

Code: 19A334T

II B.Tech. I Semester Supplementary Examinations Nov/Dec 2022

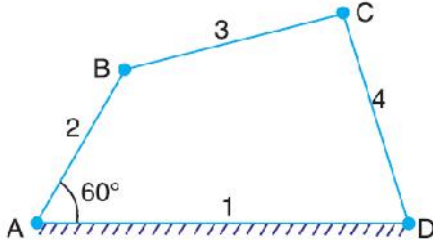
Kinematics of Machinery

(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	Blooms Level
UNIT-I			
1. Differentiate between a) Machine and Mechanism b) Kinematic chain structure c) Lower pair and Higher pair d) Mobility and Degree of freedom	14M	1	2
OR			
2. Describes the various inversions of a single slider crank chain with sketches	14M	1	2
UNIT-II			
3. Locate all the instantaneous centres for a four bar mechanism as shown in Fig. The lengths of various links are: AD=125mm; AB=62.5mm; BC=CD=75mm. If the link AB rotates at a uniform speed of 10 r.p.m. in the clockwise direction, find the angular velocity of the links BC and CD.			
			
	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 2500 mm. When the crank turns 60° from the inner-dead centre, locate all instantaneous centres. Also determine (i) velocity of slider and (ii) angular velocity of connecting rod.	14M	2	3
UNIT-III			
5. Draw a neat sketch of a 'Peaucellier straight mechanism' and prove that a point in the mechanism traces an exact straight line.	14M	3	4
OR			
6. What is a Scott-Russel mechanism? What is its limitation? How it is modified?	14M	3	1
UNIT-IV			
7. State and prove the law of gearing	14M	4	5
OR			
8. A pair of gear has 16 teeth and 18 teeth, a module 12.5 mm an addendum 12.5 mm and a pressure angle 14.5°. Prove that gears have interference. Determine the minimum number of teeth and the velocity ratio to avoid interference.	14M	4	3
UNIT-V			
9. A cam, with a minimum radius of 50 mm, rotating clockwise at a uniform speed, is required to give a knife edge follower the motion as described below: i) To move outwards through 40 mm during 100° rotation of the cam ii) To dwell for next 80°; iii) To return to its starting position during next 90°, and iv) To dwell for the rest period of a revolution i.e. 90°. Draw the profile of the cam when the line of stroke of the follower passes through the centre of the cam shaft. The displacement of the follower is to take place with uniform acceleration and uniform retardation.	14M	5	6
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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R-19

Code: 19AC34T

II B.Tech. I Semester Supplementary Examinations Nov/Dec 2022

Life Sciences for Engineers

(Common to All Branches)

Max. Marks: 70

Time: 3 Hours

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

		Marks	CO	Blooms Level
UNIT-I				
1.	Describe the types of cells and write the differences between prokaryotes and eukaryotes cells?	14M	1	2
OR				
2. a)	Explain the differences between Plant cell and Animal cell?	7M	1	2
b)	Describe is mitochondrion? Write their structure and important functions and draw the labelled diagram?	7M	1	2
UNIT-II				
3.	Define the proteins? Write the structure and functions of proteins?	14M	2	1
OR				
4.	Define the antibodies and Write the types and functions of antibodies?	14M	2	1
UNIT-III				
5.	Explain the Glycolysis pathway and importance?	14M	3	2
OR				
6.	Discuss the Clavin cycle/C ₃ cycle?	14M	3	2
UNIT-IV				
7. a)	Explain the three laws of inheritance with examples?	7M	3	2
b)	Briefly describe the transcription and translation?	7M	3	2
OR				
8.	Explain the Process of DNA Replication in prokaryotic and eukaryotic animals?	14M	4	2
UNIT-V				
9. a)	Write short notes on restriction enzymes?	7M	5	1
b)	Explain the Importance of DNA Cloning?	7M	5	2
OR				
10. a)	Explain the applications of transgenic animals?	7M	5	2
b)	Discuss the tools of Recombinant DNA Technology?	7M	5	2

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R-19

Code: 19A332T

II B.Tech. I Semester Supplementary Examinations Nov/Dec 2022

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)

UNIT-I

1. What are the methods used for measuring the grain size? Discuss any two of them. Marks
14M

OR

2. Discuss about the classification of Intermediate Alloy Phases 14M

UNIT-II

3. From the data given below for CU-Ni system, plot the equilibrium diagram to scale and label the diagram.

Weight % Ni	0	20	30	60	80	100
Liquidus temperature °C	1084	1200	1275	1345	1440	1455
Solidus temperature °C	1084	1165	1235	1310	1380	1455

Answer the following for 70% Ni alloy:

(i) What is the composition of first solid crystallizing out from liquid?

(ii) What is the composition of last solid formed at the end of solidification?

(iii) What are the amounts of solid and liquid at 1360°C 14M

OR

4. Draw a neat sketch of Iron-Iron Carbide (Fe-Fe₃C) diagram and label all important points, lines and phases in it. 14M

UNIT-III

5. a) Discuss about Hadfield manganese steels 7M

b) What do you understand by Season cracking and how it can be prevented 7M

OR

6. a) Explain the microstructure, properties and applications of Grey cast iron 7M

b) Discuss about malleable cast iron mentioning its properties and applications 7M

UNIT-IV

7. Explain about stress relieving annealing and full annealing 14M

OR

8. a) Differentiate between Annealing and Normalizing 7M

b) Differentiate between carburizing and Nitriding 7M

UNIT-V

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

OR

10. a) Differentiate between acidic and basic OH process 7M

b) Define powder metallurgy process and applications of powder metallurgy 7M

Hall Ticket Number :										
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R-19

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II B.Tech. I Semester Supplementary Examinations Nov/Dec 2022

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)

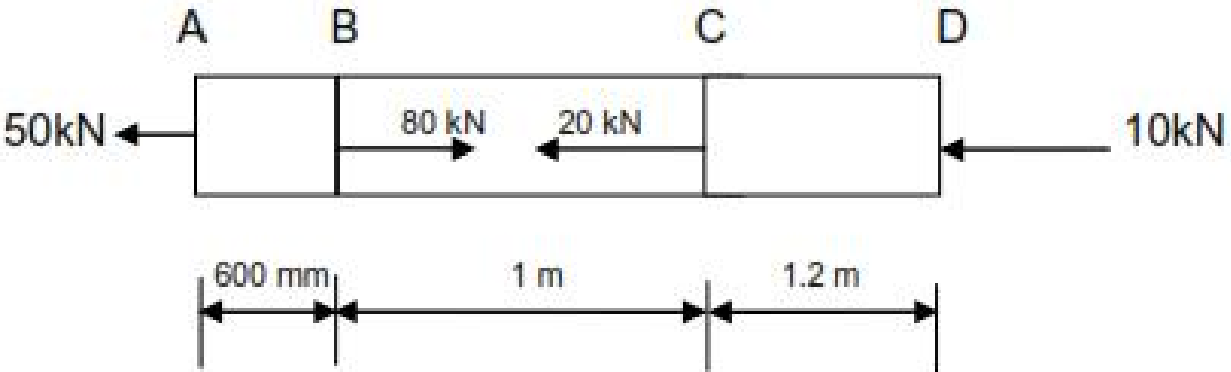
UNIT-I

Marks

1. a) Derive the relationship between young's modulus, modulus of rigidity and bulk modulus. 7M
- b) A bar of 20mm diameter is tested in tension it is observed that when a load of 40KN is applied the extension measured over a gauge length of 200mm is 0.12mm & contraction in diameter is 0.0036mm. Find poisson's ratio, young's modulus & bulk modulus & rigidity modulus. 7M

OR

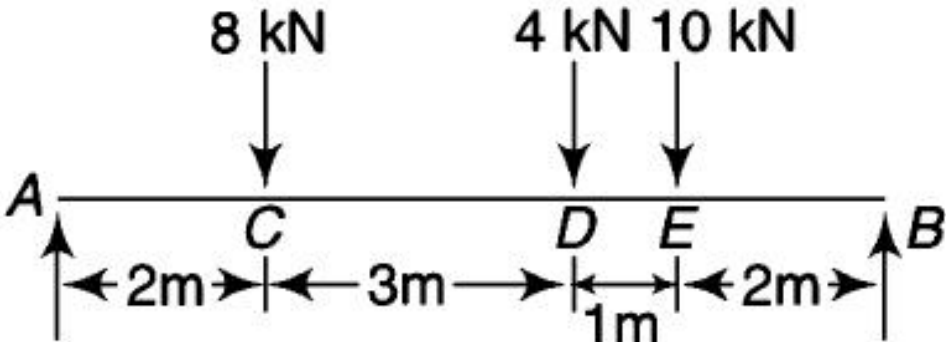
2. A brass bar, having cross-sectional area of 1000 mm² is subjected to axial forces as shown in figure. Find the total elongation of the bar. Take $E=1.05 \times 10^5 \text{ N/mm}^2$.



14M

UNIT-II

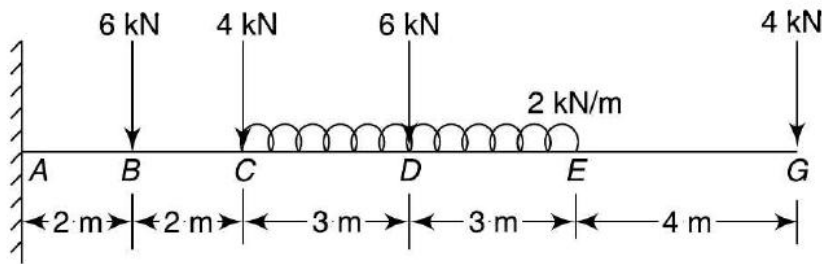
3. Draw the shear force and bending moment diagram for the given beam.



14M

OR

4. Draw the shear force and bending moment diagram for the given beam.



14M

UNIT-III

5. A cast iron beam has an I-section with top flange 80 mm x 40 mm, web 120mm x 20mm and bottom flange 160mm x 40 mm. If the tensile stress is not to exceed 30N/mm^2 and compressive stress 90N/mm^2 , what is the maximum uniformly distributed load the beam can carry over a simply supported span of 6 m if the larger flange is in tension?

14M

OR

6. a) A wooden beam of rectangular section 15 cm x 30 cm is simply supported over a length of 4m. It carries a UDL of 4kN/m throughout its length. What is the maximum shear stress developed in the beam section?
- b) A beam is of a circular section of diameter 80 mm. At particular section SF is 40kN. Draw the shear stress distribution along the depth of the section?

7M

7M

UNIT-IV

7. a) Derive the relationship between slope, deflection and radius of Curvature of a simply supported beam.
- b) A beam of 6 meter long simply supported at its ends, carries a point load 'W' at its centre. If the slope at the ends of the beam is not to exceed 1° , find the maximum deflection.

7M

7M

OR

8. A cantilever beam of span 2 m supports a UDL of 2 kN/m over a length of 1 m from the fixed end and a point load of 1 kN at 1 m from the free end.

Find the slope and deflection at the free end if $EI=1.4 \times 10^3 \text{ KN/m}^2$.

14M

UNIT-V

9. State and explain Lamé's theory for thick cylindrical shells. Derive the Lamé's equations.

14M

OR

10. Determine the ratio of buckling strengths of two columns one hollow and the other solid. Both are made of the same material and have the same length, cross sectional area and end conditions. The internal diameter of hollow column is $2/3^{\text{rd}}$ of its external diameter.

14M

Code: 19AC31T

II B.Tech. I Semester Supplementary Examinations Nov/Dec 2022

Partial Differential Equations and Complex Variables

(Common to CE, EEE, ME and 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 $f(t) = \begin{cases} \sin t, & 0 < t < f \\ 0, & t > f \end{cases}$

7M CO1 L1

b) Find the L.T of $\sin(\omega t + r)$

7M CO1 L1

OR

2. Using L.T, Evaluate $\int_0^{\infty} \frac{e^{-t} - e^{-2t}}{t} dt$

14M CO1 L3

UNIT-II

3. a) Find $L^{-1} \left\{ \frac{3(s^2 - 2)^2}{2s^5} \right\}$

7M CO2 L1

b) Find the inverse L.T of $\frac{4}{(s+1)(s+2)}$

7M CO2 L1

OR

4. Using convolution theorem, find $L^{-1} \left\{ \frac{1}{s^2(s+1)^2} \right\}$

14M CO2 L3

UNIT-III

5. Obtain the Fourier series expansion of $f(x)$ given that $f(x) = kx(f-x)$ in $0 < x < 2f$ where k is a constant.

14M CO3 L3

OR

6. Find the half range Cosine and Sine series for the function $f(x) = x$ in the range $0 < x < \pi$

14M CO3 L1

UNIT-IV

7. Using the method of separation of variables, solve

$$\frac{\partial^2 z}{\partial x^2} - 2\frac{\partial z}{\partial x} + \frac{\partial z}{\partial y} = 0$$

14M CO4 L3

OR

8. A string is stretched and fastened to two points at a distance " l " apart. Motion is started by displacing the string in the form $y = k(lx - x^2)$ from which it is released at time $t = 0$. Find the displacement at any point on the string at a distance x from one end at time t .

14M CO4 L3

UNIT-V

9. a) Prove that

$$\left(\frac{\partial^2}{\partial x^2} + \frac{\partial^2}{\partial y^2} \right) |\text{Real } f(z)|^2 = 2|f'(z)|^2$$

where $w = f(z)$ is analytic.

10M CO5 L5

- b) Show that $f(z) = z + 2\bar{z}$ is not analytic anywhere in the complex plane.

4M CO5 L1

OR

10. Evaluate $\int_c (y^2 + 2xy)dx + (x^2 - 2xy)dy$ where c is

the boundary of the region by $y = x^2$ and $x = y^2$.

14M CO5 L5

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R-19

Code: 19A236T

II B.Tech. I Semester Supplementary Examinations Nov/Dec 2022

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	Blooms Level
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UNIT-I

1. a) For the series connected Resistance (R1, R2 and R3) determine its Equivalent value.
- b) For the circuit shown simplify the network using network reduction technique and determine the current supplied by the battery.

7M	1	3
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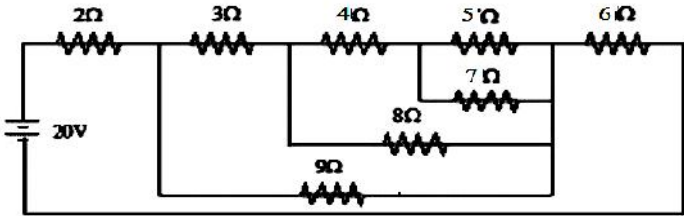


Fig .1
OR

7M	1	3
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2. a) State the voltage, current and power relationships for
i) Resistance ii) Inductance iii) capacitance
- b) State the limitations Ohms law and discuss its limitations of it.

7M	1	2
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7M	1	2
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UNIT-II

3. Explain the various methods involved for the speed control of DC motors

14M	2	1
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OR

4. a) Derive the expression for torque developed by a D.C. motor from fundamentals.
- b) A 4 pole, wave wound generator having 40 slots and 10 conductors placed per slot. The flux per pole is 0.02 wb. Calculate the generated emf when the generator is drive at 1200 rpm.

10M	2	6
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4M	2	3
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UNIT-III

5. Explain the principle of operation and constructional features of a three-phase induction motor. Mention its applications.

14M	3	2
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OR

- | | | | | |
|-------|--|----|---|---|
| 6. a) | Derive the expression for EMF equation of single-phase transformer | 7M | 3 | 6 |
| b) | With a help of neat sketch explain the principle of three phase induction motor. | 7M | 3 | 2 |

UNIT-IV

- | | | | | |
|-------|---|----|---|---|
| 7. a) | Differentiate the following terms with Energy band Diagrams | 7M | | |
| | i) Conductor ii) Insulator iii) Semi-conductor | | 4 | 5 |
| b) | Briefly Explain the P and N layers of semiconductors with respect to the flow of electrons. | 7M | 4 | 3 |

OR

- | | | | | |
|-------|--|----|---|---|
| 8. a) | Explain the input and output characteristic of a transistor in Common Emitter configurations | 7M | 4 | 2 |
| b) | Draw the equivalent circuit of a CE amplifier and explain its operation | 7M | 4 | 2 |

UNIT-V

- | | | | | |
|--------|--|-----|---|---|
| 9. | Explain the concept of induction heating and also discuss the about various industrial applications of induction heating | 14M | 5 | 2 |
| | OR | | | |
| 10. a) | Explain the theory of dielectric heating. State its advantages and industrial applications | 7M | 5 | 2 |
| b) | List out some of the applications of induction heating | 7M | 5 | 1 |

Hall Ticket Number :									
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R-19

Code: 19A333T

II B.Tech. I Semester Supplementary Examinations Nov/Dec 2022

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) Explain Quasi-static reversible process with the help of a suitable example.	7M
b) A mass of gas is compressed in a quasi-static process from 80 kPa, 0.1 m ³ to 0.4 MPa, 0.03 m ³ . Assuming that the pressure and volume are related by $pv^n = \text{constant}$, find the work done by the gas system.	7M
OR	
2. a) Write short notes on (i) Zeroth law of Thermodynamics. (ii) First law of Thermodynamics.	8M
b) Prove that Internal energy is a property of the system.	6M
UNIT-II	
3. Prove Maxwell Equations and derive two Tds equations	14M
OR	
4. A reversible heat engine operates between two reservoirs at temperatures 700°C and 50°C. The engine drives a reversible refrigerator which operates between reservoirs at temperatures of 50°C and -25°C. The heat transfer to the engine is 2500 kJ and the network output of the combined engine refrigerator plant is 400 kJ. (i) Determine the heat transfer to the refrigerant and the net heat transfer to the reservoir at 50°C; (ii) Reconsider (i) given that the efficiency of the heat engine and the C.O.P. of the refrigerator are each 45 per cent of their maximum possible values.	14M
UNIT-III	
5. a) What is a pure substance? Draw and explain P-T diagram for pure substance.	6M
b) Find the internal energy and enthalpy of unit mass of steam of a pressure of 7 bar when (i) Its quality is 0.8. (ii) it is dry saturated. (iii) Superheated the degree of superheat being 65 °C.	8M
OR	
6. a) Derive Clausius–Clapeyron equation.	7M
b) Draw a neat sketch of throttling calorimeter and explain how dryness fraction of steam is determined; clearly explain its limitations.	7M
UNIT-IV	
7. a) Explain Vander wall's equation of state and derive the constants for the equation.	14M
OR	
8. a) 0.3 m ³ of air at pressure 8 bar expands to 1.5 m ³ . The final pressure is 1.3 bar. Assuming the expansion to be polytropic. Calculate the heat supplied and change of internal energy. Assume $n=1.4$	7M
b) Derive the expressions for heat transfer and work done during a reversible isothermal process.	7M
UNIT-V	
9. a) The following volumetric composition relate to a mixture of gases: - N ₂ =81%, CO ₂ =11%, O ₂ =6%, CO=2% Determine i) the gravimetric composition. ii) Molecular weight and iii) Universal gas constant R for the mixture.	10M
b) Explain briefly about Dalton's law of partial pressures.	4M
OR	
10. a) Write a short note on the Gravimetric Analysis.	7M
b) State Avogadro's law of Additive volumes.	7M
