

PSG COLLEGE OF ARTS & SCIENCE
(AUTONOMOUS)
MSc DEGREE EXAMINATION DECEMBER 2024
(First Semester)

Branch - COMPUTER SCIENCE

SOFT COMPUTING

Time: Three Hours

Maximum: 75 Marks

SECTION-A (10 Marks)

Answer ALL questions

ALL questions carry EQUAL marks (10 × 1 = 10)

Module No.	Question No.	Question	K Level	CO
1	1	Which of the following is NOT an example of a soft computing technique? A) Fuzzy logic B) Genetic algorithms C) Neural networks D) Binary search algorithm	K1	CO1
	2	Which of the following is a commonly used activation function in neural networks? A) Logarithmic function B) Rectified Linear Unit (ReLU) C) Square root function D) Division function	K2	CO1
2	3	What is a major application of Recurrent Neural Networks (RNNs)? A) Image recognition B) Time-series prediction and natural language processing C) Exact arithmetic calculations D) Static data classification	K1	CO2
	4	Which of the following is an advantage of reinforcement learning? A) It always converges to the best solution quickly B) It allows an agent to learn by interacting with an environment and receiving feedback in the form of rewards or penalties C) It does not require the exploration of new strategies D) It is only useful for supervised learning problems	K2	CO2
3	5	What is the main inspiration behind Genetic Algorithms? A) Human brain function B) Biological evolution and natural selection C) Classical physics D) Quantum mechanics	K1	CO3
	6	Which of the following is NOT a genetic operator in a genetic algorithm? A) Mutation B) Crossover C) Selection D) Normalization	K2	CO3
4	7	In fuzzy logic, what does the term "fuzzification" refer to? A) Converting a fuzzy set into a classical set B) Defining crisp inputs as fuzzy variables with degrees of membership C) Applying exact logic to approximate values D) Performing arithmetic operations on fuzzy numbers	K1	CO4
	8	Which of the following is an application of fuzzy logic? A) Exact arithmetic calculations B) Control systems in washing machines and air conditioners C) Binary search algorithms D) Matrix multiplication	K2	CO4
5	9	How is a fuzzy relation different from a crisp relation? A) A fuzzy relation allows for partial degrees of membership between 0 and 1, while a crisp relation only allows 0 or 1. B) A fuzzy relation is defined for continuous data, while a crisp relation is defined for discrete data. C) A fuzzy relation operates only in higher dimensions. D) A fuzzy relation uses only binary values for the membership function.	K1	CO5

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	10	What is the purpose of a fuzzy rule-based system in decision making? A) To model binary relationships between variables B) To handle imprecise information and make approximate decisions based on fuzzy logic rules C) To create linear relationships between variables D) To perform exact arithmetic calculations	K2	CO5
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SECTION - B (35 Marks)Answer **ALL** questions**ALL** questions carry **EQUAL** Marks (5 × 7 = 35)

Module No.	Question No.	Question	K Level	CO
1	11.a.	Compare and contrast hard computing and soft computing. Discuss the advantages and limitations of each approach.	K3	CO1
		(OR)		
	11.b.	Explain the different applications of soft computing techniques in real-world scenarios. How do these techniques help in handling uncertainty and imprecision?		
2	12.a.	Explain artificial neural network architecture. Discuss its applications.	K4	CO2
		(OR)		
	12.b.	Write about Hebbian learning rule and Describe the delta learning rule.		
3	13.a.	What do you understand by Fitness function? Mention the importance of Fitness function in Genetic algorithm. How can Fitness functions be found for any optimization problem?	K5	CO3
		(OR)		
	13.b.	Explain following operators: Selection operator, Crossover operator, Uniform crossover, matrix crossover.		
4	14.a.	Define fuzzy sets and explain how they differ from classical sets. Illustrate your explanation with examples of fuzzy set membership functions.	K4	CO4
		(OR)		
	14.b.	What are the key applications of fuzzy logic in various industries? Choose at least two examples and explain how fuzzy logic is applied to solve practical problems in those fields.		
5	15.a.	Explain the process of fuzzification and defuzzification in fuzzy logic systems. Why are these processes crucial for the operation of fuzzy systems, and how do they influence the final decision or output?	K6	CO5
		(OR)		
	15.b.	What are the main differences between crisp and fuzzy relations when modeling real-world problems? Give examples where fuzzy relations are more suitable than crisp relations in solving practical problems.		

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SECTION -C (30 Marks)

Answer ANY THREE questions

ALL questions carry EQUAL Marks (3 × 10 = 30)

Module No.	Question No.	Question	K Level	CO
1	16	In a self-driving car system, explain how soft computing techniques can be applied to make decisions in uncertain and dynamic environments, compared to hard computing techniques. Analyze the benefits and challenges of using soft computing over hard computing in this context.	K3	CO1
2	17	In a handwritten digit recognition system, analyze how the architecture of an artificial neural network affects the system's ability to accurately classify digits. Explain how layers and activation functions contribute to the performance of the system.	K4	CO2
3	18	Explain how a genetic algorithm can be applied to a problem and analyze how the different components of GA (selection, crossover, mutation) contribute to finding the optimal solution to your problem.	K5	CO3
4	19	A company is designing a fuzzy logic-based washing machine that automatically adjusts washing time based on the dirtiness of clothes and the load size. Explain how fuzzy logic and fuzzy sets can be applied to this problem, and create a set of fuzzy rules to manage the washing time.	K4	CO4
5	20	Consider a fuzzy rule-based system used in an automatic climate control system for a smart home. Formulate a set of fuzzy rules and explain how the system uses fuzzification and defuzzification to maintain the desired room temperature.	K6	CO5

Z-Z-Z

END

PSG COLLEGE OF ARTS & SCIENCE
(AUTONOMOUS)

MSc DEGREE EXAMINATION DECEMBER 2024
(Second Semester)

Branch- COMPUTER SCIENCE

STATISTICS FOR COMPUTER SCIENCE

Time: Three Hours

Maximum: 75 Marks

SECTION-A (10 Marks)

Answer ALL questions

ALL questions carry EQUAL marks

(10 × 1 = 10)

Module No.	Question No.	Question	K Level	CO
1	1	In the regression line $Y = \alpha + \beta X$, β is called the: (a) slope of the line (b) intercept of the line (c) neither (a) nor (b) (d) both (a) and (b)	K1	CO1
	2	In a regression line of Y on X, the variable X is known as: (a) independent variable (b) regressor (c) explanatory variable (d) all the above	K2	CO1
2	3	The limiting relative frequency approach of probability is known as: (a) statistical probability (b) classical probability (c) mathematical probability (d) all the above	K1	CO2
	4	For any two events A and B, $P(A-B)$ is equal to: (a) $P(A) - P(B)$ (b) $P(B) - P(A)$ (c) $P(B) - P(AB)$ (d) $P(A) - P(AB)$	K2	CO2
3	5	A family of parametric distribution in which mean is equal to variance is: (a) binomial distribution (b) exponential distribution (c) normal distribution (d) Poisson distribution	K1	CO3
	6	X is a binomial variate with parameter n and p. if $n=1$, the distribution of X reduces to: (a) Poisson distribution (b) Binomial distribution itself (c) Bernoulli distribution (d) discrete uniform distribution	K2	CO3
4	7	Power of a test is related to: (a) type I error (b) type II error (c) types I and II errors both (d) none of the above	K1	CO4
	8	Paired t-test is applicable when the observations in the two samples are: (a) paired (b) correlated (c) equal in number (d) all the above	K2	CO4
5	9	Co-efficient of contingency is calculated when: (a) the attributes are independent (b) the attributes are associated (c) both (a) and (b) (d) neither (a) and (b)	K1	CO5
	10	Analysis of variance utilizes: (a) F-test (b) chi-square test (c) Z-test (d) t-test	K2	CO5

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SECTION - B (35 Marks)

Answer ALL questions

ALL questions carry EQUAL Marks

(5 × 7 = 35)

Module No.	Question No.	Question	K Level	CO																					
1	11.a.	The following data <table><tr><td></td><td>X</td><td>Y</td></tr><tr><td>Arithmetic Mean</td><td>36</td><td>85</td></tr><tr><td>Standard Deviation</td><td>11</td><td>8</td></tr><tr><td>Correlation coefficient</td><td>0.66</td><td></td></tr></table> (i) Find the two regression equations (ii) Estimate the value of X when Y=75		X	Y	Arithmetic Mean	36	85	Standard Deviation	11	8	Correlation coefficient	0.66		K3	CO1									
			X	Y																					
		Arithmetic Mean	36	85																					
Standard Deviation	11	8																							
Correlation coefficient	0.66																								
(OR)																									
11.b.	Distinguish clearly between 'correlation' and 'Regression' analysis.																								
2	12.a.	State the axioms of probability.	K3	CO2																					
	(OR)																								
	12.b.	Find the probability that a non-leap year selected at random will contain either 53 Sundays or 53 Mondays.																							
3	13.a.	A continuous random variable with pdf given by $f(x)=3x^2$, $0 < x < 1$. Find Mean and Variance.	K4	CO3																					
	(OR)																								
	13.b.	Distinguish between discrete random variable and continuous random variable.																							
4	14.a.	In a village 'A' out of random sample of 1000 persons 100 were found to be vegetarians while in another village 'B' out of 1500 persons 180 were found to be vegetarians. Do you find a significant difference in the found habits of the people of the two villages?	K4	CO4																					
	(OR)																								
	14.b.	State the procedure followed in testing a hypothesis. What are Type I and Type II errors in tests in hypothesis.																							
5	15.a.	From the following table test whether the colour of the son's eye is associated with that of the father <table><tr><td rowspan="4">Eye colour in father</td><td></td><td colspan="3">Eye colour of sons</td></tr><tr><td></td><td>Not light</td><td>Light</td><td>Total</td></tr><tr><td>Not light</td><td>230</td><td>148</td><td>378</td></tr><tr><td>Light</td><td>151</td><td>471</td><td>622</td></tr><tr><td>Total</td><td>381</td><td>619</td><td>1000</td></tr></table> You may use the following value of χ^2 0.05=3.84 for V=1, 5.99 for V=2, 7.82 for V=3.	Eye colour in father		Eye colour of sons				Not light	Light	Total	Not light	230	148	378	Light	151	471	622	Total	381	619	1000	K5	CO5
		Eye colour in father			Eye colour of sons																				
					Not light	Light	Total																		
Not light	230			148	378																				
Light	151		471	622																					
Total	381	619	1000																						
(OR)																									
15.b.	1000 families were selected at random in a city to test the belief that high income families usually send their children to public schools and the low income families often send their children to government schools. The following results were obtained <table><tr><td></td><td colspan="3">School</td></tr><tr><td>Income</td><td>public</td><td>Govt</td><td>Total</td></tr><tr><td>Low</td><td>370</td><td>430</td><td>800</td></tr><tr><td>High</td><td>130</td><td>70</td><td>200</td></tr><tr><td>Total</td><td>500</td><td>500</td><td>1000</td></tr></table> Test whether income and type of schooling are independent.		School			Income	public	Govt	Total	Low	370	430	800	High	130	70	200	Total	500	500	1000				
	School																								
Income	public	Govt	Total																						
Low	370	430	800																						
High	130	70	200																						
Total	500	500	1000																						

SECTION -C (30 Marks)

Answer ANY THREE questions

ALL questions carry EQUAL Marks (3 × 10 = 30)

Module No.	Question No.	Question	K Level	CO																									
1	16	Calculate the coefficient of correlation from the following data. <table><tr><td>X</td><td>128</td><td>140</td><td>125</td><td>121</td><td>122</td><td>146</td></tr><tr><td>Y</td><td>87</td><td>96</td><td>101</td><td>93</td><td>99</td><td>140</td></tr></table>	X	128	140	125	121	122	146	Y	87	96	101	93	99	140	K4	CO1											
X	128	140	125	121	122	146																							
Y	87	96	101	93	99	140																							
2	17	State and prove Baye's theorem.	K4	CO2																									
3	18	A random variable has the following probability distribution. <table><tr><td>Values of X</td><td>0</td><td>1</td><td>2</td><td>3</td><td>4</td><td>5</td><td>6</td><td>7</td><td>8</td></tr><tr><td>P(x)</td><td>a</td><td>3a</td><td>5a</td><td>7a</td><td>9a</td><td>11a</td><td>13a</td><td>15a</td><td>17a</td></tr></table> (i) find the value of 'a' (ii) Evaluate (a) $P(X<3)$ (b) $P(X\leq3)$ (c) $P(X>7)$ (d) $P(2\leq X\leq5)$	Values of X	0	1	2	3	4	5	6	7	8	P(x)	a	3a	5a	7a	9a	11a	13a	15a	17a	K4	CO3					
Values of X	0	1	2	3	4	5	6	7	8																				
P(x)	a	3a	5a	7a	9a	11a	13a	15a	17a																				
4	19	The heights of six randomly chosen soldiers are in inches: 76,70,68,69, 69, and 68. Those of 6 randomly chosen sailors are 68, 64, 65, 69, 72, 64. Discuss in the light of these data throw on the suggestions that soldiers are, on the average, taller than sailors. Use t-test.	K5	CO4																									
5	20	Perform Two-way ANOVA for the data given below <table><tr><td>plots of Land</td><td colspan="4">Treatment</td></tr><tr><td></td><td>A</td><td>B</td><td>C</td><td>D</td></tr><tr><td>i</td><td>38</td><td>40</td><td>41</td><td>39</td></tr><tr><td>II</td><td>45</td><td>42</td><td>49</td><td>36</td></tr><tr><td>iii</td><td>40</td><td>38</td><td>42</td><td>42</td></tr></table> Use coding method, subtracting 40 from the given number.	plots of Land	Treatment					A	B	C	D	i	38	40	41	39	II	45	42	49	36	iii	40	38	42	42	K5	CO5
plots of Land	Treatment																												
	A	B	C	D																									
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iii	40	38	42	42																									

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