R20

II B.TECH II SEM

SUPPLEMENTARY EXAMINATIONS

APRIL 2025

NEC NARASARAOPETA ENGINEERING COLLEGE
(AUTONOMOUS)

II B.Tech II Semester Supple. Examinations, April-2025

Sub Code: R20CC1OE11   WEB DEVELOPMENT USING MEAN STACK

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

Note: Answer All **FIVE** Questions. All Questions Carry Equal Marks   (5 X 14 = 70M)

Q.No		Questions	KL	CO	Marks
1	a	Describe the role of Pipes in Angular8. How would you create a custom pipe to format a date in a specific format?	III	I	7M
	b	How does Angular8 architecture manage data flow between components? Illustrate with an example.	III	I	7M
		OR			
	c	How does Angular8 handle asynchronous operations using services? Discuss an example of fetching data from an external API.	III	I	14M
2	a	Define routes in an Angular application with a lazy-loaded module. Implement navigation to the lazy-loaded module and demonstrate.	III	II	7M
	b	Create a reactive form with custom form validation for an email field (validating the format) and a password field (validating minimum length). Implement error messages for the validation rules. Explain the role of validators in Angular forms.	III	II	7M
		OR			
	c	Implement a basic example of a BehaviorSubject in Angular. Demonstrate how to subscribe to it and how to emit new values. Explain how this can be used in a service to share data across different components.	III	II	14M
3	a	Write a Node.js program that reads and writes to a file using the built-in fs module. Explain how Node.js handles file I/O operations asynchronously.	III	III	7M
	b	Explain with an example how to create a simple HTTP web server using Node.js.	III	III	7M
		OR			
	c	Write about the creation of user defined modules which internally use built in modules like math,os etc and import the module. Explain about Node.js how it handles blocked or non-blocked I/O operations.	III	III	14M
4	a	Write an Express.js route handler that responds to a GET request to /users by returning a JSON array of usernames. Explain how routing works in Express.js.	III	IV	7M
	b	Using Node.js EventEmitter, build a simple program that emits a dataReceived event when a mock data process is completed. Write the code and explain the role of EventEmitter in handling events.	III	IV	7M
		OR			
	c	Write how to create an Express.js Server with code that handles two routes one with basic rendering of data using GET, The other route should display static file like images or videos. Explain how Express handles static files.	III	IV	14M
5	a	Write a Node.js script to query and retrieve all documents from the products collection where the price is greater than 100. Display the retrieved documents	III	V	7M
	b	Write a Node.js script that updates all documents in the student's collection where grade is 'B' and changes it to 'A'. Display the count of modified documents	III	V	7M
		OR			
	c	Write about deleting documents from MongoDB database with code.	III	V	7M
	d	Explain the steps involved in connecting with MongoDB using Node.js also demonstrate insertion of documents in a Patient collection with a proper error handling mechanism.	III	V	7M

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II B.Tech II Semester Supple. Examinations, April-2025

Sub Code: R20CC2201

TECHNICAL AND COMMUNICATIVE ENGLISH-II

Time: 3 hours   Max. Marks: 70

Note: Answer All **FIVE** Questions.

All Questions Carry Equal Marks   (5 X 14 = 70M)

Q.No		Questions	KL	CO	Marks
		Unit-I			
1	a	i)Discuss the hurdles Nellie Bly overcame to make her wish come true.	3	1	8M
		ii)Rearrange the following words or phrases to make meaningful sentences. 1. a movie/last/night/watched/they 2. to/college/walk/I/everyday 3. rather/ boring/ the/is/book 4. ringing/ a/man/the /doorbell/is 5. around/the/cow/the/tree/running/is 6. the/delicious/is/food	3	4	6M
		OR			
	b	i)Why do the people call Nellie Bly " The Pretty Crazy Girl"?	3	1	8M
		ii)Write a brief profile of some you admire using the following prompts. Occupation, interests, Qualities you like, Accomplishments, His/Her impact on you.	6	2	6M
		Unit-II			
2	a	i)How was Mr. Ellis' method of teaching different from that of the author's predecessors?	6	2	8M
		ii) Write a coherent paragraph of 150 words on "Actions speak louder than words".	6	2	6M
		OR			
	b	i)Why did the narrator consider Mary Smith the dearest of his teachers?	3	1	8M
		ii) Fill in the blanks with appropriate articles: 1. She didn't get ____ invitation. 2. ____ peacock is in danger of extinction. 3. Our library has three copies of ____ Mahabharata. 4. Could you get me ____ kilogram of tea, please. 5. Abdul was ____ honest man. 6. The table is made of ____ wood.	3	3	6M
		Unit-III			
3	a	i) Explain the benefits and issues that are relating to "Distributed work".	3	1	8M
		ii) Correct the error in the following sentences and rewrite them. 1. This manual comprises of all the financial rules. 2. The rice is our staple food. 3. You are always coming late. 4. The concerned officer was on leave today. 5. Unless you do not eat, you will not be strong. 6. The salesperson asked the customer what she is looking for.	3	4	6M

		OR			
	b	i)Briefly summarize the changes that occurred in the workplace environment across the twentieth century.	3	1	8M
		ii) Fill in the blanks with suitable verb forms: 1. Keep_____ (guess) the answers till you them right. 2. Raman _____ (live) in Chennai for 10 years. 3. I have _____ (read) many books in the last one year. 4. Suraj _____ (love) going to parties with his friends. 5. She has been _____ (wear) this expensive watch for quite some time now. 6. How have you been _____ ?(do)	3	3	6M
		Unit-IV			
4	a	i)Explain H.G.Wells' idea of 'mechanical revolution' and its consequences.	3	3	8M
		ii) Write Antonyms for the following words. 1. Barren 2. Urban 3. Reveal 4. Vacant 5. Honest 6. Lend	3	4	6M
		OR			
	b	i)What can you infer about the author's view on the advancement of technology?	6	2	8M
		ii) Write Synonyms for the following words. 1. Abate 2. Meticulous 3. Lucid 4. Elementary 5. Wreck 6. Broad	3	4	6M
		Unit-V			
5	a	i)Does discrimination still exist in the society? Support your answer with relevant details.	3	1	8M
		ii)Write an essay about 250 words on "Violence in cinema promotes violence in society".	6	2	6M
		OR			
	b	i) Is awareness about cultural diversity essential?	3	1	8M
		ii)Write an essay about 250 words on " Technology is ruining our ability to communicate".	6	2	6M

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II B.Tech II Semester Supple. Examinations, April-2025

Sub Code: R20CC2202 COMPLEX VARIABLES, PROBABILITY AND STATISTICS

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

Note: Answer All **FIVE** Questions.

All Questions Carry Equal Marks   (5 X 14 = 70M)

Q.No		Questions	KL	CO	Marks
		UNIT-I			
1	a	I)**Show** that the function defined by $f(z)=\sqrt{\|xy\|}$ is not analytic at origin, although Cauchy-Reimann equations are satisfied.	3	1	7M
		II)Find a such that the function $f(z)=r^2\cos 2\theta+ir^2 \sin a\theta$ is analytic.	3	1	7M
		OR			
	b	I)**Prove** that every analytic function $f(z)=u+iv$ defines two families of curves $u(x,y)=k_1$ and $v(x,y)=k_2$ forming an orthogonal system.	3	1	7M
		II)Let $f(z)=u+iv$ be an analytic function. **Construct** the $f(z)$ when $3u+2v=y^2-x^2+16xy$	3	1	7M
		UNIT-II			
2	a	I)**Evaluate** $\int_C \dfrac{\sin \pi z^2+\cos\pi z^2}{(z-1)(z-2)}dz$, where C is $\|z\|=3$.	5	2	7M
		II) **Determine** the Laurent's series of $f(z)=\dfrac{z}{(z^2+1)(z^2+4)}$ in $1<\|z\|<2$.	5	2	7M
		OR			
	b	I)**Determine** the singularities of the following functions (i) $\sin\left(\dfrac{1}{z+1}\right)$ (ii) $\dfrac{1}{z(e^z-1)}$ (iii) $\dfrac{1-e^z}{z^4}$	5	2	7M
		II)**Evaluate** $\int_{-\infty}^{\infty} \dfrac{x^2}{(x^2+1)(x^2+4)}dx$ using Contour integration.	5	2	7M
		UNIT-III			
3	a	I) A hospital is known for coronary artery bypass grafting. Let X be the number of such surgeries done on a given day. The following table gives the probability distribution of the random variable X: **Determine** (i) $P(X\leq 2)$ (ii) $P(2<X<5)$ (iii) $P(X\geq 2)$ (iv) $P(1\leq X\leq 4)$	3	3	7M
		II)A continuous r.v X has a probability density function (p.d.f.) given by $f(x)=\begin{cases}kxe^{-\lambda x} ; x\geq 0,\lambda>0 , k>0\\ 0, elsewhere\end{cases}$ **Determine** the constant k, obtain the mean and variance of X.	3	3	7M
		OR			
	b	I)In a distribution which is exactly normal, 12% of the items are under 30 and 85% are under 60. **Determine** the mean and standard deviation of the distribution.	3	3	7M
		II)**A** and **B** play 12 games of chess of which 6 are won by **A**, 4 are won by **B**, and 2 end in a draw. They agree to play a tournament consisting of 3 games.	3	3	7M

The probability distribution table in Q3.a.I:

$X=x$	0	1	2	3	4	5
$p(x)$	0.02	0.05	0.10	0.15	0.18	0.50

		Determine the probability that (a) **A** wins all the three games, (b) Two games end in a draw (c) **A** and **B** win alternately			

UNIT-IV

4	a	I)Discuss the terms (i) estimate, (ii) consistent estimate, (iii) unbiased estimate, of a parameter. **Prove** that sample mean is both consistent and unbiased estimate of the population mean.	5	4	7M
		II)If on the average , the test strips painted across heavily travelled roads in 15 different locations, disappeared after they had been crossed by 146692 cars with standard deviation 14380 cars. **Construct** 99% confidence intervals for the true average number of cars it takes to wear off the paint, assuming normal population.	5	4	7M

OR

	b	I)A producer of TV's believes from past experience that the mean length of life of TV's is a normal random variable with mean $\mu_0=800$ hours and standard deviation $\sigma_0=10$ hours. It is known that TV's have mean length of life that is approximately normally distributed with a standard deviation of 100 hours. **Construct** a 95% Bayesian interval for μ if a random sample of 25 TV's has an average life of 780 hours.	5	4	7M
		II)An insurance agent feelings about the average monthly commission of insurance policies may be described by means of normal distribution with $\mu_0=¿$ Rs. 3800 and $\sigma_0=¿$ Rs. 260. **Identify** probability is the agent thus assigning to the true average monthly commission being in the interval of Rs. 3,500 to Rs. 4000.	5	4	7M

UNIT-V

5	a	I) Write the procedure for testing of Hypothesis?	3	5	7M
		II) A company claims that the mean thermal efficiency of diesel engines produced by them is 32.3%. To test this claim, a random sample of 40 engines were examined which showed the mean thermal efficiency of 31.4% and standard deviation of 1.6%. **Test** the claim be accepted or not, at 0.01 level of significance?	3	5	7M

OR

	b	I)An ambulance service company claims that on an average it takes 20 minutes between a call for an ambulance and the patient's arrival at the hospital. If in 6 calls the time taken between a call and arrival at hospital are 27, 18, 26, 15, 20, 32. **Test** the company's claim be accepted ?	3	5	7M
		II)If a can containing 500 dry fruits is selected at random from each of three different companies A, B, C of mixed dry fruits and there are 345, 313 and 359 cashew nuts respectively in each of the cans. **Test** 0.01 level of significance that the mixed dry fruits of three companies contain equal proportions of cashew nuts.	3	5	7M

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NARASARAOPETA ENGINEERING COLLEGE
(AUTONOMOUS)

II B.Tech II Semester Supple. Examinations, April-2025

Sub Code: R20CC2203   DATABASE MANAGEMENT SYSTEMS

Time: 3 hours   (CSE,IT,CY,AIML & AI)   Max. Marks: 70

Note: Answer All **FIVE** Questions.

All Questions Carry Equal Marks   (5 X 14 = 70M)

Q.No.		Questions	KL	CO	Marks
		UNIT-I			
1	a	What is Data base System? What are the advantages of database system?	2	1	14 M
		Explain Database Languages.	2	1	
		OR			
	b	Discuss about Transaction Management	2	1	14 M
		Explain the use of the Query Processor.	2	1	
		UNIT-II			
2	a	Explain Entities, Attributes and Entity Sets with an example.	2	2	14 M
		What is Integrity Constraint? Explain its need	2	2	
		OR			
	b	Explain Relationships and Relationship sets with an example	2	2	14 M
		Explain need Views in software applications. Give an example	2	2	
		UNIT-III			
3	a	What is SQL? What are the features of SQL?	2	3	14 M
		Explain Union and Intersect operations using SQL.	2	3	
		OR			
	b	Explain Aggregative Operators with examples.	3		14 M
		UNIT-IV			
4	a	What are the advantages of Normal Forms? Explain	2	4	14 M
		Explain Functional Dependencies.	2	4	
		OR			
	b	Explain various Normal forms with an examples	2	4	14 M
		UNIT-V			
5	a	What is Concurrent Executions? Give an example.	2	5	14 M
		Explain Lock-based Concurrency Control protocol.	2	5	
		OR			
	b	Explain Tree Structured Indexing.	2	5	14 M
		Explain Timestamp-based Concurrency Control protocols.	2	5	

NARASARAOPETA ENGINEERING COLLEGE
NEC (AUTONOMOUS)

II B.Tech II Semester Supple. Examinations, April-2025

Sub Code: R20CC2204   SOFTWARE ENGINEERING

Time: 3 hours   (CSE,IT & AI)   Max. Marks: 70

Note: Answer All **FIVE** Questions.

All Questions Carry Equal Marks   (5 X 14 = 70M)

Q.No.		Questions	KL	CO	Marks
		UNIT-I			
1	a	Explain about Waterfall model in detail with neat diagram	K4	1	7
		What are the Functional and non-functional requirements of Software Engineering	K4	1	7
		OR			
	b	Explain about Evolution and spiral models in detail	K4	1	7
		What do you mean by Requirement gathering	K4	1	7
		UNIT-II			
2	a	Explain about Conceptual Model of the UML,	K2	2	7
		What do you mean by Forward and Reverse Engineering	K2	2	7
		OR			
	b	Write in detail about UML architecture and its importance in Software Engineering	K2	2	7
		Explain about Modeling Object Structures in detail	K2	2	7
		UNIT-III			
3	a	What is the use of USE case diagrams in Software Engineering? Explain with an example	K2	3	7
		Write the importance of State machines	K2	3	7
		OR			
	b	Consider an example to explain component and deployment diagrams along with Modeling a Client/Server System,	K2	3	14
		UNIT-IV			
4	a	Write about Non- Functional Requirements in Analysis Phase	K4	4	7
		Explain about Dynamic Model in Analysis phase	K4	4	7
		OR			
	b	Consider an example and design System architecture along with Design principles and Object Constraint Language.	K2	3	14
		UNIT-V			
5	a	Explain about the importance of Black box testing techniques	K4	4	7
		Write about Project scheduling using PERT and GRANT charts	K4	4	7
		OR			
	b	Explain about the importance of White box testing techniques	K4	4	7
		Write about Project planning and control along with Cost Estimation.	K4	4	7

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NARASARAOPETA ENGINEERING COLLEGE
(AUTONOMOUS)

II B.Tech II Semester Supple. Examinations, April-2025

Sub Code: R20CC2210 **NUMERICAL METHODS AND TRANSFORMATIONS**

Time: 3 hours (AI&ML,DS & CY) Max. Marks: 70

Note: Answer All **FIVE** Questions. All Questions Carry Equal Marks (5 X 14 = 70M)

Q.No			Questions	KL	CO	M
1	a		**Unit-I**			
			i) **Determine** a negative root of the equation $x^3 - 21x + 3500 = 0$ using Newton-Raphson method, correct to three decimal places.	K3	CO1	7M
			ii) **Determine** the positive real root of the equation $\cos(x) = xe^x$ using Regula falsi method, correct to three decimal places.	K3	CO1	7M
			OR			
	b		i) **Determine** a negative root of the equation $2x^3 + x^2 - 20x + 12 = 0$ by bisection method, correct up to three decimal places.	K3	CO1	7M
			ii) **Construct** iterative formula for $\sqrt[k]{N}$ using Newton-Raphson method. Hence, **determine** the $\sqrt[3]{24}$ correct to four decimal places.	K3	CO1	7M
2	a		**Unit-II**			
			i) **Show** that nth. differences of the nth degree are constant and all higher order differences are zero.	K3	CO2	7M
			ii) A curve passes through the point $(0,18),(1,10),(3,-18)$ and $(6,90)$. **Determine** the slope of the curve at $x=2$.	K3	CO2	7M
			OR			
	b		i) Using Newton divided difference formula	K3	CO2	7M

x:	-3	-2	-1	1	2	3	5
$f(x)$:	18	12	8	6	8	12	26

Determine this polynomial and obtain the approximate value of $f(0)$.

| | | | ii) For the data | K3 | CO2 | 7M |

x:	-4	-2	0	2	4	6
$f(x)$:	-139	-21	1	23	141	451

Construct the forward and backward difference tables. Using the corresponding interpolation, show that the interpolating polynomial is same.

3	a		**Unit-III**			
			i) Obtain the Picard's second approximation for the initial value problem $\dfrac{dy}{dx} = \dfrac{x^2}{y^2+1}, \; y(0)=0$ **Determine** $y(1)$.	K3	CO3	7M
			ii) By **applying** Taylor's series method, **solve** the equation $\dfrac{dy}{dx} = \log(xy)$ for $y(1.1)$ and $y(1.2)$ given $y(1)=2$.	K3	CO3	7M

1

			KL	CO	M
b	**i) Derive** the Simpson's 1/3rd rule. The velocity $v[km/min]$ of a moped which starts from rest, is given at fixed intervals of time $t[min]$ as follows 	t:	2	4	6	8	10	12	14	16	18	20
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$v[t]$:	10	18	25	29	32	20	11	5	2	0 | **Applying** this rule, estimate approximately the distance covered in $20\,minutes$.	K3	CO3	7M
	ii) Apply Runge-Kutta fourth order method to find approximate value of y for $x=0.2$, in steps of 0.1, if $\dfrac{dy}{dx}=\dfrac{y^2-2x}{y^2+x}$, given that $y=1$ when $x=0$.	K3	CO3	7M

Unit-IV

4			KL	CO	M
a	**i) Construct** the Fourier series of $f[x]=\begin{cases}0,when-\pi\le x\le 0\\x^2,when\,0\le x\le\pi\end{cases}$ which is assumed to be periodic with period 2π.	K3	CO4	7M
	ii) Construct the Fourier series of $f[x]=x\cos\left(\dfrac{\pi x}{L}\right)$ in the interval $-L\le x\le L$.	K3	CO4	7M

			KL	CO	M
b	**i) Determine** the Fourier transform of $f[x]=\begin{cases}1-x^2,0<x\le 1\\0,\|x\|>1\end{cases}$ Hence evaluate $\displaystyle\int_0^\infty\dfrac{x\cos x-\sin x}{x^3}\cos\dfrac{x}{2}dx$.	K3	CO4	7M
	ii) Express $f[x]=\begin{cases}1,for\,0\le x\le\pi\\0,for\,x>\pi\end{cases}$ as a Fourier sine integral and hence **evaluate** $\displaystyle\int_0^\infty\dfrac{1-\cos(\pi\lambda)}{\lambda}\sin(x\lambda)d\lambda$.	K3	CO4	7M

Unit-V

5			KL	CO	M
a	**i) Determine** the Laplace transform of the functions $\sqrt{t}$, $\dfrac{1}{\sqrt{t}}, t\sqrt{t}$	K3	CO5	7M
	ii) Determine the Laplace transform of the periodic function $f[t]$ of period $2a$ is defined by $f[t]=\begin{cases}a\,for\,0\le t<a\\-a\,for\,a\le t\le 2a\end{cases}$	K3	CO5	7M

			KL	CO	M
b	**i)Using** Convolution theorem, **Determine** the inverse Laplace transform of the function $\dfrac{s^2}{[s^2+a^2][s^2+b^2]}$.	K3	CO5	7M
	ii) Solve using Laplace transform $y'''-3y''+3y'-y=t^2e^t$ given $y[0]=1, y'[0]=0, y''[0]=-2$	K3	CO5	7M

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

NARASARAOPETA
NEC ENGINEERING COLLEGE
(AUTONOMOUS)

II B.Tech II Semester Supple. Examinations, April-2025

Sub Code: R20CC2211 MATHEMATICAL FOUNDATIONS OF COMPUTER SCIENCE

Time: 3 hours　　　　　(CY,DS,AI&ML)　　　　Max. Marks: 70

Note: Answer All **FIVE** Questions.
All Questions Carry Equal Marks　(5 X 14 = 70M)

Q.No			Questions	KL	CO	M
1	a	i)	Define PCNF,PDNF and obtain PCNF,PDNF for the formula PV(Q→R).	3	1	7M
		ii)	Verify the validity of the following argument: Lions are dangerous animals There are lions There are dangerous animals	3	1	7M
			OR			
	b	i)	Define well formed formula? Write in brief about well defined formulas.	2	1	7M
		ii)	Obtain the Principal conjunctive normal form of **(P→Q)^ (Q↔R).**	3	1	7M
2	a	i)	Prove by mathematical induction that $6^{n+2} +7^{2n+1}$ is divisible by **43** for each positive integer **n**?	3	2	7M
		ii)	Express the following statements using quantifiers. Then construct the negation of the statement 　i) Every bird can fly　　　ii) Some birds can talk	3	2	7M
			OR			
	b	i)	Show that the following premises are inconsistent. 　(i) If jack misses many classes through illness, then he fails high school. 　(ii) If jack fails high school, then he is uneducated. 　(iii) If jack reads lot of books, then he is not uneducated. 　(iv) Jack misses many classes through illness and lot of books.	3	2	7M
		ii)	Using mathematical induction, prove that the following statement is true for all positive integers n. $1^3 + 3^3 + 5^3 + ... + (2n-1)^3 = n^2 (2n^2 -1)$ for n≥1	3	·2	7M
3	a	i)	G is a non directed graph with 12 edges. Suppose that G has 6 vertices of degree 3 and the rest have degree less than 3. Determine the minimum number of vertices G can have.	3	3	7M
		ii)	Explain kruskal's algorithm to find minimal spanning tree of a graph with suitable example?	3	3	7M
			OR			
	b	i)	Compare and contrast Euler and Hamiltonian graphs using examples?	4	3	7M
		ii)	Conclude that any 2 simple connected graphs with n vertices, all of degree 2 are isomorphic.	3	3	7M
4	a	i)	Solve the recurrence relation using generating function $a_n-6a_n-1=0$ for n≥1 where $a_0=1$	3	4	7M
		ii)	Solve the recurrence relation $a_n-5a_n-1+25a_n-2-24a_n-3= 6$ for n≥3.	3	4	7M
			OR			
	b	i)	Solve the recurrence relation	3	4	7M

		$a_n + a_{n-1} - 8a_{n-2} - 12a_{n-3} = 0$ for n>=3,given that $a_0=1, a_1=5$ and $a_2=1$			
		ii) Solve the following recurrence relation using characteristic roots. $a_n + 4a_{n-1} + 6a_{n-2} = 0$ and $a_0 = 2$, $a_1 = -7$	3	4	7M
5		Unit-V			
	a	i) Find the number of arrangements of the letters of MISSISSIPPI.	3	5	7M
		ii) Explain the concepts of Disjunctive Normal Form (DNF) and Conjunctive Normal Form (CNF). How are Boolean expressions converted into these normal forms?	3	5	7M
		OR			
	b	i) Eight people enter an elevator at the first floor. The elevator discharges a passenger on each successive floor until it empties the fifth floor. How Many different ways can this happen?	3	5	7M
		ii) Simplify the Boolean expression $(a' * b * c) \oplus (a * b' * c) \oplus (a * b * c')$.	3	5	7M

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

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II B.Tech II Semester Supple. Examinations, April-2025

Sub Code: R20CE2202   ENGINEERING GEOLOGY

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

Note: Answer All **FIVE** Questions.

All Questions Carry Equal Marks   (5 X 14 = 70M)

Q.No		Questions	KL	CO	Marks
		Unit-I			
1	a	Explain the importance of geology in civil engineering with detailed case studies.	K1	1	7M
		Explain the development of river systems and their significance in shaping the Earth's surface.	K2	1	7M
		OR			
	b	Discuss the role of river processes in the development of landscapes and how they influence civil engineering projects.	K1	1	7M
		Describe the processes involved in the weathering of rocks and how different geological agents contribute to this process.	K2	1	7M
		Unit-II			
2	a	Discuss the megascopic characteristics of common rock-forming minerals, such as feldspar, quartz, and olivine.	K2	2	7M
		Discuss the significance of different rock types, such as shale, sandstone, and limestone, in civil engineering projects.	K1	2	7M
		OR			
	b	Explain the classification of igneous, sedimentary, and metamorphic rocks, and describe their structures and textures.	K2	2	7M
		Explain the formation and characteristics of ore-forming minerals, including pyrite, hematite, and magnetite.	K1	2	7M
		Unit-III			
3	a	Explain the types and mechanisms of faults and their implications for civil engineering projects.	K2	3	7M
		Discuss the application of structural geology principles in the exploration and development of natural resources.	K1	3	7M
		OR			
	b	Discuss the concept of unconformities, their types, and their importance in understanding geological history.	K1	3	7M
		Explain the importance of studying geological structures, such as joints and faults, in the context of civil engineering.	K2	3	7M
		Unit-IV			
4	a	Discuss the importance of geophysical methods in geological studies and their applications in civil engineering.	K1	4	7M
		Describe the seismic belts and shield areas, and their significance in understanding earthquake risks.	K2	4	7M
		OR			
	b	Discuss case studies of significant earthquakes and landslides, highlighting lessons learned for future engineering practices.	K2	4	7M
		Explain the principles and applications of the gravity method in geophysical studies.	K2	4	7M
		Unit-V			
5	a	Explain the geological factors that influence the life of reservoirs and their management.	K1	5	7M
		Describe the methods used to mitigate geological risks in dam and tunnel construction.	K2	5	7M

		OR			
	b	Describe the purposes and types of tunneling, and the effects of geology on tunneling projects.	K2	5	7M
		Explain the geological challenges faced in reservoir construction and how they are addressed.	K1	5	7M

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	b	Describe the purposes and types of tunneling, and the effects of geology on tunneling projects.	K2	5	7M
		Explain the geological challenges faced in reservoir construction and how they are addressed.	K1	5	7M

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II B.Tech II Semester Supple. Examinations, April-2025

Sub Code: R20CE2203   STRUCTURAL ANALYSIS

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

Note: Answer All **FIVE** Questions. All Questions Carry Equal Marks   (5 X 14 = 70M)

Q.No		Questions	KL	CO	Marks
		Unit-I			
1	a	A propped cantilever beam of length 8m is subjected to a uniformly distributed load (UDL) of 10 kN/m over its entire length. Calculate and plot the shear force and bending moment diagrams for the beam.	K1	1	7M
		For a fixed beam of span L subjected to a uniformly distributed load (UDL) w, calculate the reactions at the supports, draw the shear force and bending moment diagrams, and find the maximum deflection and its location.	K4	1	7M
		OR			
	b	A fixed beam of length 10m carries a UDL of 15 kN/m. If one of the supports sinks by 5mm, calculate the additional moments induced at the supports due to the sinking.	K1	1	7M
		Explain the degree of static and kinematic indeterminacy for a propped cantilever beam and determine these values for a given beam with a span of 6m and subjected to a UDL of 5 kN/m.	K4	1	7M
		Unit-II			
2	a	Using the slope-deflection method, analyze a continuous beam with spans of 6m, 8m, and 5m subjected to UDLs of 10 kN/m on each span. Draw the shear force and bending moment diagrams.	K2	2	7M
		Use the moment distribution method to analyze a single bay single storey portal frame with a span of 6m and height of 4m subjected to a vertical point load of 30 kN at the center of the top beam.	K3	2	7M
		OR			
		Analyze a single bay single storey portal frame without sway using the slope-deflection method. The frame has a span of 5m and height of 3m, and is subjected to a horizontal load of 10 kN at the top of the left column.	K2	2	7M
	b	Analyze a continuous beam with spans of 8m and 5m subjected to UDLs of 5 kN/m. Compare the shear force and bending moment diagrams for cases with and without settlement of 10mm at the intermediate support using the moment distribution method.	K3	2	7M
		Unit-III			
3	a	Using the method of sections, analyze a pin-jointed plane truss with a span of 8m subjected to a UDL of 5 kN/m over the entire span.	K2	3	7M
		Analyze a simply supported truss with a span of 9m subjected to a combination of a UDL of 4 kN/m and a point load of 10 kN at 3m from the left support using the method of joints.	K5	3	7M
		OR			
	b	For a cantilever truss with a span of 6m and height of 2.5m subjected to a point load of 15 kN at the free end, calculate the member forces using the method of joints.	K2	3	7M
		Determine the forces in the members of a cantilever truss with a span of 5m and height of 2m subjected to a UDL of 3 kN/m using the method of tension coefficients.	K5	3	7M
		Unit-IV			
4	a	A simply supported beam of span 10m is subjected to a single concentrated load of 20 kN. Determine the maximum shear force and bending moment, and the positions where they occur.	K2	4	7M

		Draw the influence line for the bending moment at the midspan of a simply supported beam of span 10m. Determine the maximum bending moment when the beam is subjected to a uniformly distributed load of 6 kN/m over a length of 8m.	K4	4	7M
		OR			
		A simply supported beam of span 15m carries a uniformly distributed load of 8 kN/m over a length of 10m. Determine the maximum shear force and bending moment.	K2	4	7M
	b	Draw the influence line for the shear force at a section 4m from the left support of a simply supported beam of span 12m. Use this influence line to determine the shear force due to a point load of 15 kN at 6m from the left support.	K4	4	7M
		Unit-V			
5	a	Use the stiffness method to analyze a continuous beam with spans of 10m, 5m, and 8m subjected to point loads of 20 kN, 15 kN, and 25 kN at midspans. Draw the shear force and bending moment diagrams.	K1	5	7M
		Analyze a determinate pin-jointed plane frame with a span of 5m and height of 3m subjected to a horizontal load of 12 kN at the apex using the flexibility method. Determine the internal member forces.	K2	5	7M
		OR			
		Use the stiffness method to analyze a pin-jointed plane frame with a span of 8m and height of 5m subjected to a vertical load of 15 kN at the apex. Calculate the member forces.	K1	5	7M
	b	Use the flexibility method to analyze a pin-jointed plane frame with a span of 10m and height of 4m subjected to vertical point loads of 10 kN each at 2m intervals. Calculate the forces in the members and draw the shear force and bending moment diagrams.	K2	5	7M

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II B.Tech II Semester Supple. Examinations, April-2025

Sub Code: R20CE2204   **STRENGTH OF MATERIALS-II**

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

Note: Answer All **FIVE** Questions. All Questions Carry Equal Marks   (5 X 14 = 70M)

Q.No		Questions	KL	CO	Marks
		UNIT-I			
1	a	i) Mention the different theories of failure. Explain about any one.	K2	CO1	6M
		ii) An element in structure is subjected to a tensile stress of 120 N/mm^2 accompanied by a shear stress of 35 N/mm^2 on the X – plane. Draw the Mohr's circle and find the principal stresses and maximum shear stress and also find the directions of the corresponding planes.	K3	CO1	8M
		OR			
	b	i) Find an expression for the stresses on an oblique section of a rectangular body, when it is subjected to a direct stress in one plane.	K2	CO1	7M
		ii) At a point in a beam the normal stress along its length is 75 N/mm^2 . The shear stress at that point is 25 N/mm^2 . Find the stresses on a plane whose normal is inclined at 30° to the longitudinal axis. Also find the principal stresses and planes on which they act	K3	CO1	7M
		UNIT-II			
2	a	i) Write the assumptions of pure torsion.	K3	CO2	4M
		ii) A hallow circular shaft of outside diameter 56 mm and inside diameter 42 mm is made of steel, for which the permissible shear stress is 100MPa and C=80 GPa. Find the maximum torque and the maximum stress in the shaft.	K2	CO2	10M
		OR			
	b	i) Define Springs and Explain any one type of Springs?	K2	CO2	6M
		ii) Two springs connected in series carries a load of 2.25 kN. One spring has 12 coils of 6 mm wire in a diameter of 30 mm and the other spring has 16 coils of wire of 8 mm diameter in a 40 mm diameter. Find the spring constant for the composite system and shear stress produced in the wire of each spring. Take G = 8.5 x 10^{4}N/mm^2 .	K4	CO2	8M
		UNIT-III			
3	a	Derive the equation for long columns subjected to eccentric loading	K3	CO3	14M
		OR			
	b	i) Derive an expression for the Rankine's crippling load for a column.	K3	CO3	7M
		ii)A short column of external diameter 45 cm and internal diameter 25 cm carries an eccentric load of 75 kN. Find the eccentricity which the load can have without producing tension on the section.	K3	CO3	7M
		UNIT-IV			
4	a	i) State the assumptions involved in the theory of simple bending.	K1	CO4	6M
		ii) Find the Maximum and Minimum stress on the section of a rectangular column of width 200 mm and of thickness 150 mm carries a point load of 240 KN at the eccentricity of 10mm.	K3	CO4	8M
		OR			
	b	Distinguish between direct stress and bending stress by means of a diagram, with suitable example.	K3	CO4	14M
		UNIT-V			
5	a	Derive the stresses due to unsymmetrical bending	K2	CO5	14M
		OR			
	b	Find the bending stresses at the both the extreme fibers of the cross section. For a two wooden planks 150 mm x 50 mm each are connected to form a T section of a beam. If the moment of 7.2 kN-m is applied around the horizontal neutral axis, inducing tension below the neutral axis.	K3	CO5	14M

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II B.Tech II Semester Supple. Examinations, April-2025

Sub Code: R20CE2205   HYDRAULICS AND HYDRAULIC MACHINERY

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

Note: Answer All **FIVE** Questions.

All Questions Carry Equal Marks   (5 X 14 = 70M)

Q.No		Questions	KL	CO	Marks
		UNIT-I			
1	a	In a rectangular channel 3.5m wide laid at a slope of 0.0036, uniform flow occurs at a depth of 2m. Find how high can the hump be raised without causing afflux? If the upstream depth of flow is to be raised to 2.5 m. What should be the height of hump? Take n= 0.015 in Manning's formula.			14
		OR			
	b	The discharge of water through a rectangular channel of 8 m in width is 15 m³/sec. When the depth of flow of water is 1.2 m, calculate (i) specific energy of the flowing water, (ii) critical depth and critical velocity, and (iii) value of minimum specific energy.			14
		UNIT-II			
2	a	What is the backwater curve and afflux? Derive the expression for the length of the back water curve.			07
		Find the rate of change of depth of water in a rectangular channel of 10 m wide and 1.5 m deep, when the water is flowing with a velocity of 1 m/s. The flow of water through the channel of bed slope 1 in 4000, is regulated in such a way that the energy line has a slope of 0.00004.			07
		OR			
	b	What are the classifications of channel bottom slopes, and briefly explain the characteristics of surface profiles.			07
		A hydraulic jump forms at the downstream end of the spillway carrying 17.93 m³/s discharge. If the depth before the jump is 0.80 m, determine the depth after the jump and energy loss.			07
		UNIT-III			
3	a	Derive the equation for force exerted by a jet on the stationary inclined flat plate.			06
		An 80 mm diameter jet with a velocity of 40 m/s strikes a flat plate, the normal of which is inclined at 450 m to the axis of the jet. Find the normal pressure on the plate: i) when the plate is stationary, and ii) when the plate is moving with a velocity of 20 m/s and away from the jet. Also determine the power and efficiency of the jet when the plate is moving.			08
		OR			
	b	Show that the force exerted by a jet of water on an inclined fixed plate in the direction of the jet is given by $F_x = \rho a v^2 \sin^2\theta$.			08
		A 40 mm diameter jet with a velocity of 20 m/s strikes a flat plate, the normal of which is inclined at 30⁰ to the axis of the jet. If the plate itself is moving with a velocity of 8 m/s parallel to itself and in the direction of the normal to its surface. Calculate i) Normal force exerted on the plate ii) work done per second iii) Efficiency of the jet			06
		UNIT-IV			
4	a	How will you classify the turbines?			06
		A Kaplan turbine develops 20000 kW power at an average head of 40 m. Assuming a speed ratio of 2, flow ratio of 0.6, diameter of boss equal to 0.35 times the diameter of the runner and an overall efficiency of 90%, calculate the diameter, speed and specific speed of the turbine.			08

		OR			
		What is a draft tube? With a next sketch, list the different types of draft tubes.			06
	b	Design a Pelton wheel with the following data, shaft power = 740 kN, H = 200 m, N = 800 rpm, η_0 = 0.86, D/d = 10, C_v = 0.98, ϕ = 0.45. Determine D, d and number of jets.			08
		UNIT-V			
5	a	Derive an expression for the minimum starting speed for a centrifugal pump.			10
		What is priming of a centrifugal pump and how is it done?			04
		OR			
		Describe the different heads of a centrifugal pump with necessary equations.			06
	b	The diameter of an impeller of a centrifugal pump at the inlet and the outlet is 30 cm and 60 cm, respectively. The velocity of flow at the outlet is 2 m/s and the vanes are set back at an angle of 45^0 at the outlet. Determine the minimum starting speed of the pump if the manometric efficiency is 70%.			08

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II B.Tech II Semester Supple. Examinations, April-2025

Sub Code: R20EE2203 CONTROL SYSTEMS

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

Note: Answer All **FIVE** Questions.

All Questions Carry Equal Marks (5 X 14 = 70M)

Q.No		Questions	KL	CO	Marks
		UNIT-I			
1	a	i) Compare Open loop Control Systems & Closed loop Control Systems? Explain examples of Control Systems?	K1	1	7M
		ii) Explain the necessity and effect of feedback in control systems	K2	1	7M
		OR			
	b	Find the transfer function $\dfrac{C(s)}{R_2(s)}$ for the Block diagram shown in figure	K3	1	14M
		UNIT-II			
2	a	i) Obtain the time response of a first order system for a unit step input and plot its response.	K2	2	7M
		ii) Damping factor and natural frequency of the system are 0.12 and 84.2 rad/sec respectively. Determine the rise time (tr), peak time (tp), maximum peak overshoot (mp) and settling time (ts).	K3	2	7M
		OR			
	b	i) Derive the time domain specifications of a second order system with unit step input.	K3	2	7M
		ii) For unity feedback system having open loop transfer function as $G(s)=\dfrac{k(s+2)}{s^2(s^2+7s+12)}$.Determine error constants K_p, K_v, K_a	K3	2	7M
		UNIT-III			
3	a	i) Determine the RH stability of given characteristic equation, $s^4+8s^3+18s^2+16s+5=0$	K3	3	7M
		ii) Explain the Routh's criteria. What are its limitations	K2	3	7M
		OR			
	b	Sketch the root locus of the system, whose open loop transfer function is $G(s)=\dfrac{k(s+15)}{s(s+1)(s+5)}$	K3	3	14M
		UNIT-IV			
4	a	Sketch the Bode plot for the following transfer function and determine the system gain K for which the magnitude plot crosses the 0 db line at $\omega = 15$	K3	4	14M

		rad/sec $$G(s) = \frac{K}{s\,(s+1)(1+0.1s)(1+0.01s)}$$			
		OR			
	b	Draw the complete Nyquist plot for the following open loop transfer function $$G(s)\,H(s) = \frac{2(s+0.25)}{s^2\,(s+1)(s+0.5)}.$$ If the system is unstable, how many poles of the closed loop system are in the right half of s-plane?	K3	4	14M
		UNIT-V			
5	a	i) Explain the concepts of state, state variables, state model and state diagram with suitable examples.	K2	5	7M
		ii) What are the advantages and disadvantages of state space analysis.	K1	5	7M
		OR			
	b	i) Obtain the state transition matrix for the state model whose A matrix is given by $$A = \begin{bmatrix} 1 & 1 \\ 0 & 1 \end{bmatrix}$$	K3	5	7M
		ii) State and prove the properties of state transition matrix.	K1	5	7M

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II B.Tech II Semester Supple. Examinations, April-2025

Sub Code: R20EE2204   ELECTRICAL MACHINES-II

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

Note: Answer All **FIVE** Questions.

All Questions Carry Equal Marks   (5 X 14 = 70M)

Q.No		Questions	KL	CO	Marks
		UNIT-I			
1	a	Compare the differences in the properties of rotors of 3 phase induction motors with disadvantages?	4	1	7M
		In case of an eight pole induction motor, the supply frequency was 50Hz and the shaft speed was 725 r.p.m. Find the magnitudes of synchronous speed, slip speed, percentage slip, the frequency of induced current in the rotor, the frequency of rotor current at stand still and the speed of the rotor when the slip is 0.05?	3	1	7M
		OR			
	b	Discuss in detail about the cogging and crawling effects in three phase induction motors with remedial measures?	4	1	7M
		A 3 phase delta connected 400V, 50Hz, 4 pole induction motor has a rotor stand still e.m.f per phase of 127V. If the motor is running at 1380 r.p.m, find the slip, frequency of rotor induced e.m.f, the value of the rotor induced e.m.f per phase and stator ot rotor turns ratio for the same speed?	3	1	7M
		UNIT-II			
2	a	Explain the regenerative braking by using three phase induction motors with advantages and disadvantages?	2	2	7M
		The full load slip of a 312V, 3 phase cage induction motor is 4.2% and with locked rotor, full load current is circulated when 82V is applied between the lines. Determine the necessary tapping on an auto transformer to limit the starting current to twice the full load current of the motor. Find also the starting torque in terms of full load torque?	3	2	7M
		OR			
	b	Draw the circuit diagram and explain the working of star-delta starter used for three phase induction motor starting?	2	2	7M
		A 3 phase induction motor has a maximum torque to full load torque as 3.2:1. Find the ratio of actual starting torque to full load torque for star-delta starting. Given rotor resisatnce per phase is 0.5 ohms and stand still rotor reactance per phase is 4.9 ohms?	3	2	7M
		UNIT-III			
3	a	Describe the double field revolving theory with relevant to single phase induction motor operation?	2	3	7M
		The following data shows the result on a 215V, 50Hz capacitor start single phase induction motor at stand still: Main winding: 98V, 1.7A, 36W Auxillary winding: 72V, 0.8A, 55W. Find the value of the capacitance for obtaining the maximum starting torque?	3	3	7M
		OR			
	b	Derive and analyze the equivalent circuit of single phase induction motor?	4	3	7M
		Draw neat diagram and explain in detail about the working of linear induction motor and write the applications?	2	3	7M

		UNIT-IV			
4	a	Derive the e.m.f equation and procedure of its generation in the synchronous generator?	2	4	7M
		Explain in detail about the MMF method applied to synchrnous method and summarize the outcomes?	2	4	7M
		OR			
	b	Analyze the synchronous machine connected to infinite bus and dicuss the characteristic features?	4	4	7M
		Explain in detail about the potier triangle method applied to synchrnous method and summarize the outcomes?	2	4	7M
		UNIT-V			
5	a	Explain in detail about the objectives, procedure and outcomes from the V and inverted V curves?	3	5	7M
		Elaborate the role and importance of damper windings in the synchronous motor operation?	2	5	7M
		OR			
	b	Explain the operation of synchronous motor acting as synchronous condenser with phasor diagram?	2	5	7M
		Derive and analyze the expressions of power input and power developed in the synchrnous motors?	4	5	7M

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II B.Tech II Semester Supple. Examinations, April-2025

Sub Code: R20EE2205   **DIGITAL ELECTRONICS**

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

Note: Answer All **FIVE** Questions. All Questions Carry Equal Marks   (5 X 14 = 70M)

Q.No		Questions	KL	CO	Marks

1	a	i) Convert the following numbers:
		    i. $(4567)_8$ to base 10.
		    ii. $(11001101.0101)_2$ to base 8 and base 4.
		    iii. $(53.1575)_{10}$ to base 2.
			2	1	7M

		ii) What is the advantage of 2's complement representation in computers? Perform the following operations using 2's complement method: (i) (+55) - (+15) (ii) (-55) - (-15)	3	1	7M
		OR			
	b	i) Distinguish between weighted and non-weighted codes with examples.	3	1	7M
		ii) Perform the following using BCD arithmetic. a) 712910 + 771110 b) 812410 + 812710	2	1	7M
2	a	i) State duality theorem. List Boolean laws and their duals.	2	2	7M
		ii) Simplify the following Boolean functions to minimum number of literals. i. F = ABC + ABC' + A'B. ii. F = (A+B)' (A'+B').	3	2	7M
		OR			
	b	i) Obtain the simplified expressions in sum of products for the following Boolean functions using K-map a) $F(A, B, C, D) = \sum(7, 13, 14, 15)$ b) $f(w, x, y, z) = \sum(2, 3, 12, 13, 14, 15)$	2	2	7M
		ii) Simplify the following using tabulation method $F(A, B, C, D) = \sum m(1,2,3,5,9,12,14,15) + d(4,8,11)$	2	2	7M
3	a	i) Define decoder. Construct 3x8 decoder using logic gates and truth table.	3	3	7M
		ii) Construct a full-adder with two half-adders and basic gates.	3	3	7M
		OR			
	b	i) Construct the logic diagram of a 3 to 8 line decoder with enable input and explain its operation with the help of truth table.	3	3	7M
		ii) Design a full adder using 8×1 MUX.	3	3	7M
4	a	i) Design a mod-6 asynchronous counter using T-flip flop.	3	4	7M
		ii) Draw the circuit of a negative edge triggered JK Flip-Flop with active high preset & clear, Explain its operation with the help of truth table.	2	4	7M
		OR			
	b	i) What is a shift register? Draw the block diagram and timing diagram of a shift register that shows the serial transfer of information from register A to register B.	2	4	7M
		ii) Write the difference between combinational circuit and sequential circuit.	2	4	7M
5	a	i) Explain the general combinational PLD configuration with suitable block diagram.	2	5	7M
		ii) Design and implement Full adder with PLA.	3	5	7M
		OR			
	b	i) Classify the different types of PLDs and Compare the three combinational PLDs?	2	5	7M
		ii) Write a short note on Merits & demerits of PROM.	2	5	7M

II B.Tech II Semester Supple. Examinations, April-2025

Sub Code: R20ME2203   MANUFACTURING TECHNOLOGY

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

Note: Answer All **FIVE** Questions.

All Questions Carry Equal Marks   (5 X 14 = 70M)

Q.No		Questions	KL	CO	Marks
		Unit-1			
1	a	Define pattern. Explain the different types of pattern allowances with neat sketches	K2	CO1	[7M]
		Explain the shell moulding process with a neat sketch and also mention its application	K2	CO1	[7M]
		OR			
	b	Define gating system and explain in detail the different elements of a gating system with a neat sketch	K3	CO1	[14M]
		Unit-2			
2	a	Explain in detail about Oxy– Acetylene Gas cutting process.	K4	CO2	[7M]
		Discuss in detail the working principle of Arc welding process. Also, mention its advantages.	K3	CO2	[7M]
		OR			
	b	Define Welding and classify the welding process through a diagram.	K3	CO2	[7M]
		Explain any three welding defects with their causes and remedies.	K3	CO2	[7M]
		Unit-3			
3	a	Explain the principle of the submerged arc welding process with the help of a schematic diagram.	K4	CO3	[7M]
		Discuss the difference between the TIG & MIG welding process.	K2	CO3	[7M]
		OR			
	b	Discuss in detail any two resistance welding processes with neat sketches, their advantages, disadvantages, and applications.	K4	CO3	[14M]
		Unit-4			
4	a	a) Define the term recrystalization. State its significance in metal forming.	K2	CO4	[7M]
		b) Distinguish between hot working and cold working.	K2	CO4	[7M]
		OR			
	b	Discuss in detail about drop Forging and Rotary forging with neat sketches.	K4	CO4	[14M]
		Unit-5			
5	a	What are the applications of different extrusion processes?	K2	CO5	[7M]
		Distinguish between forward extrusion and backward extrusion process.	K2	CO5	[7M]
		OR			
	b	Discuss in detail about tube drawing with a neat sketch.	K3	CO5	[7M]
		List the important applications of the wire drawing process.	K2	CO5	[7M]

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II B.Tech II Semester Supple. Examinations, April-2025

Sub Code: R20ME2204   **APPLIED THERMODYNAMICS**

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

Note: Answer All **FIVE** Questions. All Questions Carry Equal Marks   (5 X 14 = 70M)

Q.No		Questions	KL	CO	Marks
		UNIT-I			
1	a	Define the various types of losses that occur in the actual engine operation and explain their causes and effects.	KL1	CO1	7M
		Illustrate and compare the working principles of the Battery Ignition system and Magneto Ignition system used in IC engines.	KL2	CO2	7M
		OR			
	b	Compare air cooling and water cooling systems used in IC engines, highlighting their advantages and disadvantages.	KL2	CO2	7M
		A four-stroke petrol engine has a bore of 80 mm and a stroke of 110 mm. The clearance volume is 70 cm³. Calculate the compression ratio of the engine.	KL3	CO3	7M
		UNIT-II			
2	a	Describe the process of calculating Brake Power, Indicated Power, and Mechanical Efficiency for an IC engine. Include necessary formulas and sample calculations.	KL3	CO3	7M
		Compare the effects of different fuel requirements and anti-knock additives on engine performance.	KL4	CO3	7M
		OR			
	b	A four-stroke petrol engine operates at 3000 RPM, with a cylinder bore of 80 mm and a stroke of 100 mm. If the mean effective pressure is 8 bar, calculate the indicated power of the engine. Analyze the effect of increasing the RPM on indicated power and discuss potential drawbacks in a real-world application.	KL4	CO3	10M
		Calculate the brake power of an IC engine using a Prony brake with a radius of 0.2 meters and a load of 50 N at an engine speed of 1500 rpm. Show all steps and include the formula for brake power.	KL3	CO3	4M
		UNIT-III			
3	a	Assess the significance of frictional power in determining the mechanical efficiency of an IC engine. Discuss methods to minimize frictional losses.	KL5	CO4	7M
		An IC engine consumes fuel at a rate of 0.15 kg/min and produces a Brake Power of 25 kW. Given that the calorific value of the fuel is 42 MJ/kg, calculate the thermal efficiency of the engine.	KL4	CO4	7M
		OR			
	b	An engine operates at a Brake Power of 30 kW and consumes fuel at a rate of 0.1 kg/h. Calculate the Specific Fuel Consumption (SFC) in kg/kWh. Include the steps and formula used in your calculation.	KL4	CO4	7M
		Evaluate the impact of engine variables on flame speed and knocking in SI engines.	KL4	CO3	7M
		UNIT-IV			
4	a	Given the specifications of a reciprocating compressor, calculate the work done per cycle if the pressure ratio is 7, and the initial volume of the gas is 0.1 m³. Assume an adiabatic process with γ = 1.4. Show all steps in your calculations.	KL4	CO5	7M
		Explain the difference between positive displacement and dynamic compressors. Provide examples of each type.	KL2	CO2	7M

		OR			
	b	A reciprocating compressor has a swept volume of 0.1 m³ and delivers air at a pressure of 200 kPa. If the mechanical efficiency is 85%, calculate the actual power required to operate the compressor at a speed of 100 rpm.	KL3	CO5	7M
		Describe the working principle of a Roots blower. Include a diagram to illustrate your explanation.	KL2	CO2	7M
		UNIT-V			
5	a	Discuss the mechanical details and working principle of a centrifugal compressor. How does the design of the impeller influence its performance?	KL3	CO2	7M
		A centrifugal compressor has a design flow rate of 0.05 m³/s and an outlet pressure of 250 kPa. If the mechanical losses account for 10% of the input power, calculate the input power required if the compressor's efficiency is 75%.	KL3	CO5	7M
		OR			
	b	Explain the concept of degree of reaction in axial flow compressors and how it affects the overall efficiency of the compressor.	KL2	CO3	7M
		An axial flow compressor operates at a speed of 10,000 rpm, and the inlet conditions are at 1 atm and 300 K. If the isentropic efficiency is 85% and the pressure ratio is 4, calculate the outlet temperature of the compressor.	KL3	CO5	7M

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NAKASAKAUPETA ENGINEERING COLLEGE
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II B.Tech II Semester Supple. Examinations, April-2025

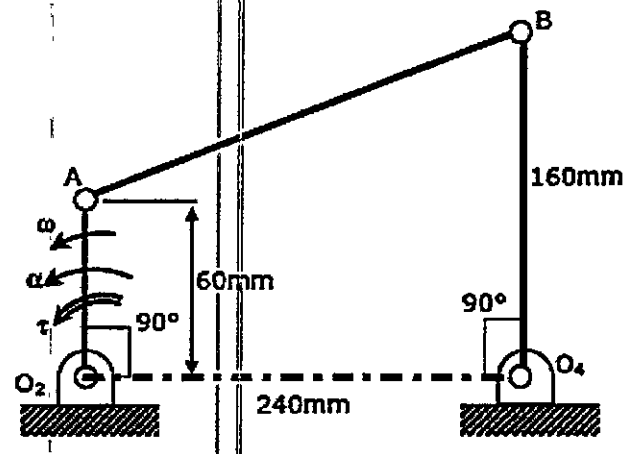**Sub Code:** R20ME2205   KINEMATICS OF MACHINERY

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

Note: Answer All FIVE Questions. All Questions Carry Equal Marks   (5 X 14 = 70M)

Q.No		Questions	KL	CO	Marks
1	a	State Grashof's law & its significance	K3	01	7M
		Two of the turning pairs of a four-bar chain are replaced by a sliding pairs. Illustrate the inversions by fixing different links with neat diagrams.	K4	01	7M
		OR			
	b	Explain whitworth quick return mechanism with neat sketch?	K4	01	14M
2	a	Enumerate the merits and demerits of Ackermann and Davis Steering gear mechanism	K5	02	6M
		Elucidate the Hart's mechanism and show that it generates straight-line motion.	K3	02	8M
		OR			
	b	Distinguish the two main types of steering gears and their relative advantages.	K5	02	14M
3	a	State and explain the Kennedy's theorem of three centres by taking a suitable Example.	K4	03	7M
		Locate all the Instantaneous centers of Elliptical trammel mechanism.	K4	03	7M
		OR			
	b	An instantaneous configuration of a four-bar mechanism, is shown in the figure below. At this instant, the angular velocity and angular acceleration of link O_2A are 8rad/s and 0 rad/s^2 respectively and the driving torque is zero. The link O_2A is balanced so that its center of mass falls at O_2.	K5	03	14M
4	a	i) Explain with sketches different types of cams and followers?	K3	04	6M
		ii) Construct the displacement, velocity and acceleration diagrams for a follower when it moves with simple harmonic motion.	K4	04	8M
		OR			
	b	A cam operating a knife - edged follower has the following data i. Follower moves outwards through 60mm during 120° of cam rotation. ii. Follower dwells for the next 60°. iii. Follower returns to its original position during next 90°. iv. Follower dwells for the rest of the rotation. The displacement of the follower is to take place with cycloidal motion during the outward and uniform velocity motion during the return strokes. The least radius of the cam is 50mm. Draw the profile of the cam with radial follower.	K3	04	14M

5	a	i) Differentiate between involute profile and cycloidal profile.	K3	05	7M
		ii) Derive the expression for the velocity ratio of a compound gear train	K5	05	7M
		OR			
	b	The arm of an epicyclic gear train rotates at 100 rpm anti-clockwise. The arm carries two wheels A and B, having 36 and 45 teeth respectively, and meshing with each other. Wheel A makes 200 rpm clockwise, and the arm rotates about the center of wheel A. Find the speed of wheel B.	K3	05	14M

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II B.Tech II Semester Supple. Examinations, April-2025

Sub Code: R20EC2202   **INTERNET OF THINGS**

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

Note: Answer All **FIVE** Questions. All Questions Carry Equal Marks   (5 X 14 = 70M)

Q.No		Questions	KL	CO	Marks
		UNIT-I			
1	a	i)Summarize the key features of IoT with examples.	K2	1	7
		ii)Design a Level-2 IoT solution for a smart home application.	K4	1	7
		OR			
	b	i)Outline the different protocols used in IoT for communication.	K2	1	7
		ii)Implement a use case where MQTT is used for lightweight IoT communication.	K4	1	7
		UNIT-II			
2	a	i)Compare domain model specification with information model specification in IoT.	K2	2	7
		ii)Analyze the impact of integration challenges on the performance of an IoT network.	K4	2	7
		OR			
	b	i)Describe how operational view specification helps in the deployment of IoT systems.	K2	2	7
		ii)Compare the specifications of Level-2 and Level-5 IoT systems.	K4	2	7
		UNIT-III			
3	a	i)Explain the concept of Machine-to-Machine (M2M) communication with suitable examples.	K2	3	7
		ii) Compare the benefits of using SDN and NFV in traditional networks versus IoT networks.	K3	3	7
		OR			
	b	i)Explain the architecture of Software Defined Networking (SDN).	K2	3	7
		ii) Compare the communication protocols used in IoT and M2M, highlighting their differences.	K3	3	7
		UNIT-IV			
4	a	i)Explain how sensors and actuators work together to enable automation in an IoT-enabled smart home system.	K2	4	7
		ii) Compare the performance and cost-effectiveness of using a Raspberry Pi versus BeagleBone Black for an edge-computing IoT solution.	K3	4	7
		OR			
	b	i)Explain the factors to consider when choosing an embedded platform for a low-power IoT device.	K2	4	7
		ii)Apply GPIO pin programming to develop a simple security system using a Raspberry Pi, which detects motion and triggers an alarm.	K3	4	7
		UNIT-V			
5	a	i)Describe the role of sensors and actuators in controlling various devices within a smart home environment.	K2	5	7
		ii)Compare the implementation of smart energy grids versus traditional power distribution systems.	K4	5	7
		OR			
	b	i)Explain the role of IoT in enhancing public safety and emergency response in smart cities.	K2	5	7
		ii)Develop a prototype for a crop monitoring system using sensors and a cloud platform, explaining how data is collected and analyzed.	K4	5	7

II B.Tech II Semester Supple. Examinations, April-2025

Sub Code: R20EC2203   **ANALOG AND DIGITAL COMMUNICATIONS**

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

Note: Answer All **FIVE** Questions. All Questions Carry Equal Marks   (5 X 14 = 70M)

Q.No		Questions	KL	CO	Marks
		UNIT-I			
1	a	i) What is the principle of Frequency modulation? Derive an expression for the FM wave and draw its spectrum.	K1	CO1	[7M]
		ii) The antenna current of an AM transmitter is 8 A if only the carrier is sent, but it increases to 8.93 A if the carrier is modulated by a single sinusoidal wave. Determine the percentage modulation. Also, find the antenna current if the percent of modulation changes to 0.8.	K3	CO1	[7M]
		OR			
	b	i) Explain any one method for the generation of AM.	K2	CO1	[7M]
		ii) Find the bandwidth of commercial FM transmission assuming frequency deviation Δf=75 KHz and bandwidth of modulating signal f_m=20 KHz.	K3	CO1	[7M]
		UNIT-II			
2	a	i) Draw the block diagram of a superheterodyne receiver to explain its operation.	K4	CO2	[7M]
		ii) Explain the characteristics of Radio receivers in detail.	K4	CO2	[7M]
		OR			
	b	i) In a superheterodyne receiver having no RF amplifier, the loaded Q of the antenna coupling circuit (at the input of the mixer) is 100. If the intermediate frequency is 455 KHz, Calculate the following: (a) The image frequency and image frequency rejection ratio at 950 kHz and (b) The image frequency and its rejection ratio at 10 MHz.	K3	CO2	[7M]
		ii) Write a short note on the TRF receiver.	K2	CO2	[7M]
		UNIT-III			
3	a	i) With the help of neat block diagrams, explain the transmitter and receiver of the PCM system.	K2	CO3	[7M]
		ii) Consider a sinusoidal signal given by S(t)=3cos(100πt) (a) Find the signal-to-quantization noise ratio when the signal is quantized using 10-bit PCM. (b) Find the minimum number of bits needed to achieve a signal-to-noise ratio of at least 40 dB.	K3	CO3	[7M]
		OR			
	b	i) Describe the block diagram of the transmitter and receiver section of the DM (Delta Modulation) system	K2	CO3	[7M]
		ii) Find the signal-to-quantization noise ratio for linear quantization when input of the PCM system is a sinusoidal signal.	K3	CO3	[7M]
		UNIT-IV			
4	a	i) With the help of neat block diagrams, explain the transmission and reception of a QPSK system.	K2	CO4	[7M]
		ii) Justify how MSK can also be viewed as a kind of FSK modulation scheme.	K3	CO4	[7M]
		OR			
	b	i) With the help of neat block diagrams, explain the transmission and reception of an FSK system.	K2	CO4	[7M]
		ii) Compare ASK, FSK, and PSK.	K3	CO4	[7M]

		UNIT-V			
5	a	i) What is Entropy? An analog signal is band-limited to fm Hz and sampled at the Nyquist rate. The samples are quantized into 4 levels. Each level represents one symbol. Thus, there are 4 symbols. The probabilities of occurrence of these 4 levels (symbols) are P(x1) =P(x4) =1/8 and P(x2) =P(x3)=3/8. Obtain the information rate of the source.	K3	CO5	[7M]
		ii) Obtain the generator matrix for a systematic (7, 4) cyclic code if G(p)=P^3+P+1. Also, obtain the parity check matrix.	K3	CO5	[7M]
		OR			
	b	i) What is Mutual Information? A DMS X has five symbols x1, x2, x3, x4 and x5 with P(x1)=0.4, P(x2)=0.19, P(x3)=0.16, P(x4)=0.15 and P(x5)=0.1. Construct a Shanon-Fano code for X and calculate the efficiency of the code.	K3	CO5	[7M]
		ii) The Parity check matrix of a (7, 4) Humming code is expressed as $$[H]=\begin{bmatrix}1110:100\\0111:010\\1101:001\end{bmatrix}_{3\times7}$$ Evaluate the syndrome vector for single-bit errors.	K3	CO5	[7M]

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II B.Tech II Semester Supple. Examinations, April-2025

Sub Code: R20EC2204   ELECTRONIC CIRCUITS AND PULSE CIRCUITS

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

Note: Answer All **FIVE** Questions. All Questions Carry Equal Marks   (5 X 14 = 70M)

Q.No.		Questions	KL	CO	Marks
		UNIT-I			
1	a	Analysis of a transistor amplifier circuit using h-parameters along with diagrams	K3	1	7
		Solve Av,Zi, and Zo for the transistor connected in CS configuration. Assume g_m =6mA/V, r_d =20 kΩ Rs =1 kΩ, R_D=100kΩ, R_G =10 kΩ.	K3	1	7
		OR			
	b	Derive the overall current gain and overall input impedance of a darlington pair amplifier	K4	1	7
		Derive the expression for the bandwidth of a multi stage amplifier	K4	1	7
		UNIT-II			
2	a	Draw the circuit diagram of a Voltage series feedback amplifier, Derive expressions of input & output impedances, Gain, feedback factor	K3	2	7
		Derive the frequency of oscillation of Hartley oscillator? Explain	K3	2	7
		OR			
	b	Explain the concept of feedback with block diagram. What are the advantages and disadvantages of negative feedback?	K2	2	8
		Why LC oscillators are not used at low frequencies? Explain	K2	2	6
		UNIT-III			
3	a	With the help of a suitable circuit diagram, show that the maximum conversion efficiency of a class B power amplifier is 78.5%	K3	3	8
		What is a cross over distortion and explain a remedy for it.	K3	3	6
		OR			
	b	Draw the Class-A Power Amplifier and explain operation in detail with necessary equations. Also derive the expression for maximum conversion efficiency	K1	3	14
		UNIT-IV			
4	a	Prove that a low pass circuit acts as an integrator. Derive an expression for the output voltage levels under steady state conditions of a low pass circuit excited by a ramp input	K5	4	7
		Write short notes on Clamping circuit theorem?	K5	4	7
		OR			
	b	Explain the working of a two-level diode clipper with the help of circuit diagram, waveform and transfer characteristics.	K3	4	14
		UNIT-V			
.	a	Analysis and design of collector coupled monostable multivibrator?	K2	5	7
		Draw the circuit of a Schmitt trigger and give some of its applications	K2	5	7
		OR			
5	b	Draw the circuit diagram of an astable multivibrator and obtain all the steady state voltages and currents. Show how it acts as a voltage to frequency converter.	K4	5	7
		Why a monostable multivibrator is also called a delay circuit? Explain	K4	5	7

II B.Tech II Semester Supple. Examinations, April-2025

Sub Code: R20EC2205 **ELECTROMAGNETIC WAVES AND TRANSMISSION LINES**

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

Note: Answer All **FIVE** Questions.

All Questions Carry Equal Marks (5 X 14 = 70M)

Q.No		Questions	KL	CO	Marks
		UNIT-I			
1	a	i) State Coulomb's law and write the equation of F that exists between two unlike Charges?	2	1	7M
		ii) Analyze the Magnetic field for Line, Surface and Volume Currents using Biot Savart's law	3	1	7M
		OR			
	b	i) Estimate the force F_{21} & F_{12}, If the charge $Q_1 = 3 \times 10^{-4}$ C is located at (1,2,3) & charge $Q_2 = 10^{-4}$ C at (2,0,5) in a vacuum.	3	1	7M
		ii) Derive Poisson's and Laplace's equations from fundamentals. List few of its applications concerned to electrostatic fields	3	1	7M
		UNIT-II			
2	a	i) Derive a Maxwell's expression of $\nabla \times H$ for time varying EM fields	3	2	7M
		ii) Explain the Following. (i) Motional e.m.f (ii)Transformer e.m.f	2	2	7M
		OR			
	b	Write Maxwells equations for Time Varying fields in integral and differential form. Discuss the difference between static fields and Time Varying fields.	3	2	14M
		UNIT-III			
3	a	i) Write short notes on EM wave Polarization.	2	3	7M
		ii) Compare the wave propagation in perfect dielectric, good dielectric, good conducting medium.	2	3	7M
		OR			
	b	i) State and prove pointing theorem.	2	3	7M
		ii) Derive the Relation between E and H in free Space	3	3	7M
		UNIT-IV			
4	a	i) Define Transmission line and Explain the Primary Constants.	2	4	7M
		ii) An air line has a Characteristic Impedance of 70 and phase Constant of 3 rad/m at 100MHz.Calculate R,C,and L.	2	4	7M
		OR			
	b	i) Find the Zin at any point on the line in terms load impedance starting from voltage and current wave equations on line.	2	4	7M
		ii) A lossless transmission line operating at 4.5GHz has L=2.4µH/m and Z0=85Ω. Calculate the phase constant and the phase velocity	3	4	7M
		UNIT-V			
5	a	i) Derive Zin of a 2-wire transmission line.	3	5	7M
		ii) For a transmission line which is terminated in a normalized impedance Zn, VSWR = 2. Find the normalized impedance magnitude.	2	5	7M
		OR			
	b	Develop a relationship between Reflection Coefficient and VSWR for a Transmission Line.	4	5	14M

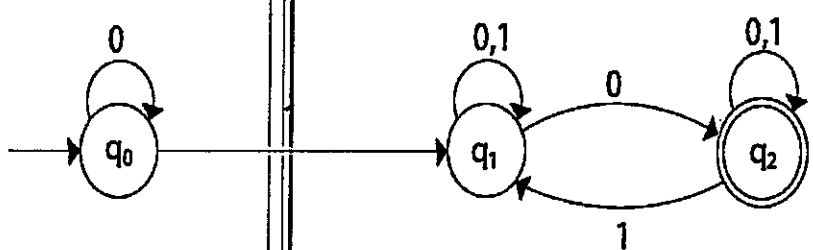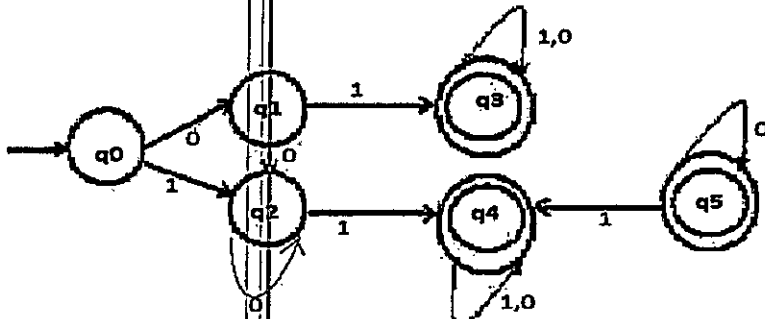## II B.Tech II Semester Supple. Examinations, April-2025

Sub Code: R20CS2202 **FORMAL LANGUAGES AND AUTOMATA THEORY**

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

Note: Answer All **FIVE** Questions. All Questions Carry Equal Marks (5 X 14 = 70M)

Q.No		Questions	KL	CO	Marks
		UNIT-I			
1	a	Describe the formal notation for NFA with epsilon closure and the uses of ε- closure.	K2	CO1	7M
		Design a Moore machine that determines the residue mod 4 for each binary string treated as integer.	K2	CO1	7M
		OR			
	b	Define Finite Automation? Explain about the model of Finite Automaton.	K2	CO1	14M
		UNIT-II			
2	a	Convert the given NFA to DFA.	K4	CO2	7M
		Construct a NFA equivalent to the regular expression 10(0+11)0*1?	K3	CO2	7M
		OR			
	b	Explain about the Closure Properties of Regular sets.	K3	CO2	7M
		Explain the Pumping Lemma for regular sets. Show that L={a^p| p is a prime} is not regular.	K3	CO2	7M
		UNIT-III			
3	a	Simplify (Minimize/Optimize) the following DFA.	K4	CO3	7M
		Write in detail the Chomsky hierarchy of formal languages.	K3	CO3	7M
		OR			
	b	Define Ambiguous Grammar? Check whether the grammar S→aAB, A→bC/cd, C→cd, B→c/d. Is Ambiguous or not?	K4	CO3	7M
		Define Context Free Grammar. State and Explain the closure properties of CFG.	K3	CO3	7M

		UNIT-IV			
4	a	Explain minimization of CFG? Simplify the following grammar S → a|aA|B|C A → aB| ɛ B → Aa C → cCD D → ddd	K4	CO4	7M
		L = {a^n b^n| n >=1}. Give the graphical representation for PDA obtained. Show the instantaneous description of the PDA on the input string *aaaabbbb*	K3	CO4	7M
		OR			
	b	What is deterministic Push Down Automata? Draw and explain a deterministic PDA for accepting { 0^{n}1^n | n>1}	K5	CO4	14M
		UNIT-V			
5	a	Define Turing Machine. Explain about Components of Turing Machine. Design a Turing Machine which accepts L = {a^{n}b^{n}c^n | n>=1}.	K3	CO5	7M
		What is undecidability? Explain the usage of post correspondence theorem to solve undecidability problems.	K3	CO5	7M
		OR			
	b	Construct a Turing Machine for language L = {0^{n}1^{n}2^n| n≥1}.	K4	CO5	7M
		Write short notes on NP complete and NP hard problems. Explain with suitable examples.	K3	CO5	7M

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II B.Tech II Semester Supple. Examinations, April-2025

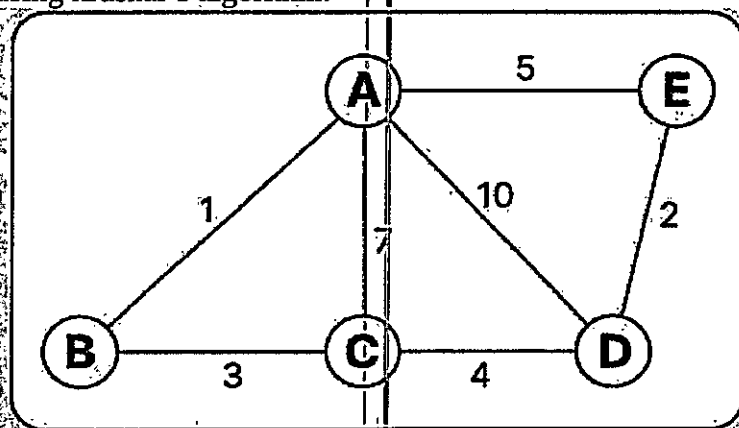**Sub Code:** R20IT2202   **DESIGN ANALYSIS OF ALGORITHMS**

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

Note: Answer All **FIVE** Questions.

All Questions Carry Equal Marks   (5 X 14 = 70M)

Q.No		Questions	KL	CO	Marks
		UNIT-I			
1	a	Explain the characteristics of an algorithm	2	1	7
		Write an algorithm for linear search and analyze the algorithm for its time complexity.	3	1	7
		OR			
	b	Describe performance analysis, space complexity and time complexity	2	1	7
		Compare and Contrast Big Oh, Omega and theta notations	4	1	7
		UNIT-II			
2	a	Analyze the Quick sort algorithm for the following example 25,36,12,4,5,16,58,54,24,16,9,65,78	3	2	7
		Write the Binary search algorithm and analyze for its best, worst and average case time complexity.	3	2	7
		OR			
	b	Explain the strassens matrix multiplication and derive its time complexity	3	2	14
		UNIT-III			
3	a	Explain the control abstraction of greedy method	2	3	7
		Give the optimal solution for 0/1 knapsack problem using greedy method. (p1,p2,p3, p4) = (11, 21, 31, 33), (w1, w2, w3, w4) = (2, 11, 22, 15), M=40, n=4.	3	3	7
		OR			
	b	Compute a minimum cost spanning tree for the graph of figure using kruskal's algorithm.	3	3	14
		UNIT-IV			
4	a	Design a three stage system with device types D1, D2, D3. The costs are $30, $15, $20 respectively. The cost of the system is to be no more than $105.the reliability of each device type is 00.9, 0.8and 0.5 respectively	3	4	14
		OR			
	b	et n=4 and (a1,a2,a3,a4) Construct optimal binary search for (a1, a2, a3, a4) = (cout, float, if, while), p(1 : 4) = (1/20,1/5,1/10,1/20) q(0 : 4)= (1/5,1/10,1/5,1/20,1/20)	3	4	14

UNIT-V			
Solve the 4-queens problem	3	5	7
a	Find all m-colors of a graph with undirected connections v1->v2, v1->v3, v1->v4,v2->v3, v2->v4, v2->v5, v3->v4, v4->v5 using backtracking technique	3	5	7
OR			
b	Solve the following instance of Traveling Salesperson (TSP) using branch and bound technique. Given below is the cost matrix. $\begin{pmatrix} \infty & 8 & 8 & 11 & 6 \\ 11 & \infty & 4 & 10 & 9 \\ 10 & 7 & \infty & 5 & 5 \\ 9 & 3 & 4 & \infty & 5 \\ 6 & 9 & 5 & 5 & \infty \end{pmatrix}$	3	6	14

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NAKASARAKAUPETA ENGINEERING COLLEGE
(AUTONOMOUS)

II B.Tech II Semester Supple. Examinations, April-2025

Sub Code: R20AI2202   AUTOMATA AND COMPILER DESIGN

Time: 3 hours   CSE(AI)   Max. Marks: 70

Note: Answer All **FIVE** Questions.
All Questions Carry Equal Marks   (5 X 14 = 70M)

Q.No			Questions	KL	CO	Marks
			Unit-I			
1	a		Define finite automata? Differentiate between NFA and DFA?	2	1	7 M
			Explain in detail about LEX tool	2	1	7 M
			OR			
	b		Construct DFA equivalent to regular expression (0+1)*(00+11)(0+1)*	3	1	7 M
			What are different phases of a Compiler? Explain with a diagram.	2	1	7 M
			Unit-II			
2	a		Define Context Free Grammar. Explain how it is suitable for parsing.	2	2	7 M

			Discuss the following:
			    i) Left Recursion
			    ii) Left factoring
				2	2	7 M

			OR			

	b		Compute first and follow functions for the given grammar:
			    E-> E+T/T
			    T->T*F/F
			    F-> F*|a|b
				3	2	7 M

			What is Left Recursion? How to eliminate Left Recursion.	2	2	7 M
			Unit-III			
3	a		Differentiate between top down parsing and bottom up parsing techniques.	2	3	7 M
			Explain the process of handling "Dangling-ELSE" ambiguity.	2	3	7 M
			OR			
	b		Develop LR parser for the given grammar and check the acceptance of input string of your own. R -> R+ / +R / RR / R* / (R) /a /b	3	3	14 M
			Unit-IV			
4	a		Convert the following expression into syntax tree and three address code: h=(b*-(a+b)/d)-c+6.	3	4	7 M
			Explain Storage allocation strategies with suitable examples?	2	4	7 M
			OR			
	b		What are the reasons to use intermediate code in a compiler? Write the intermediate code for the expression -a + a * (b + c) * d.	3	4	7 M
			How to access non-local data? Explain with example.	2	4	7 M
			Unit-V			
5	a		Discuss about different types of code optimization techniques.	2	5	7 M
			What is a flow graph? Explain with an example.	2	5	7 M
			OR			

		Discuss about register allocation and assignment in target code generation.	2	5	7 M

	b	Construct the DAG for the following basic block.
		    (i). t1 : = 4*i
		    (ii). t2 : = a[t1]
		    (iii). t3 : = 4*i
		    (iv). t4 : = b[t3]
		    (v). t5 : = t2*t4
		    (vi). t6 : = prod + t5
		    (vii). prod : = t6
		    (viii). t7 : = i + 1
		    (ix). i : = t7
		    (x). if i < = 20 goto (i).
			3	5	7 M

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NEC NARASARAOPETA ENGINEERING COLLEGE
(AUTONOMOUS)

II B.Tech II Semester Supple. Examinations, April-2025

Sub Code: R20AI2205

INTRODUCTION TO ARTIFICIAL INTELLIGENCE

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

Note: Answer All **FIVE** Questions.
All Questions Carry Equal Marks   (5 X 14 = 70M)

Q.No		Questions	KL	CO	Marks
		Unit-I			
1	a	Explain various Production System Characteristics.	2	1	7M
		Draw the diagram for one legal chess move.	2	1	7M
		OR			
	b	Explain about Problem Characteristics with suitable examples	2	1	7M
		Explain about water jug problem with production rules.	2	1	7M
		Unit-II			
2	a	Explain Generate and Test algorithm.	2	2	7M
		Explain about Means and Analysis algorithm with an example.	2	2	7M
		OR			
	b	Explain about representing the instance and Is a relationship.	2	2	7M
		Describe the Computable Function and Predicates.	2	2	7M
		Unit-III			
3	a	Explain various types of Semantic Nets.	2	3	7M
		Explain about any five Conceptual Dependency Rules.	2	3	7M
	b	Difference between Procedural vs Declarative Knowledge.	2	3	14M
		Unit-IV			
4	a	Explain about Rote Learning.	2	4	7M
		Explain about Q- Learning Algorithm.	2	4	7M
		OR			
	b	Explain about Markov decision problem with an example.	2	4	14M
		Unit-V			
5	a	Explain about Semantic analysis	2	5	7M
		Explain about Parallelism in Reasoning systems.	2	5	7M
		OR			
	b	Illustrate the Discourse and Pragmatic Processing.	2	5	7M
		Explain in detail about Distributed Reasoning System.	2	5	7M

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II B.Tech II Semester Supple. Examinations, April-2025
Sub Code: R20DS2203   **DATA WAREHOUSING & DATA MINING**

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

Note: Answer All **FIVE** Questions.
All Questions Carry Equal Marks   (5 X 14 = 70M)

Q.No			Questions	KL	CO	M
			Unit-I			
1	a	i)	Discuss about classification of Data mining System.	L2	CO1	7M
		ii)	Describe Major issues in Data Mining.	L2	CO1	7M
			OR			
	b	i)	Write about knowledge discovery process from databases.	L2	CO1	7M
		ii)	Explain about data mining tasks.	L2	CO1	7M
			Unit-II			
2	a	i)	Explain the pre-processing techniques in detail. Why it is essential.	L2	CO2	14M
			OR			
	b	i)	Describe the difference between measures of location and measures of spread in the process of data exploration.	L2	CO2	7M
		ii)	Distinguish between data similarity and dissimilarity measures in data pre-processing.	L4	CO2	7M
			Unit-III			
3	a	i)	Explain in detail about data warehouse architecture and implementation	L2	CO3	7M
		ii)	Explain OLAP operations in multi-dimensional data model.	L2	CO3	7M
			OR			
	b	i)	Compare and Contrast OLAP and OLTP.	L2	CO3	7M
		ii)	Explain 3-tier Data warehouse architecture and its applications.	L2	CO3	7M
			Unit-IV			
4	a	i)	How to construct a decision tree? Illustrate the process of solving a classification problem using a decision tree.	L3	CO4	14M
			OR			
	b	i)	What are the different approaches to evaluate the performance of a classifier? Explain.	L2	CO4	7M
		ii)	Explain Bayesian classification technique.	L2	CO4	7M
			Unit-V			
5	a	i)	Write the Apriori algorithm for finding frequent item set.	L2	CO5	7M
		ii)	Analyze briefly about FP growth algorithm.	L4	CO5	7M
			OR			
	b	i)	Write and explain the basic K-means clustering algorithm.	L2	CO5	7M
		ii)	What is agglomerative hierarchical clustering? Explain.	L2	CO5	7M

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

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II B.Tech II Semester Supple. Examinations, April-2025

Sub Code: R20DS2212 **SOFTWARE ENGINEERING**

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

Note: Answer All **FIVE** Questions.
All Questions Carry Equal Marks (5 X 14 = 70M)

Q.No		Questions	KL	CO	M
		Unit-I			
1	a	i)Write in detail about the Evolution of Software Engineering Methodologies	K2	1	7M
		ii)Explain in detail about characteristics of software process	K2	1	7M
		OR			
	b	i)Explain about Software Engineering Challenges in detail	K2	1	7M
		ii) Write in detail about iterative waterfall model and explain how it is different from Agile Process	K2	1	7M
		Unit-II			
2	a	i)Consider an Example and write about Requirements elicitation-fact finding techniques	K4	2	7M
		ii)explain what do you mean by Prototyping Analysis- throwaway in requirement analysis	K4	2	7M
		OR			
	b	i)Consider an example and explain about the functional and nonfunctional requirements in Software Engineering	K4	2	7M
		ii)Explain about the validation requirements in software engineering	K2	1	7M
		Unit-III			
3	a	i)Explain the Characteristics of Good Software Design along with Design Principles	K2	1	7M
		ii)Consider an example to explain object oriented design methodology	K4	2	7M
		OR			
	b	i)Explain the importance of Modular design with an example along with Coupling and cohesion	K2	1	7M
		ii) Consider an example to explain Structured Design Methodology	K4	2	7M
		Unit-IV			
4	a	i)Explain the importance of coding principles along with code verification and code documentation	K4	3	7M
		ii) What is the role of Software testers in software Engineering	K4	2	7M
		OR			
	b	i) Write short notes on a) traditional coding process b) test driven development.	K4	3	7M
		ii)Explain the difference between White box testing and Black box testing in detail	K4	3	7M
		Unit-V			
5	a	i) Explain about Software Metrics and measurements in detail	K2	4	7M
		ii) What are the Software Quality Factors that a software depends on?	K4	3	7M
		OR			
	b	i) Write in detail about COCOMO Cost model	K2	4	7M
		ii)Explain about Capability Maturity Model(CMM)	K4	4	7M

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

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II B.Tech II Semester Supple. Examinations, April-2025

Sub Code: R20AC2204 **OPERATING SYSTEMS**

Time: 3 hours (AI&ML) Max. Marks: 70

Note: Answer All **FIVE** Questions All Questions Carry Equal Marks (5 X 14 = 70M)

Q.No			Questions	KL	CO	M
			Unit-I			
1	a		i)Write about Operating Systems functions in detail	K2	1	7M
			ii)Explain about File-System Management	K2	1	7M
			OR			
	b		i)Explain about various system calls in operating System	K2	1	7M
			ii) Write in detail about Layered Approach of OS	K2	1	7M
			Unit-II			
2	a		i)Explain about the importance of Process Scheduling in OS	K2	2	7M
			ii)Consider an example and explain about Multi Thread programming models	K2	2	7M
			OR			
	b		i)Explain about Priority Scheduling with example	K2	2	7M
			ii) Write about Round robin Scheduling with example	K2	2	7M
			Unit-III			
3	a		i) Write about peterson's solution	K3	3	7M
			ii) Explain about Semaphore with an example	K3	3	7M
			OR			
	b		i)Write short notes on a)Bounded buffer problem b) Readers writers' problem	K3	3	7M
			ii) Explain about Dining-Philosophers problem	K3	3	7M
			Unit-IV			
4	a		i)Explain about fragmentation, Paging in Memory management	K4	4	7M
			iii) Define Deadlock and explain about the Deadlock conditions	K4	4	7M
			OR			
	b		i) Write the difference between LRU page replacement and LFU page replacement algorithms	K4	4	7M
			ii) Explain about bankers Algorithm and Recovery from deadlock	K4	4	7M
			Unit-V			
5	a		i)Explain about Single level and two level directories	K2	5	7M
			ii) write short notes on a) FCFS Scheduling b)SSTF Scheduling	K2	5	7M
			OR			
	b		i)Explain about tree structured directory and general graph directory	K2	5	7M
			ii)Write short notes on a) SCAN Scheduling and b) LOOK Scheduling	K2	5	7M

II B.Tech II Semester Supple. Examinations, April-2025

| R20 |

Sub Code: R20AM2205   **ARTIFICIAL INTELLIGENCE**

Time: 3 hours   (AI&ML)   Max. Marks: 70

Note: Answer All **FIVE** Questions.   All Questions Carry Equal Marks   (5 X 14 = 70M)

Q.No			Questions	KL	CO	M
			Unit-I			
1	a	i) How do you define a problem as a state space search? Explain.		L2	CO1	7M
		ii) Define Artificial Intelligence. List out its characteristics and applications.		L2	CO1	7M
			OR			
	b	i) Explain the different development phases of AI and describe the significance of knowledge-based systems?		L2	CO1	7M
		ii) What is problem state space search? What are the production rules in the water jug problem?		L3	CO1	7M
			Unit-II			
2	a	i)What is predicate logic ? Explain the predicate logic representation with reference to a suitable example		L2	CO2	7M
		ii) Describe the heuristic search technique applied to a Hill climbing problem with an example.		L2	CO2	7M
			OR			
	b	i) Provide a detailed explanation of the concepts of Instance and Isa relationships in artificial intelligence?		L2	CO2	7M
		ii) Explain heuristic search techniques, their types, function, and their applications in solving complex problems?		L2	CO2	7M
			Unit-III			
3	a	i) Explain the concept of forward reasoning and backward reasoning in the context of Artificial intelligence and export systems.		L3	CO3	14M
			OR			
	b	i) How does the representation of knowledge using rules differ between declarative and procedural knowledge?		L2	CO3	14M
			Unit-IV			
4	a	i) Describe the concept of weak slot and filler structures in the context of knowledge representation.		L2	CO4	7M
		ii) Explain the concept of Q-learning in reinforcement learning.		L2	CO4	7M
			OR			
	b	i) Discuss various types of learning in Artificial Intelligence. Illustrate how these learning paradigm applied in real-world AI applications?		L3	CO4	14M
			Unit-V			
5	a	i) What are the key techniques and approaches used for semantic analysis in NLP?		L2	CO5	7M
		ii) Discuss the concept of disclosure and pragmatic processing in Natural Language Processing.		L2	CO5	7M
			OR			
	b	i) Explain the principles and methodologies behind statistical natural language processing.		L2	CO5	7M
		ii) What are the key differences between parallel and distributed AI? Describe the main challenges for their implementation.		L2	CO5	7M

II B.Tech II Semester Supple. Examinations, April-2025
Sub Code: R20DS2205   **DATA SCIENCE WITH R PROGRAMMING**
Time: 3 hours   (DS)   Max. Marks: 70

Note: Answer All **FIVE** Questions.
All Questions Carry Equal Marks   (5 X 14 = 70M)

Q.No			Questions	KL	CO	M
			Unit-I			
1	a		i) Describe the types of data objects in R language. Explain with syntax for their creation.	2	1	7M
			ii) What are the two common looping expressions that are used in R language? Explain their Subsetting with Logical Operators.	2	1	7M
			OR			
	b		i) What about when you have a data file that you want to import into R, which was made in another program? Explain the methods.	2	1	7M
			ii) Write an R-language program to find the Fibonacci Sequence using Recursion in R.	3	1	7M
			Unit-II			
2	a		i) Explain how do Probability and Statistical inference work together?	2	2	7M
			ii) Explain about the Two sample t-test with example.	2	2	7M
			OR			
	b		i) In a study conducted by the Department of Mechanical Engineering at Virginia Tech, the steel rods supplied by two different companies were compared. Ten sample springs were made out of the steel rods supplied by each company, and a measure of flexibility was recorded for each. The data are as follows: Company A: 9.3 8.8 6.8 8.7 8.5 6.7 8.0 6.5 9.2 7.0 Company B: 11.0 9.8 9.9 10.2 10.1 9.7 11.0 11.1 10.2 9.6 (a) Calculate the sample mean and median for the data for the two companies. (b) Plot the data for the two companies on the same line and give your impression regarding any apparent differences between the two companies.	3	2	14M
			Unit-III			
3	a		i) Discuss how to append rows to R data frame with an example.	2	3	7M
			ii) Explain how to clean the column names of a data frame using R Programming with an example.	2	3	7M
			OR			
	b		i) Discuss the functions to join columns and rows in a data frame.	2	3	7M
			ii) Explain with an example a. how to create a data frame. b. To add the new variables to the data frame. c. How to modify a data frame in R?	3	3	7M
			Unit-IV			
4	a		i) What are the assumptions that are made to fitting the regression model? Explain.	2	4	7M
			ii) What is Agglomerative hierarchical clustering? Explain its applications.	2	4	7M

		OR			
	b	i) Differentiate between the K-means and K-Medoid Clustering algorithms.	2	4	7M
		ii) Describe the Linkage Methods for Hierarchical Clustering.	2	4	7M
5		Unit-V			
	a	i) How do we split data in Machine Learning? Explain the Different Forms and Properties of Data.	2	5	7M
		ii) Discuss the several statistical metrics that are used for evaluating the accuracy of regression models.	2	5	7M
		OR			
	b	i) What is Dimensionality Reduction? Explain how the Principal Component Analysis for dimension reduction using R.	2	5	7M
		ii) Explain the step in Implementation of the principal component analysis using R.	2	5	7M

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

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