

**MANUFACTURING TECHNOLOGY-II
(MECHANICAL ENGINEERING)****Time: 3 Hours****Max Marks: 70**

Answer ONE Question from each Unit

All Questions Carry Equal Marks

All parts of the Question must be answered at one place

		<u>UNIT-I</u>	Marks	CO	BTl
1.	a)	What is the method to designate single point cutting tool in ASA system? Explain the significance of each angle in it.	7	1	K2
	b)	Derive an equation for finding shear angle using orthogonal rake angle and chip thickness ratio in orthogonal cutting.	7	1	K2
(OR)					
2.	a)	What are the factors affect Tool life? Describe Taylor's equation for tool life.	7	1	K2
	b)	With the help of neat schematic describe different types of chips form during machining and explain the role of chip breaker.	7	1	K2
		<u>UNIT-II</u>			
3.	a)	With the help of neat schematic explain different types of lathe operations.	10	2	K2
	b)	What is the principle of thread cutting?	4	2	K2
(OR)					
4.	a)	With the help of neat schematic explain bar feeding mechanism in production lathe.	10	2	K2
	b)	What are the setup methods that prevent errors before they occur in lathe turning process?	4	2	K2
		<u>UNIT-III</u>			
5.	a)	What are the different types of reciprocating machines? Explain the quick return mechanism of slotter.	8	3	K2
	b)	Why do reciprocating machines are not popular machine tools in industries?	6	3	K2
(OR)					
6.	a)	What is the difference between up milling and down milling? Explain with neat schematic.	8	3	K2
	b)	Briefly explain different methods for gear cutting using milling machine. Why does gear hobbing is widely used in gear manufacturing instead of gear indexing?	6	3	K2
		<u>UNIT-IV</u>			
7.	a)	What are the different types of grinding machines? Explain any one of it with neat schematic.	8	4	K2
	b)	Briefly discuss different types of grinding machines with their applications in machine shop practice.	6	4	K2
(OR)					
8.	a)	Briefly discuss honing, buffing and lapping.	7	4	K2
	b)	With the help of neat schematic discuss different types of feed in centreless grinding.	7	4	K2
		<u>UNIT-V</u>			
9.	a)	With the help of neat schematic describe the difference between hole basis and shaft basis system.	8	5	K2
	b)	What is interchangeability? Why does interchangeability play significant role in industry practice?	6	5	K2
(OR)					
10.	a)	With the help of neat schematic describe the different types of fits used in industrial practice.	9	5	K2
	b)	Justify the uniqueness of Taylor's principle of gauge design in industry.	5	5	K2

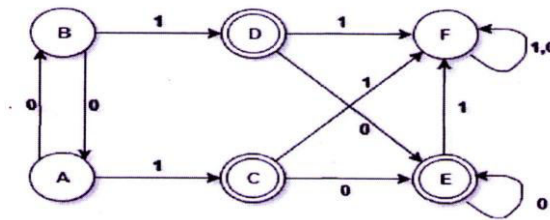
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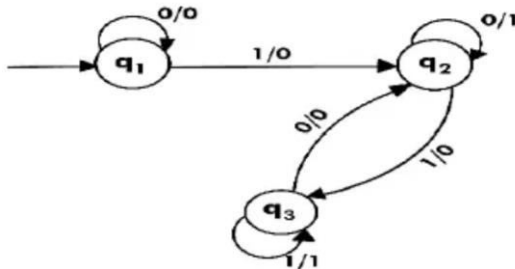
UNIT-I

- | | Marks | CO | BTL |
|--|-------|-----|-----|
| 1. a) Draw a DFA for the language accepting strings starting with '101' over input alphabets $\Sigma = \{0, 1\}$ | 7 | CO1 | L3 |
| b) Minimize the following DFA | 7 | CO1 | L3 |



(OR)

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|---|---|-----|----|
| 2. a) Convert the following Mealy machine into equivalent Moore machine | 7 | CO1 | L3 |
|---|---|-----|----|



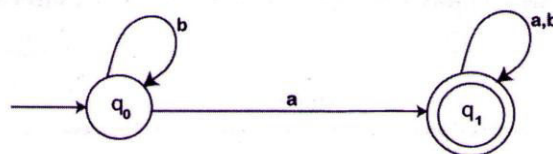
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|---|---|-----|----|
| b) Provide a DFA that accepts a language L over input alphabets $\Sigma = \{a, b\}$ such that L is the set of all strings starting with 'aa' or 'bb'. | 7 | CO1 | L3 |
|---|---|-----|----|

UNIT-II

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|--|---|-----|----|
| 3. a) State and Explain Pumping Lemma for regular Languages. Generate regular expression for strings with even number of a's. $\Sigma = \{a, b, c\}$ | 8 | CO2 | L3 |
| b) Develop equivalent automata for the R.E. $(ab+bb)^*(a+bb)^*a^*$ | 6 | CO2 | L3 |

(OR)

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|--|---|-----|----|
| 4. a) List out the rules for writing regular expressions. Convert the following DFA to its equivalent Regular Expression | 7 | CO2 | L3 |
|--|---|-----|----|



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|--|---|-----|----|
| b) Draw the state-transition diagram showing a DFA for recognizing the following language: $L = \{x \in \{0, 1\}^* \mid x \text{ is a binary representation of a natural number which is a multiple of 5}\}$ | 7 | CO2 | L2 |
|--|---|-----|----|

UNIT-III

5. a) Describe all the properties of CFLs 6 CO3 L2
b) Let G be the grammar 8 CO3 L3
S → aB | bA
A → a | aS | bAA
B → b | bS | aBB
For the string baaabbabba, Find leftmost derivation, rightmost derivation and parse tree
- (OR)
6. a) Remove the useless productions from the following CFG 7 CO3 L3
S → AB | AC
A → aAb | bAa | a
B → bbA | aaB | AB
C → abCA | aDb
D → bD | aC
b) Find Context Free Languages for the following grammars 7 CO3 L3
S → aSbS | bSaS | ε
S → aSb | aAb
A → bAa
A → ba

UNIT-IV

7. a) Illustrate a Turing machine for finding a complement of any binary number 7 CO4 L3
b) Demonstrate a PDA for the language $L = \{ww^r \mid w \in (0,1)^*\}$. Also illustrate the computation of the PDA on the string '001100' 7 CO4 L3
- (OR)
8. a) Find the equivalent PDA to the given CFG with the following productions 7 CO4 L3
S → A, A → BC, B → ba, C → ac
S → aSb | A, A → bSa | S | ε
b) Demonstrate a TM to find the sum of two numbers m and n. Assume that initially the tape contains m number of 0s followed by # followed by n number of 0s 7 CO4 L3

UNIT-V

9. a) Explain Chomsky hierarchy for formal languages 6 CO5 L1
b) Demonstrate a Turing Machine for the language $L = \{a^n b^{2n}; n > 1\}$. Illustrate the computation of TM on the input aaabbbbbb. 8 CO5 L3
- (OR)
10. a) What is Post Correspondence Problem (PCP)? Check whether any solution exists to the given instance 7 CO5 L4
[a, aa], [bb, b], [a, bb]
[a, ab], [ba, aba], [bba, b]
b) Define Context Sensitive Languages and list out its properties 7 CO5 L1

Time: 3 Hours

Max Marks: 70

Answer ONE Question from each Unit

All Questions Carry Equal Marks

All parts of the Question must be answered at one place

			Marks	CO	BTL
UNIT-I					
1.	a)	List the types of conductors used in transmission lines and give brief notes on it.	7	1	K2
	b)	Write a short note on the following i) GMR ii) GMD	7	1	K2
(OR)					
2.	a)	Derive the expression for the inductance per phase of a three-phase overhead transmission line when conductors are unsymmetrically spaced.	8	1	K2
	b)	Determine the loop inductance and reactance per km of a 1-phase overhead transmission line consisting of two conductors, each 1.50 cm diameter. The spacing between conductors is 2 m and frequency is 60 Hz.	6	1	K3
UNIT-II					
3.	a)	Define short, medium, and long transmission lines. Explain their classification based on length and operating voltage.	7	2	K2
	b)	Find the ABCD parameters of a medium transmission line using nominal pi method.	7	2	K2
(OR)					
4.	a)	Derive the expression for the voltage regulation in case of short transmission line supplying inductive load.	7	2	K2
	b)	Determine the ABCD parameters of a medium transmission line by applying the nominal T method.	7	2	K2
UNIT-III					
5.	a)	Draw the equivalent circuit of the long transmission line and derive the expression for the Sending end voltage, current using rigorous method.	10	3	K2
	b)	Define the following terms i) Characteristic impedance ii) Surge impedance loading and also write the corresponding equations.	4	3	K2
(OR)					
6.	a)	Draw the Equivalent- π network of long transmission line and find ABCD parameters.	7	3	K2
	b)	Explain the phenomena of incident, reflected, and refracted waves on a long transmission line.	7	3	K2
UNIT-IV					
7.	a)	Explain Skin effect and proximity effect in detail.	7	4	K2
	b)	In a 33 kV overhead line, there are three units in the string of insulators. If the capacitance between each insulator pin and earth is 11% of self-capacitance of each insulator, find (i) the distribution of voltage over 3 insulators and (ii) string efficiency.	7	4	K3
(OR)					
8.	a)	Apply the concept of Ferranti effect to a medium-length transmission line and explain why the receiving end voltage becomes higher than the sending end voltage under no-load conditions.	7	4	K3
	b)	Define String efficiency and obtain the expression for the String efficiency of the string of the suspension insulator containing three units	7	4	K2
UNIT-V					
9.	a)	What is grading and explain the capacitance grading	7	5	K2
	b)	Explain the following with equations (i) Critical disruptive voltage (ii) Visual critical voltage (iii) Power loss due to Corona	7	5	K2
(OR)					
10.	a)	Develop the expression for sag in overhead line system when the supports are at unequal level	7	5	K2
	b)	A transmission line has a span of 150 m between level supports. The conductor has a cross-sectional area of 2 cm ² . The tension in the conductor is 2000 kg. If the specific gravity of the conductor material is 9.9 gm/cm ³ and wind pressure is 1.5 kg/m length, calculate the sag.	7	5	K3

Time: 3 Hours**Max Marks: 70**

Answer ONE Question from each Unit

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	<u>UNIT-I</u>	Marks	CO	Blooms Level
1.	a) Explain the working of transistor-transistor logic (TTL).	6	CO 1	Understand
	b) Construct logic family comparison tables and interpret their implications.	8	CO 1	Analyze
	(OR)			
2.	a) Develop a timing diagram to illustrate the dynamic behavior of CMOS logic.	8	CO 1	Analyze
	b) Illustrate the CMOS and TTL logic families with examples.	6	CO 1	Apply
	<u>UNIT-II</u>			
3.	a) Identify the standard digital ICs used for decoders and encoders.	8	CO 2	Remember
	b) Write a Verilog HDL program for a 4-bit comparator.	6	CO 2	Apply
	(OR)			
4.	a) Explain the working of a 4-to-1 multiplexer with a truth table.	8	CO 2	Understand
	b) Write a Verilog HDL program for a 3-to-8 decoder.	6	CO 2	Understand
	<u>UNIT-III</u>			
5.	a) Explain the priority encoder with a truth table.	6	CO 3	Understand
	b) Write a Verilog HDL code for a simple ALU that supports AND, OR, ADD, and SUB.	8	CO 3	Apply
	(OR)			
6.	a) Implement cascading of two 4-bit comparators using IC 7485.	7	CO 3	Apply
	b) Explain the Verilog HDL modelling of a 4-bit subtractor.	7	CO 3	Understand
	<u>UNIT-IV</u>			
7.	a) Explain the working of a JK flip-flop with a timing diagram.	7	CO 4	Understand
	b) Write the Verilog HDL code for a 4-bit shift register.	7	CO 4	Apply
	(OR)			
8.	a) Construct a 4-bit bidirectional shift register.	7	CO 4	Apply
	b) Explain Verilog HDL modelling of a 4-bit synchronous counter.	7	CO 4	Understand
	<u>UNIT-V</u>			
9.	a) Explain the procedure of state reduction with an example.	6	CO 5	Understand
	b) Design a Mealy machine for detecting the sequence "101".	8	CO 5	Apply
	(OR)			
10.	a) Discuss the role of next-state equations in FSM design.	6	CO 5	Understand
	b) Explain the design of an asynchronous serial adder using the FSM approach.	8	CO 5	Understand

Time: 3 Hours

Max Marks: 70

Answer ONE Question from each Unit

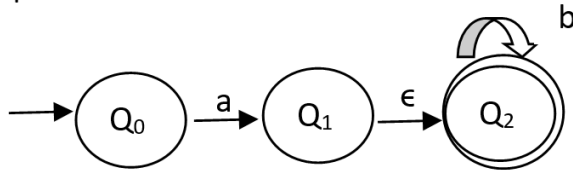
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UNIT-I

1. a) Convert the following NFA with Epsilon moves into NFA without Epsilon moves.

Marks	CO	BTL
7M	CO1	K3



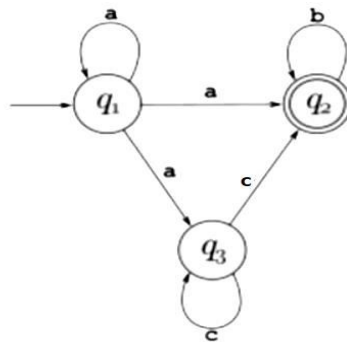
- b) Design a Finite State Machine which outputs the 1st complement of a binary number.

7M	CO1	K3
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(OR)

2. a) Convert the following NFA in to DFA

7M	CO1	K3
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- b) Define NFA and DFA.
List various applications of NFA and DFA.

7M	CO1	K2
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UNIT-II

3. a) Design an NFA with ϵ -moves for the following Regular Expressions.

7M	CO2	K3
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Letter (i) (letter+digit)* (ii) $(0+1)^*1(0+1)$

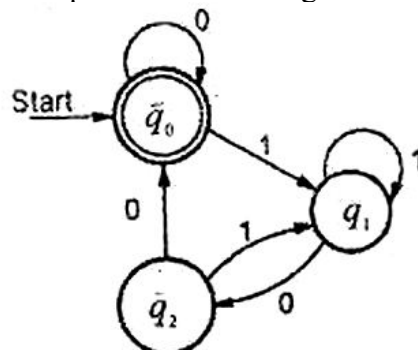
- b) Describe the closure properties of Regular sets.

7M	CO2	K2
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(OR)

4. a) Find out the regular expression from the given DFA

7M	CO2	K3
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- b) Show that the language $L = \{ a^i b^{2i} \}$ is not regular for $i > 0$.

7M	CO2	K3
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UNIT-III

5. a) Describe Chomsky Normal Form. Convert the following grammar into CNF.
 $G2 = \{S \rightarrow a, S \rightarrow aZ, Z \rightarrow a\}$ 7M CO3 K3
- b) Explain the problems associated with left recursive grammars. 7M CO3 K2
- (OR)**
6. a) Eliminate left recursion from the following grammar.
 $E \rightarrow E + T / T$
 $T \rightarrow T * F / F$
 $F \rightarrow E / id$ 7M CO3 K3
- b) Explain pumping lemma for Context free languages. 7M CO3 K2

UNIT-IV

7. a) Consider the following PDA which accepts L by empty stack and convert it into equivalent PDA which accepts L by final state.
 $M = (\{q_0, q_1\}, \{a, b\}, \{B, z_0\}, \delta, q_0, z_0, \Phi)$ where δ is given by
 $\delta(q_0, a, z_0) = (q_0, Bz_0)$
 $\delta(q_0, a, B) = (q_0, BB)$
 $\delta(q_0, b, B) = (q_1, \epsilon)$
 $\delta(q_1, b, B) = (q_1, \epsilon)$
 $\delta(q_1, \epsilon, z_0) = (q_1, \epsilon)$
the above PDA accepts $L = \{a^n b^n / n \geq 1\}$ by empty stack 7M CO4 K3
- b) Consider a PDA $M = (\{s, p, q\}, \{a, c\}, \{a, z_0\}, \delta, s, z_0, p)$ which accepts language $L = \{a^n c b^n / n \geq 1\}$ by final state, where δ is defined as follows
 $\delta(s, a, z_0) = (s, a z_0)$
 $\delta(s, a, a) = (s, a a)$
 $\delta(s, c, a) = (q, a)$
 $\delta(q, a, a) = (q, \epsilon)$
 $\delta(q, \epsilon, z_0) = (p, z_0)$
Construct an equivalent PDA M^1 which accepts L in empty stack 7M CO4 K3
- (OR)**
8. a) Show that for every CFG then there exists a PDA such that $N(P) = L(G)$? 7M CO4 K3
- b) Construct DPDA which accepts the language $L = \{wcwR \mid w \in \{a, b\}^*, c \in \Sigma\}$. 7M CO4 K3

UNIT-V

9. a) Explain the different types of Turing machines 7M CO5 K2
- b) Design a turing machine that accepts $L = \{0^n 1^n / n \geq 1\}$ 7M CO5 K2
- (OR)**
10. a) Explain the advantages of Turing machines over Push down automata. 7M CO5 K2
- b) Obtain a turing machine that accepts strings of 0s and 1s ending with "011". 7M CO5 K3

TRANSPORTATION ENGINEERING - I
(CIVIL ENGINEERING)**Time: 3 Hours****Max Marks: 70**

Answer ONE Question from each Unit

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			Marks	CO	BTL
UNIT-I					
1.	a)	Summarize the contributions of the Jayakar Committee towards road development in India.	7	CO1	Understand
	b)	Classify the roads as per IRC and explain their suitability for rural and urban connectivity.	7	CO1	Apply
(OR)					
2.	a)	What are the objectives of highway planning? Discuss the necessity of highway planning in India.	7	CO1	Understand
	b)	Categorize different road network patterns and discuss their merits and demerits with sketches.	7	CO1	Analyze
UNIT-II					
3.	a)	A highway is designed for a speed of 120 kmph. Calculate the SSD, assuming reaction time = 2.5 s and coefficient of friction = 0.35.	7	CO2	Apply
	b)	Discuss in detail the design considerations of vertical curves.	7	CO2	Analyze
(OR)					
4.	a)	Derive an expression for the length of a summit curve for providing adequate stopping sight distance.	8	CO2	Evaluate
	b)	Explain the necessity of extra widening on horizontal curves. Write its empirical formula.	6	CO2	Apply
UNIT-III					
5.	a)	Define bitumen. Explain the physical properties of bitumen used in highway construction.	7	CO3	Understand
	b)	Illustrate the step-by-step construction procedure of Cement Concrete roads, mentioning tie bars and dowel bars.	7	CO3	Apply
(OR)					
6.	a)	Discuss in detail the Marshall stability test and its significance in bituminous mix design.	8	CO3	Apply
	b)	Explain briefly about the California Bearing Ratio (CBR) test and its applications in highway design.	6	CO3	Understand
UNIT-IV					
7.	a)	Define traffic flow and capacity. Explain the concept of fundamental diagrams of traffic flow.	7	CO4	Understand
	b)	Describe the procedure for conducting origin–destination studies and state their applications in traffic planning.	7	CO4	Analyze
(OR)					
8.	a)	Discuss different methods of traffic volume studies and their relative advantages.	7	CO4	Analyze
	b)	Explain speed–time–distance relationships and the importance of speed and delay studies.	7	CO4	Understand
UNIT-V					
9.	a)	Discuss the various types of parking problems commonly encountered in urban areas.	7	CO5	Understand
	b)	Explain the importance of accident analysis and describe the preparation of condition and collision diagrams.	7	CO5	Analyze
(OR)					
10.	a)	What is meant by Level of Service (LOS)? Explain different LOS categories with respect to urban roads.	7	CO5	Understand
	b)	Discuss the PCU concept. What are its applications and limitations in highway capacity analysis?	7	CO5	Analyze

Time: 3 Hours

Max Marks: 70

Answer ONE Question from each Unit

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		Marks	CO	Blooms Level
UNIT-I				
1.	a) Analyze the main challenges of Machine Learning (overfitting, data scarcity, interpretability) and suggest possible solutions.	7M	CO1	BL4
	b) Compare the trade-offs in bias-variance dilemma and explain its effect on statistical learning performance.	7M	CO1	BL4
(OR)				
2.	a) Analyze how training loss and test loss can guide model selection and avoid overfitting.	7M	CO1	BL4
	b) Suppose you are training a spam email classifier. Show how Empirical Risk Minimization (ERM) is applied to minimize classification errors.	7M	CO1	BL3
UNIT-II				
3.	a) What is the main distinction between Linear Regression and Logistic Regression?	7M	CO2	BL3
	b) Explain the concept of the margin and support vectors in SVM.	7M	CO2	BL4
(OR)				
4.	a) Explain the working principle of the k-Nearest Neighbor (k-NN) algorithm with an example.	7M	CO2	BL3
	b) Analyze the effect of regularization (L1, L2) in linear models for reducing overfitting.	7M	CO2	BL4
UNIT-III				
5.	a) Compare and contrast the K-Means and DBSCAN clustering algorithms.	7M	CO3	BL4
	b) Apply the Expectation-Maximization (EM) idea to update parameters of a two-cluster Gaussian Mixture.	7M	CO3	BL4
(OR)				
6.	a) Apply one iteration of K-Means clustering on a small 2D dataset with given initial centroids.	7M	CO3	BL4
	b) Describe how Gaussian Mixtures work as a probabilistic approach to clustering.	7M	CO3	BL4
UNIT-IV				
7.	a) Suppose you have three classifiers with accuracies 70%, 75%, and 80%. Show how a voting classifier could improve overall performance.	7M	CO4	BL4
	b) Analyze the differences between Bagging, Boosting, and Stacking in terms of bias-variance tradeoff.	7M	CO4	BL4
(OR)				
8.	a) Compare Random Forests and Boosting algorithms in terms of interpretability, accuracy, and overfitting risk.	7M	CO4	BL4
	b) How a Random Forest combines multiple decision trees to improve performance? Explain	7M	CO4	BL4
UNIT-V				
9.	a) Compare Randomized PCA and Kernel PCA in terms of scalability and handling nonlinear data.	7M	CO5	BL4
	b) Describe the main approaches to dimensionality reduction (feature selection vs. feature extraction).	7M	CO5	BL3
(OR)				
10.	a) Describe the basic architectural structure of an Artificial Neural Network.	7M	CO5	BL3
	b) Compare traditional Machine Learning algorithms vs. Deep Learning in terms of feature engineering, scalability, and performance.	7M	CO5	BL4

Time: 3 Hours

Max Marks: 60

Answer ONE Question from each Unit

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UNIT-I

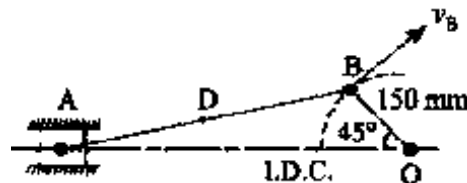
- | | | Marks | CO | Blooms Level |
|-------|--|-------|----|--------------|
| 1. a) | Classify kinematic pairs. Explain each pair with an Example. | 5M | 1 | 2 |
| b) | Explain the types of constrained motions with neat sketch and examples | 5M | 1 | 2 |

(OR)

- | | | | | |
|----|--|-----|---|---|
| 2. | Explain different inversions of a single-slider crank chain with the help of neat sketches and examples. | 10M | 1 | 2 |
|----|--|-----|---|---|

UNIT-II

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|----|---|-----|---|---|
| 3. | The crank of a slider crank mechanism rotates clockwise at a constant speed of 300 rpm. The crank is 150 mm and the connecting rod is 600 mm long. Determine
i) Linear velocity and acceleration of the midpoint of the connecting rod
ii) angular velocity and angular acceleration of the connecting rod, at a crank angle of 45° from inner dead centre position. | 10M | 2 | 3 |
|----|---|-----|---|---|



(OR)

- | | | | | |
|----|---|-----|---|---|
| 4. | PQRS is a four bar chain with link PS fixed. The lengths of the links are PQ = 62.5 mm ; QR = 175 mm ; RS = 112.5 mm ; and PS = 200 mm. The crank PQ rotates at 10 rad/s clockwise. Draw the velocity and acceleration diagram when angle QPS = 60° . Find the angular velocity and angular acceleration of links QR and RS. | 10M | 2 | 3 |
|----|---|-----|---|---|

UNIT-III

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|-------|--|----|---|---|
| 5. a) | Explain any two types of gear trains. | 4M | 3 | 2 |
| b) | Two gear wheels mesh externally and are to give a velocity ratio 3:1. The teeth are involute form. Module= 6mm, addendum= one module, Pressure angle: 20° The pinion rotates at 100 rpm. Find
i) Number of teeth on pinion to avoid interference on it and the corresponding no. of teeth on the wheel.
ii) The path of contact | 6M | 3 | 3 |

(OR)

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|----|--|-----|---|---|
| 6. | An internal wheel B with 80 teeth is keyed to a shaft F. A fixed internal wheel C with 82 teeth is concentric with B. A compound wheel D-E gears with the two internal wheels. D has 28 teeth and gears with C while E gears with B. The compound wheels revolve freely on a pin which projects from a disc keyed to a shaft A co axial with F. If the Wheels have the same pitch and the shaft makes 800 rpm, what is the speed of shaft F? Sketch the arrangement. | 10M | 3 | 3 |
|----|--|-----|---|---|

UNIT-IV

7. The length of a connecting rod of an engine is 500 mm measured between the centres and its mass is 18 kg. The centre of gravity is 125 mm from the crank pin centre and the crank radius is 100 mm. Determine the dynamically equivalent system keeping one mass at the small end. The frequency of oscillation of the rod, when suspended from the centre of the small end is 43 vibrations per minute. 10M 4 3

(OR)

8. A certain machine requires a torque of $(5000 + 500 \sin \theta)$ N-m to drive it, where θ is the angle of rotation of shaft measured from certain datum. The machine is directly coupled to an engine which produces a torque of $(5000 + 600 \sin 2\theta)$ N-m. The flywheel and the other rotating parts attached to an engine has a mass of 500 kg at a radius of gyration of 0.4 m. If the mean speed is 150 rpm, determine 10M 4 3
- i) the fluctuation of energy
 - ii) the total percentage fluctuation of speed, and
 - iii) the maximum and minimum angular acceleration of the flywheel and the corresponding shaft position.

UNIT-V

9. In a Porter governor, the links and arms are each 30 cm long. Each ball weighs 2.5kg and the central load is 25 kg. For the lowest and highest of the sleeve the arms are inclined 30° and 40° respectively to the vertical. The friction at the governor and the mechanism connecting it to the valve is equivalent to a force of 2.5 kg at the sleeve. Assuming the links and arms intersect on the axis, find 10M 5 3
- i) Height of the governor.
 - ii) The minimum ascending speed
 - iii) The maximum descending speed
 - iv) Range of speed of the governor.

(OR)

10. a) Discuss briefly about isochronism in governors. 2M 5 2
- b) A simple band brake is operated by a lever of length 500 mm. The brake drum has a diameter of 500 mm and the brake band embraces $\frac{5}{8}$ of the circumference. One end of the band is attached to the fulcrum of the lever while the other end is attached to a pin on the lever 100 mm from the fulcrum. If the effort applied to the end of the lever is 2 kN and the coefficient of friction is 0.25, find the maximum braking torque on the drum. 8M 5 3

UNIT-VI

11. a) Discuss the effect of the gyroscopic couple on a Four-wheeled vehicle when taking a turn. 5M 6 2
- b) Describe the Gyroscopic effect on Aero plane 5M 6 2

(OR)

12. The turbine rotor of a ship has a mass of 3500 kg. It has a radius of gyration of 0.45 m and a speed of 3000 rpm. clockwise when looking from stern. Determine the gyroscopic couple and its effect upon the ship 10M 6 3
- i) when the ship is steering to the left on a curve of 100 m radius at a speed of 36km/h.
 - ii) when the ship is steering to the right on a curve of 150 m radius at a speed of 40km/h.

Time: 3 Hours

Max Marks: 60

Answer ONE Question from each Unit

All Questions Carry Equal Marks

All parts of the Question must be answered at one place

	<u>UNIT-I</u>	Marks	CO	Blooms Level
1. a)	Clearly explain what do you understand by GMR and GMD of a transmission line?	5M	CO1	Understand
b)	The three conductors of a 3-Ø line are arranged at the corners of a triangle of sides 2.5m, 3m and 3.5m. Calculate the inductance per km of the line when the conductors are regularly transposed. The diameter of each conductor is 1.24cm	5M	CO1	Applying
	(OR)			
2. a)	Derive an expression for the capacitance of a single-phase transmission line.	5M	CO1	Understand
b)	A single-phase transmission line has two parallel conductors 3 metres apart, radius of each conductor being 1 cm. Calculate the capacitance of the line per km. Given that $\epsilon_0 = 8.854 \times 10^{-12}$ F/m.	5M	CO1	Applying
	(OR)			
3. a)	Find the expression for regulation and efficiency of short transmission line	5M	CO2	Understand
b)	A 3-phase, 50 Hz transmission line 100 km long delivers 20 MW at 0.9 p.f. lagging and at 110 kV. The resistance and reactance of the line per phase per km are 0.2Ω and 0.4Ω respectively, while capacitance admittance is 2.5×10^{-6} siemen/km/phase. Calculate: (i) the current and voltage at the sending end (ii) efficiency of transmission. Use nominal T method	5M	CO2	Applying
	(OR)			
4. a)	Obtain the ABCD parameters of nominal- π circuit of medium transmission line.	5M	CO2	Understand
b)	A 3-phase line delivers 3600 kW at a p.f. 0.8 lagging to a load. If the sending end voltage is 33 kV, determine (i) the receiving end voltage (ii) line current (iii) transmission efficiency. The resistance and reactance of each conductor are 5.31Ω and 5.54Ω respectively	5M	CO2	Applying
	(OR)			
5.	A 3-phase transmission line has the following constants. Resistance/ ph/ km = 0.16 ohm; reactance/ ph/km = 0.25 ohm. Shunt admittance/ph/km = 1.5×10^{-6} mho. Calculate by rigorous method the sending end voltage and current when the line is delivering a load Power-20MW at 0.8 p. f lagging. The receiving end voltage is kept constant at 110 kV.	10M	CO3	Applying
	(OR)			
6. a)	Explain the concepts of incident, reflected and refracted waves in the Transmission lines?	5M	CO3	Understand
b)	Explain the surge impedance with necessary expressions?	5M	CO3	Understand

UNIT-IV

7. a) Explain about travelling or propagation of surges and derive the mathematical expression for it. 5M CO4 Understand
b) Derive the coefficients of reflection and refraction of voltage and current when a transmission line is short circuited 5M CO4 Understand

(OR)

8. a) If a surge of 15kv travels along a cable towards its junction with a overhead line. The inductance and capacitance of a cable and overhead line respectively are 0.3mH, 0.4 μ F and 1.5mH, 0.012 μ F per Km. Determine the voltage rise at the junction due to the surge. 5M CO4 Applying
b) What is Ferranti effect? Deduce a simple expression for the voltage rise of an unloaded line? 5M CO4 Understand

UNIT-V

9. Each line of a 3-phase system is suspended by a string of 3 identical insulators of self-capacitance C farad. The shunt capacitance of connecting metal work of each insulator is 0.2 C to earth and 0.1 C to line. Calculate the string efficiency of the system if a guard ring increases the capacitance to the line of metal work of the lowest insulator to 0.3 C. 10M CO5 Applying

(OR)

10. a) Explain the various methods for improving the string efficiency in a string of insulators.? 5M CO5 Understand
b) Explain the capacitance grading method of cables. 5M CO5 Understand

UNIT-VI

11. a) A certain 3-phase equilateral transmission line has a total corona loss of 53 KW at 106KV and a loss of 98 KW at 110.9 KV. What is the disruptive critical voltage? What is the corona loss at 113KV? 5M CO6 Applying
b) Explain the effect of radio interference on the performance of transmission lines.? 5M CO6 Understand

(OR)

12. a) Derive the expression for sag when the supports are at unequal heights 5M CO6 Understand
b) An overhead transmission line has a span of 220m. The conductor weight is 0.6kg/m. Calculate the maximum sag, if ultimate strength of conductor is 5760kg. Assume factor of safety equal to 2? 5M CO6 Applying

Time: 3 Hours

Max Marks: 60

Answer ONE Question from each Unit

All Questions Carry Equal Marks

All parts of the Question must be answered at one place

UNIT-IMarks CO Blooms
Level

1. a) Define the term system call in the context of operating systems. 5 1 1
- b) Draw the Gantt chart and calculate the average Waiting Time for these processes using the Shortest Remaining Time First (SRTF) algorithm. 5 1 3

Process No	Arrival Time (ms)	Burst Time (ms)
1	20	0
2	25	15
3	10	30
4	15	45

(OR)

2. a) List the types of operating systems and provide a brief description of each type. 5 1 1
- b) Explain the process concept and its significance in operating systems. 5 1 2

UNIT-II

3. a) Explain the concept of process synchronization and why it is necessary in concurrent systems. 5 2 2
- b) Apply the concepts of process synchronization to a classic problem of synchronization, such as the dining philosophers problem. Explain how it can be solved. 5 2 3

(OR)

4. a) Describe the role of synchronization hardware in managing concurrency. What mechanisms are typically used? 5 2 2
- b) Explain monitors for solving critical-section problem. 5 2 3

UNIT-III

5. a) Draw resource allocation graph to illustrate how resources are allocated among processes. How does it help in understanding deadlock? 5 3 3
- b) Explain different characteristics of deadlock condition. 5 3 4

(OR)

6. a) Explain deadlock detection algorithm. 5 3 2
- b) Explain deadlock avoidance techniques. 5 3 4

UNIT-IV

7. a) What is paging? How does page swapping in virtual memory? Explain. 5 4 2
- b) What is thrashing, explain demand paging in detail? 5 4 2

(OR)

8. Consider the following page reference string: 2, 3, 4, 2, 1, 5, 6, 4, 1, 2, 3, 7, 6, 3, 2, 1. Calculate the number of page faults would occur for optimal page replacement algorithm with frame size of 5. 10 4 4

UNIT-V

- | | | | | | |
|-------------|----|--|---|---|---|
| 9. | a) | Define Directory. Determine the most common schemes for defining the logical structure of a directory? | 5 | 5 | 2 |
| | b) | Write different types of files and also explain file attributes. | 5 | 5 | 2 |
| (OR) | | | | | |
| 10. | a) | What are the allocation methods of a disk space? | 5 | 5 | 2 |
| | b) | List various layers of a file system. | 5 | 5 | 2 |

UNIT-VI

- | | | | | | |
|-------------|----|--|----|---|---|
| 11. | a) | Explain the key components of mass-storage structures and their significance in a computer system. | 5 | 6 | 2 |
| | b) | Demonstrate how block devices differ from character devices in terms of data storage and access. Provide examples of each type. | 5 | 6 | 3 |
| (OR) | | | | | |
| 12. | | Given a moving-head disk with 200 tracks (numbered 0 to 199), the disk head is currently at track 120 after completing a request at track 125. The queue of requests is in FIFO order: 86, 147, 91, 177, 94, 150, 102, 175, and 130. Calculate the total head movement required to satisfy these requests using the First-Come, First-Served (FCFS), Scan, and Shortest Seek Time First (SSTF), C-SCAN (Circular Scan), and Look disk scheduling algorithms. | 10 | 6 | 3 |

Time: 3 Hours

Max Marks: 60

Answer ONE Question from each Unit

All Questions Carry Equal Marks

All parts of the Question must be answered at one place

UNIT-I

1. a) Explain the terms used to measure the performance of an algorithm
- b) Prove that $2n^2 + 2n + 1 = O(n^2)$

Marks	CO	Blooms Level
5	CO1	K2
5	CO1	K2

(OR)

2. a) Differentiate between Big oh and omega notation with example.
- b) Write an algorithm for calculating the factorial of a given number.

5	CO1	K2
5	CO1	K2

UNIT-II

3. Illustrate the tracing of quick sort algorithm for the following set of numbers: (24, 9, 29, 14, 19, 27).

10	CO2	K3
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(OR)

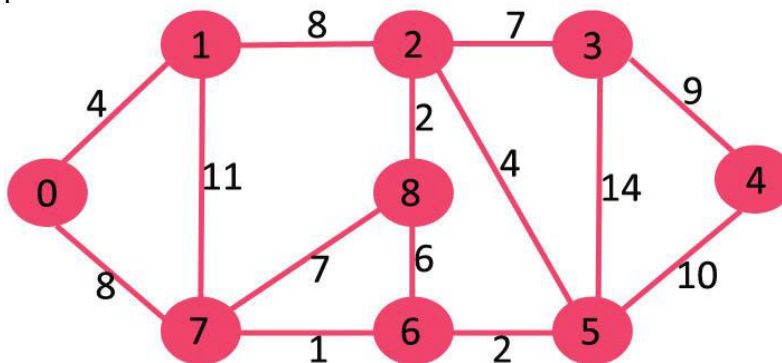
4. a) Write an algorithm for merge sort.
- b) Prove that the time complexity of merge sort is $O(n \log n)$

5	CO2	K2
5	CO2	K2

UNIT-III

5. State single source shortest path algorithm (Dijkstra's algorithm). Find the shortest paths from the source to all vertices in the given graph.

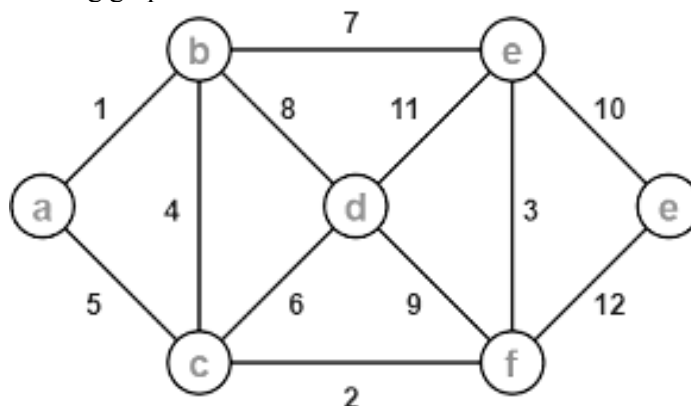
10	CO3	K3
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(OR)

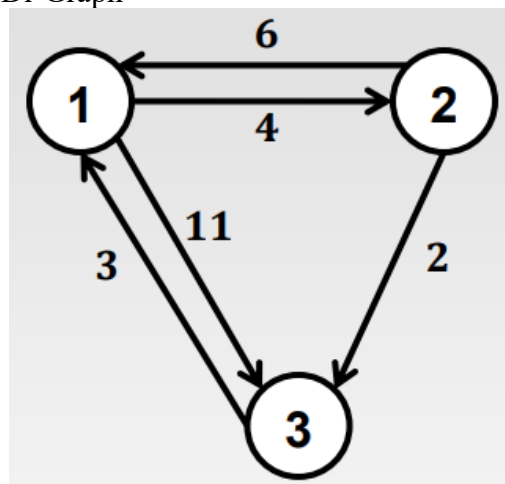
6. Explain Prim's algorithm to find the minimum cost spanning tree. Apply it to the following graph

10	CO3	K3 K3
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UNIT-IV

- | | | | | |
|----|---|----|-----|----|
| 7. | Define All Pairs Shortest Path Problem (APSP)? Solve the ASP for the following Di-Graph | 10 | CO4 | K3 |
|----|---|----|-----|----|



(OR)

- | | | | | |
|----|--|----|-----|----|
| 8. | Find an optimal solution for the dynamic programming 0/1 knapsack instance for $n=3$, $m=6$, profits are $(p_1, p_2, p_3) = (1, 2, 5)$, weights are $(w_1, w_2, w_3) = (2, 3, 4)$. | 10 | CO4 | K3 |
|----|--|----|-----|----|

UNIT-V

- | | | | | |
|----|---|---|-----|----|
| 9. | a) Explain how the Hamiltonian cycle's problem is solved by using the backtracking concept. | 5 | CO5 | K2 |
| | b) Explain the Graph – coloring problem. And draw the state space tree for $m=3$ colors $n=4$ vertices graph. | 5 | CO5 | K2 |

(OR)

- | | | | | |
|-----|---|---|-----|----|
| 10. | a) Illustrate the state space tree to find the positions of 4 queens on a 4X4 chessboard. | 5 | CO5 | K3 |
| | b) Find all sum of subsets for $n=4$, $(w_1, w_2, w_3, w_4) = (11, 13, 24, 7)$ and $M=31$. Draw the portion of the state space tree | 5 | CO5 | K3 |

UNIT-VI

- | | | | | |
|-----|--|---|-----|----|
| 11. | a) Write Non-deterministic algorithm for Searching an element in a list. | 5 | CO6 | K2 |
| | b) Differentiate between NP-complete and NP-Hard. | 5 | CO6 | K2 |
- (OR)
- | | | | | |
|-----|--|---|-----|----|
| 12. | a) Explain about P, NP, NP-Complete and NP-Hard problems with examples and represent their relation. | 5 | CO6 | K2 |
| | b) State and describe Cook's theorem | 5 | CO6 | K2 |