

Answer ONE Question from each Unit

All Questions Carry Equal Marks

All parts of the Question must be answered at one place

		Marks	CO	Blooms Level																				
<u>UNIT-I</u>																								
1.	a) Discuss the architecture of a three tier data warehouse with a neat sketch.	7	1	K2																				
	b) Discuss facts constellation with an example.	7	1	K2																				
(OR)																								
2.	a) Define a Data Warehouse. Discuss the characteristics of a Data Warehouse.	7	1	K2																				
	b) Discuss ROLAP, MOLAP & HOLAP Servers in detail.	7	1	K2																				
<u>UNIT-II</u>																								
3.	a) Discuss the challenges that motivated the development of data mining.	7	2	K2																				
	b) Discuss sampling in detail.	7	2	K2																				
(OR)																								
4.	a) Discuss Dimensionality Reduction in detail.	7	2	K2																				
	b) Discuss the various types of data on which data mining can be performed.	7	2	K2																				
<u>UNIT-III</u>																								
5.	a) List the various measures for selecting the best split in a decision tree. Discuss any one measure in detail.	7	3	K2																				
	b) Discuss cross validation and bootstrap methods for evaluating the performance of the classifier	7	3	K2																				
(OR)																								
6.	a) Discuss Naive Bayes classifier in detail.	7	3	K2																				
	b) Discuss general approach to solving a classification problem.	7	3	K2																				
<u>UNIT-IV</u>																								
7.	Discuss FP Growth algorithm with the following example. Assume the minimum support count to be 3.	14	4	K3																				
	<table><tr><th><i>TID</i></th><th><i>List of item_IDs</i></th></tr><tr><td>T100</td><td>I1, I2, I5</td></tr><tr><td>T200</td><td>I2, I4</td></tr><tr><td>T300</td><td>I2, I3</td></tr><tr><td>T400</td><td>I1, I2, I4</td></tr><tr><td>T500</td><td>I1, I3</td></tr><tr><td>T600</td><td>I2, I3</td></tr><tr><td>T700</td><td>I1, I3</td></tr><tr><td>T800</td><td>I1, I2, I3, I5</td></tr><tr><td>T900</td><td>I1, I2, I3</td></tr></table>	<i>TID</i>	<i>List of item_IDs</i>	T100	I1, I2, I5	T200	I2, I4	T300	I2, I3	T400	I1, I2, I4	T500	I1, I3	T600	I2, I3	T700	I1, I3	T800	I1, I2, I3, I5	T900	I1, I2, I3			
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T900	I1, I2, I3																							
(OR)																								
8.	a) Discuss the major subtasks adopted by Association Rule Mining in identifying the frequent item sets.	7	4	K2																				
	b) Discuss the various techniques used to improve the efficiency of Apriori Algorithm.	7	4	K2																				
<u>UNIT-V</u>																								
9.	a) Discuss Basic Agglomerative Clustering algorithm in detail.	7	5	K2																				
	b) Discuss any two types of clusters in detail.	7	5	K2																				
(OR)																								
10.	a) Discuss bisecting K-means algorithm in detail.	7	5	K2																				
	b) Briefly discuss the key issues in Hierarchical Clustering	7	5	K2																				

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	<u>UNIT-I</u>	Marks	CO	Blooms Level
1.	a) Explain the significance of geology in civil engineering structures	7	1	K2
	b) Explain the properties of calcite and gypsum	7	1	K2
	(OR)			
2.	What are the physical properties of minerals used in the identification of a mineral	14	1	K2
	<u>UNIT-II</u>			
3.	a) Explain different structures of sedimentary rock	7	2	K2
	b) Explain the properties of granite and gneiss	7	2	K2
	(OR)			
4.	a) Explain rock cycle	7	2	K2
	b) Explain the properties of basalt and gabbaro	7	2	K2
	<u>UNIT-III</u>			
5.	a) What is unconformity and types	7	3	K2
	b) What is fault and different types of fault	7	3	K2
	(OR)			
6.	a) Explain Physical weathering in detail	7	3	K2
	b) Explain the geological classification of soils.	7	3	K2
	<u>UNIT-IV</u>			
7.	Explain the geological considerations for a successful dam	14	4	K2
	(OR)			
8.	a) What are the different types of dams	7	4	K2
	b) Explain the purpose of tunneling	7	4	K2
	<u>UNIT-V</u>			
9.	a) Explain the causes and effects of an earthquake	10	5	K2
	b) Explain the Richter scale to measure the earthquake	4	5	K2
	(OR)			
10.	a) Explain the measures to be considered to mitigate landslides.	7	5	K2
	b) Illustrate with neat sketches the Electrical Resistivity Method.	7	5	K2

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

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		Marks	CO	Blooms Level
<u>UNIT-I</u>				
1.	a) How the Database Systems are different from file systems?	6	1	K2
	b) Explain the types of Data Models and Levels of abstraction in DBMS.	8	1	K2
(OR)				
2.	a) Explain in detail about Database System Architecture with a neat diagram	9	1	K2
	b) Describe DML commands. Use all commands and apply them in one table as Student.	5	1	K2
<u>UNIT-II</u>				
3.	a) Draw ER Diagram for Bank Management System?	9	2	K3
	b) What is Cardinality? Explain Mapping Cardinalities in the ER Model with examples.	5	2	K2
(OR)				
4.	a) What is a Key? Explain various types of keys in the Relational Database Model.	7	2	K2
	b) Explain Selection, Projection, and Set operations of relational algebra with examples.	7	2	K2
<u>UNIT-III</u>				
5.	a) Explain in detail about Nested Queries in SQL with suitable examples.	7	3	K3
	b) What are Triggers? Explain various types of Triggers.	7	3	K2
(OR)				
6.	a) Explain in detail about five Aggregate Operators in SQL with suitable examples.	10	3	K3
	b) Define Active Databases? Describe the features of active Databases with a neat diagram.	4	3	K2
<u>UNIT-IV</u>				
7.	a) Explain various types of Functional Dependencies Concepts with suitable examples.	8	4	K3
	b) Write the properties and its types of Decomposition?	6	4	K2
(OR)				
8.	a) What is Normalization? Explain various types of Normal forms with examples.	10	4	K3
	b) What is Transaction? Explain ACID properties of Transaction.	4	4	K2
<u>UNIT-V</u>				
9.	a) What is Indexing? Explain about Hash Based Indexing and Tree Based Indexing with suitable examples.	8	5	K3
	b) Explain Shadow paging in detail and also write its advantages.	6	5	K2
(OR)				
10.	a) Describe the structure of B+ tree and give the algorithm for search in the B+ tree with example?	10	5	K3
	b) List out the ways for Recovery with concurrent transactions?	4	5	K2

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		Marks	CO	Blooms Level
<u>UNIT-I</u>				
1.	a) Draw and explain the output of a low pass RC circuit for step input. Define the terms rise time and time constant from the output waveform.	7M	CO1	L2
	b) State and prove the clamping circuit theorem.	7M	CO1	L2
(OR)				
2.	a) A 20 Hz square wave is fed to a high pass RC circuit. Calculate and plot the output waveforms if the lower 3 dB frequency is (i) 0.3 Hz (ii) 3 Hz and (iii) 30 Hz.	7M	CO1	L2
	b) Describe the functioning of 2 level diode clipper with necessary waveforms.	7M	CO1	L2
<u>UNIT-II</u>				
3.	a) Draw and explain block diagram of an op-amp.	7M	CO2	L2
	b) Define input bias current. What is the effect of it on output voltage? Explain how it can be compensated in op-amp circuits?	7M	CO2	L2
(OR)				
4.	a) Explain the operation of inverting amplifier.	7M	CO2	L2
	b) List the ideal characteristics of op-amp. Draw the equivalent circuit of op-amp.	7M	CO2	L2
<u>UNIT-III</u>				
5.	a) Explain the operation of Wien bridge oscillator using IC 741.	7M	CO3	L1
	b) Define a lossy integrator. Explain the operation of a practical integrator with IC 741.	7M	CO3	L2
(OR)				
6.	a) Illustrate the current to voltage and voltage to current converters using IC 741.	7M	CO3	L2
	b) Design an inverting and non-inverting averaging circuit using op-amp.	7M	CO3	L2
<u>UNIT-IV</u>				
7.	a) Draw the functional block diagram of 555 timer.	7M	CO4	L1
	b) Explain the operation of Voltage Controlled Oscillator with the help of neat sketches.	7M	CO4	L2
(OR)				
8.	a) Design a wide band reject filter with $f_l = 200$ Hz, $f_h = 1$ kHz, and a pass band gain of 6.	7M	CO4	L1
	b) Design a first order active high pass filter with cut off frequency of 1KHz and pass band gain of 2.	7M	CO4	L2
<u>UNIT-V</u>				
9.	a) Explain successive approximation ADC with neat diagrams.	7M	CO5	L1
	b) List out the drawbacks of weighted resistor type DAC and explain how these can be avoided.	7M	CO5	L2
(OR)				
10.	a) Explain dual slope ADC with neat diagrams.	7M	CO5	L1
	b) Explain the R-2R ladder DAC with neat sketches.	7M	CO5	L1

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	<u>UNIT-I</u>	Marks	CO	Blooms Level
1.	a) What are the three essential torques required in measuring instruments and explain in detail.	(7M)	CO1	L2
	b) How is the current range of a PMMC instrument extended with the help of shunt resistor? Derive the expression for shunt resistor	(7M)	CO1	L3
	(OR)			
2.	a) Derive the equation for deflection if the instruments are spring controlled in PMMC instrument	(7M)	CO1	L2
	b) A moving coil instrument has a resistance of $5\ \Omega$ and gives a full scale deflection of 10 mv. Show how the instrument may be used to measure (a) voltage up to 50 v, and (b) current up to 10 A.	(7M)	CO1	L3
	<u>UNIT-II</u>			
3.	a) What are the Instrument transformers and represent these devices with neat sketch and also write the uses of instrument transformers?	(7M)	CO2	L2
	b) Explain the construction, principle and operation of single phase electro dynamometer type watt meter and derive its torque equation	(7M)	CO2	L2
	(OR)			
4.	a) Derive the expressions for the phase angle errors of a current transformer with a neat phasor diagram.	(7M)	CO2	L2
	b) An electro-dynamometer-type wattmeter has a current coil with a resistance of $0.1\ \Omega$ and a pressure coil with resistance of $6.5\ k\Omega$. Calculate the percentage errors while the meter is connected as (i) current coil to the load side, and (ii) pressure coil to the load side. The load is specified as (a) 12 A at 250 V with unity power factor, and (b) 12 A at 25 V with 0.4 lagging power factor.	(7M)	CO2	L3

UNIT-III

5. a) Explain about Single phase electro-dynamometer type power factor meter? (7M) CO3 L2
b) Explain about Single phase induction type energy meter, deriving its torque equation? (7M) CO3 L2

(OR)

6. a) What is the effect of friction in induction-type energy meters? How is it overcome? What is creeping error? How is it overcome? (7M) CO3 L1
b) A 220 V, 10 A dc energy meter is tested for its name plate ratings. Resistance of the pressure coil circuit is $8000\ \Omega$ and that of current coil itself is $0.12\ \Omega$. Calculate the energy consumed when testing for a period of 1 hour with
(a) Direct loading arrangement
(b) Phantom loading with the current coil circuit excited by a separate 9 V battery (7M) CO3 L2

UNIT-IV

7. a) Describe the circuit of Kelvin double bridge used for measurement of low resistance. Derive the conditions for balance (7M) CO4 L2
b) Explain with a neat circuit the working of Wein's bridge for measurement of capacitance and frequency of the supply voltage and derive the expression for unknown capacitance and frequency (7M) CO4 L2

(OR)

8. a) Describe the working of a low voltage Schering bridge. Derive the equations for unknown capacitance under conditions of balance (7M) CO4 L2
b) Construct the circuit Maxwell's bridge and develop relation for unknown inductance (7M) CO4 L2

UNIT-V

9. a) Derive an equation for gauge factor in strain gauge. (7M) CO5 L2
b) What are thermistors? Explain the working, construction and applications of thermistors. Compare resistance temperature characteristics of a typical thermistor and platinum. (7M) CO5 L2

(OR)

10. a) With help of a neat diagram, explain the principle and working of LVDT (7M) CO5 L2
b) What is the necessity of Standardization? Discuss in detail how the potentiometer can be standardized (7M) CO5 L2

**Artificial Intelligence
(INFORMATION TECHNOLOGY)****Time: 3 Hours****Max Marks: 70**

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		<u>UNIT-I</u>	Marks	CO	BTL
1.	a)	Explain intelligent agents? Explain the different types of agents used in AI with examples.	7	1	K2
	b)	Compare goal-based agents and utility-based agents with examples and identify the situations where a utility-based agent is preferable.	7	1	K2
		(OR)			
2.	a)	Describe the Tic-Tac-Toe problem in AI. How does AI approach solving this game using search techniques?	7	1	K2
	b)	Analyze how the nature of the environment influences the design of intelligent agents.	7	1	K3
		<u>UNIT-II</u>			
3.	a)	Explain the working of the Hill Climbing algorithm with an example.	7	2	K2
	b)	A robot is in a 5x5 grid, starting at (0,0) and needs to reach (4,4) while avoiding obstacles at (2,2), (3,1). Explain how A* search finds the shortest path using heuristic values like Manhattan distance.	7	2	K3
		(OR)			
4.	a)	Describe AO search and its application in solving AND-OR graphs	7	2	K2
	b)	Discuss the roll of Alpha-Beta pruning in optimizing game playing algorithm.	7	2	K3
		<u>UNIT-III</u>			
5.	a)	Explain the Min-Max algorithm and how it is used in adversarial search.	7	3	K2
	b)	Formulate the Sudoku puzzle as a CSP and solve a 4x4 Sudoku using backtracking.	7	3	K3
		(OR)			
6.	a)	Explain the backtracking approach for solving CSPs and its advantages.	7	3	K2
	b)	Analyze the benefits and drawbacks of backtracking methods and heuristic methods of solving Constraint Satisfaction Problems (CSPs).	7	3	K3
		<u>UNIT-IV</u>			
7.	a)	Given a training dataset, determine the most general and most specific hypotheses using Candidate Elimination.	7	4	K2
	b)	Evaluate the role of Bayesian inference in decision-making under uncertainty and compare it with non-probabilistic methods.	7	4	K2
		(OR)			
8.	a)	Construct a rule-based system for diagnosing a cold, flu, or allergies based on symptoms and represent the knowledge accordingly.	7	4	K2
	b)	Compare Find-S and Candidate Elimination algorithms in terms of efficiency and applicability to noisy data.	7	4	K2
		<u>UNIT-V</u>			
9.	a)	What is knowledge acquisition in expert systems? Explain its importance.	7	5	K2
	b)	Evaluate the impact of expert systems in medical diagnosis and suggest improvements for better accuracy.	7	5	K3
		(OR)			
10.	a)	Explain heuristics in expert systems and their significance in problem-solving.	7	5	K2
	b)	Analyze the advantages and limitations of expert systems in handling complex real-world problems.	7	5	K3

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UNIT-I

1. A steel member is subjected to a tensile stress of 80 MPa and a compressive stress of 50 MPa in two mutually perpendicular directions. Additionally, a shear stress of 30 MPa acts on the plane.
i) Determine the principal stresses and their directions.
ii) Construct Mohr's circle and find the maximum shear stress.

Marks	CO	BTL
14 M	CO1	K3

(OR)

2. A hollow steel shaft of 50 mm outer diameter and 30 mm inner diameter is subjected to a torque of 150 N-m and a bending moment of 120 N-m. i) Determine the maximum normal stress and shear stress in the shaft. ii) Analyze the shaft using the maximum distortion energy theory of failure.

14 M	CO1	K3
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UNIT-II

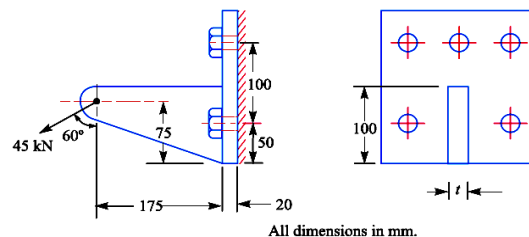
3. A circular bar of 500 mm length is supported freely at its two ends. It is acted upon by a central concentrated cyclic load having a minimum value of 20 kN and a maximum value of 50 kN. Determine the diameter of bar according to good man and soderberg failure criteria, by taking a factor of safety of 1.5, size effect of 0.85, surface finish factor of 0.9. The material properties of bar are given by : ultimate strength of 650 MPa, yield strength of 500 MPa and endurance strength of 350 MPa.

14 M	CO2	K3
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(OR)

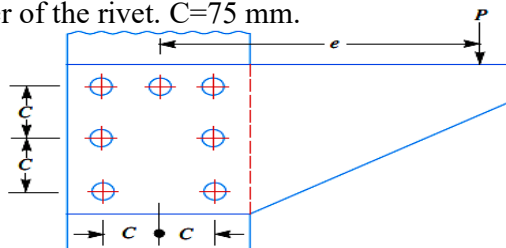
4. A bracket, as shown in Fig. is fixed to a vertical steel column by means of five standard bolts. Determine the diameter of the fixing bolts, Assume safe working stresses of 70 MPa in tension and 50 MPa in shear.

14 M	CO2	K3
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**UNIT-III**

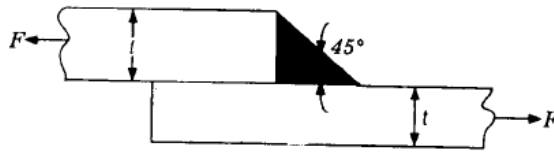
5. A bracket is riveted to a column by 6 rivets of equal size as shown in Fig. It carries a load of 100 kN at a distance of 250 mm from the column. If the maximum shear stress in the rivet is limited to 63 MPa, Find the diameter of the rivet. $C=75$ mm.

14 M	CO3	K3
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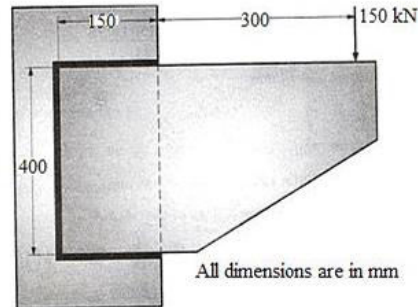


(OR)

6. a) Two metal plates of thickness 't' and width 'w' are joined by a fillet weld of 45° as shown in given figure. When subjected to a pulling force 'F', Evaluate the stress induced in the weld. 4 M CO3 K3



- b) A bracket plate carrying a load of 150 kN is to be welded to a column as shown in figure find the size of the weld, if the allowable shear stress in the weld is 120MPa. 10 M CO3 K3



UNIT-IV

7. A Steel solid shaft transmitting 15 KW at 200 rpm is supported on two bearings 750 mm apart and has two gears keyed to it. The pinion having 30 teeth of 5mm module is located 100mm to the left of the right hand bearing, and delivers power horizontally to the right. The gear having 100 teeth of 5 mm module is located 150 mm to the right of the left hand bearing and receiver power in a vertical direction from below. Using an allowable stress of 55 MN/m² in shear, determine the diameter of the shaft. 14 M CO 4 K3

(OR)

8. a) Explain the design procedure of keys. 4M CO4 K2
b) Design a cast iron protective type flange coupling, to transmit 15 kW at 900 r.p.m. from an electric motor to a compressor. The service factor may be assumed as 1.35. The following permissible stresses may be used: Shear stress for shaft, bolt and key material = 40 MPa Crushing stress for bolt and key = 80 MPa Shear stress for cast iron = 8 MPa. 10 M CO 4 K3

UNIT-V

9. Design and draw a knuckle joint to transmit 100 kN. The design stresses may be taken as 75 MPa in tension, 60 MPa in shear and 150 MPa in compression. Draw a neat sketch of the joint designed. 14 M CO 5 K3

(OR)

10. A concentric spring for an aircraft engine valve is to exert a maximum force of 5000 N under an axial deflection of 40 mm. Both the springs have free length, same solid length and are subjected to equal maximum shear stress of 850 MPa. If the spring index for both the springs is 6, find (a) the load shared by each spring (b) the main dimensions of both the springs, and (c) the number of active coils in each spring. Assume $G = 80 \text{ kN/mm}^2$ and diametral clearance to be equal to the difference between the wire diameter. 14 M CO 5 K3