NARASARAOPETA ENGINEEERING COLLEGE:NARASARAOPET
(AUTONOMOUS)
II B.Tech I Semester Regular Examinations: December-2024
(Branches: CSE, AI, IT, ME &CE)
ENVIRONMENTAL STUDIES

Sub Code: R23CC21MC   Max. Marks: 5x14=70M
Time: 3 hours   Date: 23-12-2024
Note: Answer All FIVE Questions.

All Questions Carry Equal Marks

UNIT-1

1. A) Define the environment? Why environmental studies considered as a multi-disciplinary subject? What is the scope of environmental education?   (CO1 K2 14M)

                           OR

   B) Write notes on Environmental effecting of extracting and using mineral resources?
                                                          (CO1 K3 14M)

UNIT-1I

2. A) What are ecological pyramids? Explain why some of these pyramids are upright while others are inverted in different ecosystems?   (CO2 K2 14M)

                         OR

   B) Explain various values in biodiversity? Explain about India as a mega-diversity nation.
                                                          (CO2 K2 14 M)

UNIT-1II

3. A) Discuss adverse effects and control of water pollution?
                                                          (CO3; K2 14M)

                         OR

   B Classified solid waste? What adverse effects can solid waste cause? How can the solid waste be managed?   (CO3 K1&K2 14 M)

UNIT-1V

4. A) Discuss the salient features of (a) wildlife protection act 1972 (b)forest conservation act 1980.
                                                          (CO4   K2 14M)

                         OR

   B) What is a watershed? Critically Discuss the objectives and practices of watershed Management.
                                                          (CO4   K2   14M)

UNIT-V

5. A) Discuss the environmental and social impacts of growing population. With a neat diagram, Explain the variation in population growth among various nations   (CO5 K2 14M)

                         OR

   B) Explain the role of information technology in environment and human health.

                                                          (CO5   K2 14M)

NEC

II B.Tech I Semester Regular Examinations, December-2024

R23

Sub Code: R23CC2102   **UNIVERSAL HUMAN VALUES**

Time: 3 hours.   (COMMON TO ALL BRANCHES)   Max. Marks: 70

Note: Question Paper consists of Two parts (Part-A and Part-B)

PART-A
Answering all the questions from Part-A is compulsory (10 x 2M = 20M)

Q.No		Questions	KL	CO	M
1	a	Describe the value education.	2	1	2M
	b	Differentiate between happiness and prosperity.	2	1	2M
	c	Define the concept of harmony in the human being.	1	2	2M
	d	Interpret the harmony in the self.	2	2	2M
	e	Describe the harmony in the family.	2	3	2M
	f	Differentiate between 'trust' and 'respect'.	2	3	2M
	g	List the four orders of nature.	2	4	2M
	h	Interpret the interconnectedness in nature	2	4	2M
	i	Define the term definitiveness of ethical human conduct.	1	5	2M
	j	Describe the natural acceptance.	2	5	2M

PART-B
Answer either 'a' or 'b' from each question of **PART-B** (5 x 10M = 50M)

Q.No		Questions	KL	CO	M
2		**Unit-I**			
	a	i) Explain the role of education in achieving holistic development.	2	1	5M
		ii)Outline the method to fulfill basic human aspirations.	2	1	5M
		OR			
	b	i) List the basic components of holistic development.	2	1	5M
		ii) Explain the current scenario concerning happiness and prosperity in society.	2	1	5M
3		**Unit-II**			
	a	i)Explain the co-existence of the self and the body.	2	2	5M
		ii)How do the needs of the self differ from the needs of the body?	2	2	5M
		OR			
	b	i) Briefly explain the role of health in ensuring harmony in the human being.	2	2	5M
		ii) Discuss the key components of a programme for self-regulation?	2	2	5M
4		**Unit-III**			
	a	i) Explain the significance of 'trust' as a foundational value in relationships.	2	3	5M
		ii) Explain why harmony in the family is considered the basic unit of human interaction.	2	3	5M

			KL	CO	M
		OR			
	b	i) Explain the importance of harmony in society for the well-being of individuals.	2	3	5M
		ii) Mention two examples of other feelings that contribute to harmonious relationships.	2	3	5M
		Unit-IV			
5	a	i) Explain the concept of self-regulation in the four orders of nature.	2	4	5M
		ii) Explain the relationship between interconnectedness and coexistence.	2	4	5M
		OR			
	b	i) Explain the significance of coexistence in realizing existence	2	4	5M
		ii) How does nature achieve self-regulation without external intervention?	2	4	5M
		Unit-V			
6	a	i) Explain the significance of humanistic education in shaping individual behavior.	2	5	5M
		ii) Discuss the main features of value-based management models.	2	5	5M
		OR			
	b	i) Outline any one strategy for transitioning toward a value-based profession.	1	5	5M
		ii) How does a humanistic constitution contribute to a universal human order?	2	5	5M

KL: Blooms Taxonomy Knowledge Level   CO: Course Outcome   M: Marks

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NARASARAOPETA ENGINEERING COLLEGE
(AUTONOMOUS)

II B.Tech I Semester Regular Examinations, December-2024

| | R23 |

Sub Code: R23ME2101

NUMERICAL METHODS & TRANSFORM TECHNIQUES

Time: 3 hours   (ME)   **Max. Marks: 70**

Note: Question Paper consists of Two parts (Part-A and Part-B)

PART-A
Answering all the questions from Part-A is compulsory (10 x 2M = 20M)

Q.No		Questions	KL	CO	M
1	a	Evaluate $\Delta(3e^x)$.	2	1	2M
	b	Write the Lagrange's interpolation formula for the unequally spaced values of x.	1	1	2M
	c	Write the Trapezoidal rule to evaluate the definite integral value of a function.	1	2	2M
	d	Write the equations (formulae) of the second order Rungta-Kutta method (Heun's method).	1	2	2M
	e	Find $L\left\{4t^2 + \sin 3t + e^{2t}\right\}$.	3	3	2M
	f	Find the inverse Laplace transform of $\dfrac{3s+4}{s^2+9}$.	3	3	2M
	g	Write the Dirichlet's Conditions.	1	4	2M
	h	Write the formulae to calculate the Fourier series of even function f(x) in the interval $(0, 2\pi)$.	1	4	2M
	i	Find the Fourier transform of $f(x) = \begin{cases} x, & 0 < x < a \\ 0, & otherwise \end{cases}$.	3	5	2M
	j	State Fourier integral theorm.	1	5	2M

PART-B
Answer either 'a' or 'b' from each question of PART-B (5 x 10M = 50M)

Q.No		Questions	KL	CO	M
2		**Unit-I**			
	a	i) Perform three iterations of the bisection method to obtain the root of the equation 2 sin x – x = 0, correct up to three decimal places.	3	1	5M
		ii) A second degree polynomial passes through the points (0, 1), (1, 3) and (2, 7)	3	1	5M
		OR			
	b	i) Find the root of $x^4 - x - 10 = 0$, correct up to three decimal places by Newton-Raphson method.	3	1	5M
		ii) The area A of a circle of diameter d is given for the following values: <table><tr><td>d</td><td>80</td><td>85</td><td>90</td><td>95</td><td>100</td></tr><tr><td>A</td><td>5026</td><td>5674</td><td>6362</td><td>7088</td><td>7854</td></tr></table> Calculate the area of a circle of a diameter of 105 units using Newton's interpolation formula.	3	1	5M
3		**Unit-II**			
	a	i) Evaluate $\displaystyle\int_0^5 \dfrac{dx}{4x+5}$ by using Simpson's 1/3rd rule, taking 10 equal parts.	3	2	5M

		ii) Use Euler's method, find y(0.2) given $\frac{dy}{dx}=y-\frac{2x}{y}$, $y(0)=1$ with h = 0.1.	3	2	5M

<div align="center">OR</div>

	b	i) By Simpson's 3/8th rule evaluate $\int_0^1 \frac{\sin x}{x}dx$ taking h = 1/6.	3	2	5M
		ii) Use the Taylor's series method to solve $\frac{dy}{dx}=x^2y-1$, $y(0)=1$. Also find y(0.1)	3	2	5M

<div align="center">Unit-III</div>

4	a	i) Find the Laplace transform of $t\sin^3 t$	3	3	5M
		ii) Solve the differential equation by using Laplace transforms $\frac{dy}{dt}+2y=e^{-3t}$, $y(0)=1$	3	3	5M

<div align="center">OR</div>

	b	i) Evaluate the following integral by using Laplace transform $\int_0^\infty \frac{\cos 6t - \cos 4t}{t}dt$	3	3	5M
		ii) Find the inverse Laplace transform of $\tan^{-1}\left(\frac{2}{s^2}\right)$.	3	3	5M

<div align="center">Unit-IV</div>

5	a	i) Find the Fourier series of $f(x)=\begin{cases}0, & -5<x<0 \\ 3, & 0<x<5\end{cases}$.	3	4	5M
		ii) Find half-range cosine series f(x) = sin x in the interval $(0, \pi)$	3	4	5M

<div align="center">OR</div>

	b	i) Find the Fourier series of f(x) = x in the interval $(0, 2\pi)$.	3	4	5M
		ii) Find the half-range sine series of f(x) = e^{ax} in the interval $(0, \pi)$.	3	4	5M

<div align="center">Unit-V</div>

6	a	i) Find the Fourier cosine and sine transforms of $f(x)=\begin{cases}x, & 0<x<1 \\ 2-x, & 1<x<2 \\ 0, & x>2\end{cases}$.	3	5	5M
		ii) Find the Fourier transform of $f(x)=\begin{cases}a-|x|, & |x|\le a \\ 0, & |x|>a\end{cases}$. Hence, show that $\int_0^\infty \frac{\sin^2 x}{x^2}dx=\frac{\pi}{2}$.	3	5	5M

<div align="center">OR</div>

	b	i) Find the Fourier cosine and sine transforms of $f(x) = 2e^{-5x} + 5e^{-2x}$.	3	5	5M
		ii) Find the Fourier transform of $f(x)=\begin{cases}1, & |x|<a \\ 0, & |x|>a\end{cases}$. Hence, find the value of $\int_0^\infty \frac{\sin x}{x}dx$.	3	5	5M

II B.Tech I Semester Regular Examinations, December-2024 | R23

Sub Code: R23ME2103 **THERMODYNAMICS**

Time: 3 hours   (ME)   Max. Marks: 70

Note: Question Paper consists of Two parts (Part-A and Part-B)

PART-A

Answering all the questions from Part-A is compulsory (10 x 2M = 20M)

Q.No		Questions	KL	CO	M
1	a	Define "Thermodynamic Equilibrium" and explain its significance.	K1	1	2M
	b	Differentiate between reversible and irreversible processes with examples.	K2	1	2M
	c	What are the limitations of the First Law of Thermodynamics?	K2	2	2M
	d	Derive the expression for the steady flow energy equation.	K3	2	2M
	e	Explain Carnot's principle and its applications.	K3	3	2M
	f	Describe the significance of entropy in analyzing thermodynamic processes.	K4	3	2M
	g	How do P-V-T surfaces aid in understanding phase transformations?	K4	4	2M
	h	Discuss the concept of human comfort in air conditioning.	K2	4	2M
	i	Sketch a Mollier chart and explain the region representing superheated steam.	K3	5	2M
	j	List and describe psychometric processes used in air-conditioning systems.	K1	5	2M

PART-B: Answer either 'a' or 'b' from each question of **PART-B** (5 x 10M = 50M)

Q.No		Questions	KL	CO	M
2		Unit-I			
	a	i) Derive the mathematical expression for the displacement work in a polytropic process.	K3	1	5M
		ii) A system contains 1 kg of gas at 300 K. It is compressed adiabatically from 1 bar to 5 bar. Calculate the work done assuming $\gamma = 1.4$.	K3	1	5M
		OR			
	b	i) Explain the concept of quasi-static process and its importance in thermodynamics.	K2	1	5M
		ii) Derive the relationship between heat, work, and internal energy change for a closed system during a thermodynamic process.	K2	1	5M
3		Unit-II			
	a	i) Explain the concept of enthalpy and derive its relationship with internal energy, pressure, and volume.	K2	2	5M
		ii) Write the First Law of Thermodynamics for the following open systems and explain the terms involved: (a) A steam turbine. (b) A boiler.	K3	2	5M
		OR			
	b	i) State and explain the First Law of Thermodynamics for a control mass undergoing a cyclic process.	K2	2	5M
		ii) A piston-cylinder contains 0.1 m³ of air at 100 kPa and 300 K. It is compressed reversibly and adiabatically to 500 kPa. Calculate the final temperature and work done. Assume $\gamma=1.4$.	K3	2	5M

			KL	CO	M
		Unit-III			
4	a	i) Prove that the efficiency of a Carnot engine is independent of the working substance.	K3	3	5M
		ii) A Carnot engine operates between a source at 500 K and a sink at 300 K. Calculate: (a) The efficiency of the Carnot engine. (b) The work output if 1500 kJ of heat is supplied.	K3	3	5M
		OR			
	b	i) Derive the mathematical expression for the entropy change of an ideal gas during an isothermal process.	K3	3	5M
		ii) A 1 kg block of copper at 400 K is cooled to 300 K. Calculate the entropy change of the block if its specific heat is 385J/kgK	K3	3	5M
5		**Unit-IV**			
	a	i) Define pure substances and explain the difference between saturated liquid, saturated vapor, and superheated vapor states.	K2	4	5M
		ii) Explain the concept of throttling processes and also explain the working of throttling calorimeter with a neat sketch	K3	4	5M
		OR			
	b	i) Derive Maxwell's relations and explain their importance in thermodynamics.	K3	4	5M
		ii) In a throttling process, the enthalpy remains constant. Steam enters a throttling valve at 10 MPa, 500^{0}C, and exits at 100kPa. Determine the quality of the steam at the exit. Take h at 10 Mpa, 500^{0}C=1279.3KJ/Kg, at 100kPa h$_f$=69.995KJ/Kg, h$_{fg}$=1035.9KJ/Kg and h$_g$=1105.9 KJ/Kg	K3	4	5M
6		**Unit-V**			
	a	i) Explain sensible and latent heat loads and their relevance in air-conditioning design.	K4	5	5M
		ii) Explain the concept of wet bulb temperature and its significance in psychometric processes.	K2	5	5M
		OR			
	b	i) A room requires 10kW of cooling. The refrigeration system operates with a COP of 3. Calculate the power input required for the system.	K3	5	5M
		ii) Calculate the relative humidity of air if the dry bulb temperature is 30^{0}C and the partial pressure of water vapor is 2.5kPa. Assume the saturation pressure of water vapor at 30^{0}C is 4.25kPa.	K3	5	5M

KL: Blooms Taxonomy Knowledge Level   CO: Course Outcome   M: Marks

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II B.Tech I Semester Regular Examinations, December-2024 | R23

Sub Code: R23ME2104   **MECHANICS OF SOLIDS**

Time: 3 hours   (ME)   Max. Marks: 70

Note: Question Paper consists of Two parts (Part-A and Part-B)

PART-A
Answering all the questions from Part-A is compulsory (10 x 2M = 20M)

Q.No		Questions	KL	CO	M
1	a	Differentiate between Elasticity and plasticity.	K2	1	2M
	b	Define the following terms: i) Poisson's ratio ii) Hooke's Law	K2	1	2M
	c	Classify the different types loads applied in beams.	K1	2	2M
	d	State the importance of S.F and B.M diagrams in beams.	K3	2	2M
	e	Write Bending Moment equation and mention the assumptions made in the theory of simple bending?	K2	3	2M
	f	Write formula for Shear stress distribution across circular section	K2	3	2M
	g	Mentions the assumptions taken while deriving formula for a circular shaft.	K2	4	2M
	h	State Mohr's theorem and Moment area method.	K3	4	2M
	i	Define the following terms: i) Hoop stress ii) Longitudinal Stress	K2	5	2M
	j	Mention Limitations of Rankine's Formula for Columns?	K3	5	2M

PART-B
Answer either 'a' or 'b' from each question of **PART-B** (5 x 10M = 50M)

Q.No		Questions	KL	CO	M
2		**Unit-I**			
	a	i) Draw a stress vs. strain diagram for mild steel and mark salient points.	K3	1	5M
		ii) Derive the expression for strain energy stored in a body when the impact load is applied.	K3	1	5M
		OR			
	b	A steel bar of 30 mm square in section is subjected to an axial compressive load of 80 kN. Find the percentage (%) change in volume if the bar is 400 mm long. What are the equal stresses that must be applied to the sides of the bar if the volumetric change is to be zero? Young's modulus is 200 GPa and poisson's ratio is 0.3.	K4	1	10 M
3		**Unit-II**			
	a	The cantilever beam of length 2 m carries a uniformly distributed load (UDL) of 1 KN/m runs over a length of 1.5 m from the fee end. Draw the shear force (SF) and bending moment (BM) diagrams for the cantilever beam shown below.	K5	2	10 M
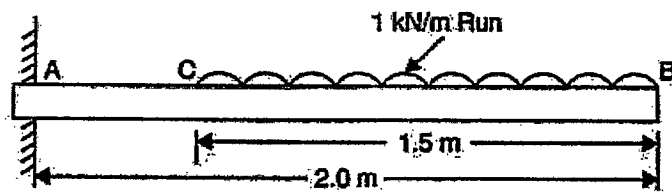
		OR			
b	i) Derive the relationship between shear force, bending moment, and rate of loading at a section of a beam.	K3	2	5M
	ii) List the different types of beams. Differentiate between a cantilever and a simply supported beam.	K3	2	5M

		Unit-III			
4	a	A cast iron bracket subjected to bending has the cross-section of I-form with unequal flanges. The total depth of the section is 280 mm and the metal is 40 mm thick throughout. The top flange is 200 mm wide and the bottom flange is 120 mm wide. Find the position of the neutral axis and moment of inertia of the section about the neutral axis and the maximum bending moment that should be imposed on this section if the tensile stress in the top flange is not to exceed 20N/mm². What is then the value of the maximum compressive stress in the bottom flange?	K5	3	10 M
		OR			
	b	i) Derive an expression for the shear stress at any point in a circular section of a beam, which is subjected to a shear force F. And prove that the maximum shear stress in a circular section of a beam is 4/3 times the average shear stress.	K2	3	5M
		ii) Derive the Bending Moment equation.	K3	3	5M

		Unit-IV			
5	a	A timber beam of rectangular section has a span of 4.8 metres and is simply supported at its ends. It is required to carry a total load of 45 kN uniformly distributed over the whole span. Find the values of the breadth (b) and depth (d) of the beam, if maximum bending stress is not to exceed 7 MPa and maximum deflection is limited to 9.5 mm. Take E for timber as 10.5 GPa.	K4	4	10 M
		OR			
	b	i) A solid steel shaft has to transmit 75 kW at 200 r.p.m. Taking allowable shear stress as 70 MN/m², find a suitable diameter for the shaft if the maximum torque transmitted on each revolution exceeds the mean by 30%.	K4	4	5M
		ii) Derive the equation of maximum torque transmitted by a circular solid shaft.	K3	4	5M

		Unit-V			
6	a	A thick cylinder of 200 mm outside diameter and 140 mm inside diameter is subjected to internal pressure of 40 Mpa and external pressure of 24 Mpa. Determine the maximum shear stress in the material of the cylinder at the inside diameter.	K4	5	10 M
		OR			
	b	Derive the Expression for Hoop stress and longitudinal stress in a thin cylinder shells subjected to internal fluid pressure?	K3	5	10 M

KL: Blooms Taxonomy Knowledge Level   CO: Course Outcome   M: Marks

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II B.Tech I Semester Regular Examinations, December-2024

R23

Sub Code: R23ME2105   **MATERIAL SCIENCE & METALLURGY**

Time: 3 hours   (ME)   Max. Marks: 70

Note: Question Paper consists of Two parts (Part-A and Part-B)

PART-A

Answering all the questions from Part-A is compulsory (10 x 2M = 20M)

Q.No		Questions	KL	CO	M
1	a	Draw FCC structure.	K2	1	2M
	b	What is meant by packing Factor	K2	1	2M
	c	Explain Lever rule with an example.	K3	2	2M
	d	What is eutectoid.	K2	2	2M
	e	Draw the microstructure of Malleable Cast iron.	K2	3	2M
	f	What are the applications of Titanium alloys.	K2	3	2M
	g	What is Tempering.	K2	4	2M
	h	What is sintering.	K2	4	2M
	i	What are the limitations of Ceramic materials.	K2	5	2M
	j	What are the limitations of composite materials.	K2	5	2M

PART-B

Answer either 'a' or 'b' from each question of **PART-B** (5 x 10M = 50M)

Q.No		Questions	KL	CO	M
2		**Unit-I**			
	a	i) Explain the detail about Ionic and Covalent bonding. Also explain about the strongest bonding with proper justification.	K2	1	5M
		ii) Write short notes on Bravais Lattices.	K2	1	5M
		OR			
	b	i) Explain unary and binary equilibrium phase diagram.	K2	1	5M
		ii) Explain Gibb's phase rule.	K2	1	5M
3		**Unit-II**			
	a	i) Explain about the structure and properties of Grey cast iron.	K2	2	5M
		ii) Explain about the structure and properties of plain carbon steel.	K2	2	5M
		OR			
	b	i)What are the alloys of copper . Write their compositions and their applications.	K2	2	5M
		ii) Discuss about the structure and properties of Aluminium and its alloys.	K2	2	5M
4		**Unit-III**			
	a	i) Explain difference between annealing and normalizing.	K2	3	5M
		ii) What is Flame hardening & Induction hardening.	K2	3	5M
		OR			
	b	Draw neatly a labelled TTT diagram for eutectoid steel (0.8%C) and explain briefly the different microstructures obtained at various cooling rates.	K3	3	10M

			KL	CO	M
		Unit-IV			
5	a	i) With a neat flow chart, briefly explain the Powder Metallurgy process and its applications.	K2	4	10M
		OR			
	b	i) Enumerate the different Powder Production methods. With suitable sketch briefly explain the Atomization method.	K2	4	10M
6		**Unit-V**			
	a	i) What are the applications and advantages of Ceramic Materials	K2	5	5M
		ii) What are carbon composites? Discuss about their micro structure and properties	K2	5	5M
		OR			
	b	i) Explain the applications where nano materials are used.	K2	5	3M
		ii) Define composite material. List the functions of the following: (i) Matrix material. (ii) Reinforcement materials	K3	5	7M

KL: Blooms Taxonomy Knowledge Level   CO: Course Outcome   M: Marks

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