular junctions?	7M	CO3	2
	b)	Describe the Glycolysis?	7M	CO3	2
		UNIT–IV			
7.	a)	Briefly describe the transcription and translation?	7M	C04	2
	b)	Write the importance of Genetic code?	7M	C04	1
		OR			
8.		Discuss in detail about Gene Mapping?	14M	C04	2
		UNIT–V			
9.		Describe the DNA Microarray technique**,** types and applications?	14M	CO5	2
		OR			
10.		Explain the various process of recombinant DNA technology?	14M	CO5	2

***

Hall Ticket Number :										

R-19

Code: 19A332T

II B.Tech. I Semester Supplementary Examinations March/April 2023

Mettalurgy 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)

****

			Marks
		UNIT–I	
1.		Classify bonds and explain them with examples	14M
		OR	
2.	a)	Define alloy. Explain its necessity.	7M
	b)	Discuss about Schottky defect and Frankel defect.	7M
		UNIT–II	
3.	a)	Briefly explain the methods used for construction of Equilibrium diagrams.	7M
	b)	Draw the phase diagram for an Isomorphous system.	7M
		OR	
4.		Draw a neat sketch of Iron-Iron Carbide (Fe-Fe_3C) diagram and label all important points, lines and phases in it.	14M
		UNIT–III	
5.		Discuss briefly the properties and applications of Titanium and its alloys	14M
		OR	
6.	a)	Briefly explain the characteristics of cast irons	7M
	b)	Classify Cast Irons Explain any one of them	7M
		UNIT–IV	
7.		Describe the steps involved in construction of TTT diagram	14M
		OR	
8.	a)	What is Normalizing? Explain its purpose	7M
	b)	Compare hardening and Tempering processes	7M
		UNIT–V	
9.		Classify composites. Explain about fiber reinforced composites	14M
		OR	
10.		Briefly explain metal matrix composites and Carbon-Carbon composites	14M

***

Hall Ticket Number :										

R-19

Code: 19A331T

II B.Tech. I Semester Supplementary Examinations March/April 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 tensile test was conducted on a mild steel bar. The following data was obtained from the test:
   (i) Diameter of the steel bar = 3 cm
   (ii) Gauge length of the bar = 20cm
   (iii) Load at elastic limit=250kN
   (iv) Extension at a load of 150kN=0.21mm
   (v) Maximum load = 380 kN
   (vi) Total extension = 60 mm
   (vii) Diameter of rod at failure = 2.25 cm
   Determine:
   (a) The Young's modulus (b) The stress at elastic limit
   (c) The percentage of elongation (d) The percentage decrease in area. 14M

OR

2. a) Prove that the maximum stress induced in a body due to suddenly applied load is twice the stress induced when the same load is applied gradually. 7M

   b) Define the term 'composite bar'. How will you find the stresses and load carried by each member of a composite bar? 7M

UNIT–II

3. A beam ABC 8 m long has the support at the end A and other support at B 6 m from A. It carries a uniformly distributed load of 6 kN/m over the entire length and a point load of 10 kN at the end C. Draw the shear force and bending moment diagrams 14M

OR

4. A simple supported beam of length 8m rests on supports 6m apart, the right hand end is overhanging by 2 m. The beam carries a uniformly distributed load of 1500 N/m over the entire length. Draw the shear force and bending moment diagrams and find the point of contra flexure, if any? 14M

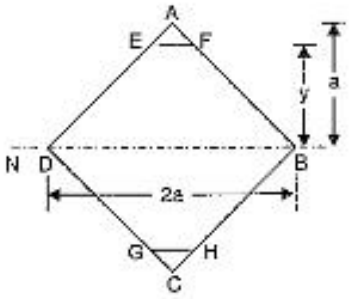
UNIT–III

5. a) Derive the section modules for (a) rectangular section and (b) circular section 7M

   b) Prove that for a rectangular section the maximum shear stress is 1.5times the average stress. Sketch the variation of shear stress. 7M

OR

6. Prove that the moment of a resistance of a beam of square section, with its diagonal in the plane of bending is increased by flatting top and bottom corners as shown in figure and that moment of resistance is maximum when $y = \frac{8a}{9}$. Find the percentage increase in moment of resistance also.



14M

UNIT–IV

7. Define Macaulay's method? And find out Deflection of a simply supported beam with an Eccentric point load 14M

OR

8. A beam of length 6 m is simply supported at the ends and carries two point loads of 48 kN and 40 kN at a distance of 1 m and 3 m respectively from the left support. Compute,
   i. Slope and deflection under each load. ii. Maximum deflection
   iii. The point at which maximum deflection occurs.
   Assume E = 2 X 10^5 N/mm^2 and I = 85 X 10^6 mm^4. 14M

UNIT–V

9. A solid round bar 3 m long and 5 cm in diameter is used as a sturt. Determine the cripping load when the given sturt is used for the following conditions
   i) Both the ends are hinged
   ii) Both the ends are fixed
   iii) One end is fixed and one end is hinged and
   iv) One end is fixed and one end is free.
   Take E = 2.1 x 10^5 N/mm^2. Also find safe load taking factor of safety as 4 in each case. 14M

OR

10. What are the stresses induced in the thin cylindrical shell subjected to internal pressure? Explain and derive them. 14M

***

Hall Ticket Number :										

R-19

Code: 19AC31T

II B.Tech. I Semester Supplementary Examinations March/April 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)

****

		Marks	CO	BL
	UNIT–I			
1. a)	Find the L.T of $e^{-3t}\left(2\cos 5t - 3\sin 5t\right)$	7M	1	L1
b)	Find $L\left\{e^{3t}\sin^2 t\right\}$	7M	1	L1
	OR			
2.	Find $L\left\{f(t)\right\}$, where $f(t)$ is aperiodic function of the period $2®$ and it is given by $f(t)=\begin{cases}\sin t, & 0<t<®\\ 0 \ , & ®<t<2®\end{cases}$	14M	1	L3
	UNIT–II			
3. a)	Find $L^{-1}\left\{\dfrac{s+3}{s^2-10s+29}\right\}$	7M	2	L1
b)	Find $L^{-1}\left\{\dfrac{2s+12}{s^2+6s+13}\right\}$	7M	2	L1
	OR			
4.	Using convolution theorem , find $L^{-1}\left\{\dfrac{1}{\left(s^2+a^2\right)^2}\right\}$	14M	2	L3
	UNIT–III			
5.	Express $f(x)=x-®$ as Fourier series in the interval $-® < x < ®$	14M	3	L2
	OR			
6.	Find the Fourier Series to represent $f(x)=x^2-2$ when $-2 \le x \le 2.$	14M	3	L1

UNIT–IV

7. Solve by the method of separation of variables $\frac{\partial^2 z}{\partial x^2} = \frac{\partial z}{\partial y} + 2z$ 14M 4 L3

OR

8. Solve the one dimensional heat equation $\frac{\partial u}{\partial t} = C^2 \frac{\partial^2 u}{\partial x^2}$ subject to the condition

$u(0,t) = 0,\ u(L,t) = 0, t > 0$ *and* $u(x,0) = 3\sin\left(\frac{®x}{L}\right), 0 < x < L.$ 14M 4 L3

UNIT–V

9. a) Find all values of k, such that $f(z) = e^x(\cos ky + i \sin ky)$ is analytic. 7M 5 L1

b) Show that the function $f(z) = z\bar{z}$ is differentiable but not analytic at $z = 0.$ 7M 5 L2

OR

10. Evaluate using Cauchy's theorem $\int_c \frac{z^3 e^{-z}}{(z-1)^3} dz$ where c is $|z-1| = \frac{1}{2}$. Using Cauchy's integral formula. 14M 5 L5

***

Hall Ticket Number :										

R-19

Code: 19A236T

II B.Tech. I Semester Supplementary Examinations March/April 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)

****

			Marks	CO	BL
		UNIT–I			
1.	a)	Derive the expression for an equivalent resistance if any two resistors R1, R2 are connected in series.	7M	1	6
	b)	Briefly explain the following terms i) Active and Passive Elements ii) linear and Bilateral Elements iii)Depended and independed Sources iv) voltage and current sources	7M	1	2
		OR			
2.	a)	Derive the Expression for Capacitance when C1, C2, and C3 are connected in series.	7M	1	6
	b)	If two 100 Ohms Resistor are connected (a) in series and (b) in parallel to a 24 V battery. What is the current through each resistor?	7M	1	3
		UNIT–II			
3.		Explain the various methods involved for the speed control of Dc motors	14M	2	1
		OR			
4.		Describe various types self -excited of DC generator with their circuit layout along with necessary equations.	14M	2	2
		UNIT–III			
5.		A 1000kVA, 3300 V, 50Hz, 3-phase star connected alternator has 0.2Ω resistance when measured between any two stator terminals. Effective resistance is 1.5 times the dc resistance. Synchronous reactance pre phase is 4Ω. Calculate the full load regulation of the alternator at i) 0.8 lagging and ii) 0.8 leading power factor.	14M	3	3
		OR			
6.		Describe the synchronous impedance method for calculating the regulation of a three-phase alternator	14M	3	2
		UNIT–IV			
7.	a)	Briefly Explain the formation of unbiassed and biased form of PN junction diode.	7M	4	2
	b)	List out the Various applications of the Diode.	7M	4	1
		OR			
8.		Explain the operation of a p-n junction diode in forward biased and reverse biased condition and also draw its V-I characteristics.	14M	4	2
		UNIT–V			
9.	a)	Explain the principle of induction heating. Which are the two types of induction heating?	7M	5	2
	b)	Explain the procedure for determining the unknown resistance using the CRO	7M	5	2
		OR			
10.		Explain how voltage, current and frequency is measured using CRO?	14M	5	2

***

Hall Ticket Number :										

R-19

Code: 19A333T

II B.Tech. I Semester Supplementary Examinations March/April 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)

****

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) Derive the general steady flow energy equation and deduce SFEE for Turbine. 8M

   b) A mass of 8 kg gas expands within a flexible container so that the p–v relationship is of the form $pv^{1.2}$ = constant. The initial pressure is 1000 kPa and the initial volume is 1 m^3. The final pressure is 5 kPa. If specific internal energy of the gas decreases by 40 kJ/kg, find the heat transfer in magnitude and direction. 6M

UNIT–II

3. a) Determine the expression for the measurement of performance for reversible heat engines, heat pump and refrigerators. 10M

   b) State Carnot theorem. 4M

OR

4. a) Write short notes on Second law of Thermodynamics. 7M

   b) An inventor claims to develop an engine which absorbs 100KW of heat from a reservoir at 1000K produces 60 kW of work and rejects heat to a reservoir at 500 K. Will u advise investment in its development? 7M

UNIT–III

5. a) Write about the Mollier Chart and its use. 7M

   b) Draw and explain P-V diagram for pure substance. 7M

OR

6. a) A sample of steam from a boiler drum at 3 MPa is put through a throttling calorimeter in which the pressure and temperature are found to be 0.1 MPa, 120°C. Find the quality of the sample taken from the boiler. 8M

   b) Explain the concept of Triple point. 6M

UNIT–IV

7. a) 1.5 kg of air at pressure 6 bar occupies a volume of 0.2 $m^{3.}$ If this air is expanded to a volume of 1.1 m^3. Find the work done and heat absorbed or rejected by the air for each of the following methods. (i) Isothermal process (ii) Adiabatic process (iii) Polytropic 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) Derive the relationship between the two principal specific heats and characteristic gas constant for a perfect gas 6M

   b) Deduce the equation PV^Y = Constant for an adiabatic process 8M

UNIT–V

9. a) Explain Mass fraction, Mole fraction, Internal energy and specific heat of gas mixtures 8M

   b) Briefly discuss about the Volumetric Analysis. 6M

OR

10. The volumetric analysis of a dry flue gas in a boiler trail is given in percentage as 13% CO_2, 1.5% CO, 3.5% O_2 and 82% N_2. Determine the percentage gravimetric analysis also find the specific gas constant of the mixture 14M

***