016402

May 2024

B.Tech. (CE(DS)) (Fourth Semester)
Statistics-II (BSC-DS-401)

Time : 3 Hours] [*Maximum Marks : 75*

Note : It is compulsory to answer all the questions (1.5 marks each) of Part A in short. Answer any *four* questions from Part B in detail. Different sub-parts of a question are to be attempted adjacent to each other.

Part A

1. (a) Prove that mode of Normal distribution is equal to mean. **1.5**

   (b) State lack of memory property of Geometric distribution. **1.5**

   (c) Define simple and stratified random sampling. **1.5**

   (d) Prove that mean of sampling distribution of means is equal to population mean. **1.5**

   (e) State Cramer-Rao Theorem. **1.5**

(f) Write invariance property of M.L.E. 1.5

(g) State Neymann Pearson lemma. 1.5

(h) Explain unbiased critical region. 1.5

(i) Explain coding method for analysis of variance in short. 1.5

(j) Write any *three* utilities of analysis of variance. 1.5

Part B

2. (a) If X and Y are two independent binomial variates with parameters $n_1 = 6$, $p = \frac{1}{2}$ and $n_2 = 4$, $p = \frac{1}{2}$, respectively, evaluate : 7

(i) $P(X + Y = r)$,

(ii) $P(X + Y \geq 3)$.

(b) Let the two independent random variables X_1 and X_2 have the same geometric distribution. Show that the conditional distribution of $X_1/(X_1 + X_2 = n)$ is uniform. 8

3. (a) Show by stating all the conditions, that the Binomial distribution can be approximated to Poisson distribution. 7

(b) Take a concrete illustration and in relation to this illustration, explain the following terms : 8

(i) Null hypothesis and alternative hypothesis

(ii) Type I and Type II errors

(iii) Critical region

(iv) Level of significance

4. (a) Random samples of 400 men and 600 women were asked whether they would like to have a flyover near their residence. 200 men and 325 women were in favour of the proposal. Test the hypothesis that proportions of men and women in favour of the proposal, are same against that they are not, at 5% level. (At 5% level of significance is 1.96) 7

(b) In random sampling from normal population $N(\mu, \sigma^2)$, find the maximum likelihood estimators for : 8

(i) μ when σ^2 is known

(ii) σ^2 when μ is known

(iii) the simultaneous estimation of μ and σ^2.

5. (a) For the double Poisson distribution :

$$p(x) = P(X = x) = \frac{1}{2}.\frac{e^{-m_1}.m_1^x}{x|} + \frac{1}{2}.\frac{e^{-m_2}.m_2^x}{x|};$$

$$x = 0,\ 1,\ 2,.....$$

Show that the estimates for m_1 and m_2 by the method of moments are : 7

$$\mu_1' \pm \sqrt{\mu_2' - \mu_1' - \mu_1'^2}.$$

(b) If $x \geq 1$ is the critical region for testing $H_o : \theta = 2$ against the alternative $\theta = 1$, on the basis of the single observation from the population : 8

$$f(x,\theta) = \theta \exp(-\theta x),\ 0 \leq x < \infty,$$

Obtain the values of type I and type II errors.

6. (a) Explain the following terms : 10

(i) Errors of first and second kinds.

(ii) The best critical region.

(iii) Power function of a test

(iv) Most powerful test

(v) Uniformly most powerful test.

(b) Let $x_1, x_2,...,x_n$, be a random sample from the uniform distribution with probability density function : 5

$$f(x,\theta) = \begin{cases} \frac{1}{\theta}, & 0 < x < \infty, \theta > 0 \\ 0, & \text{elsewhere} \end{cases}$$

Obtain the maximum likelihood estimators for θ.

7. A manufacturing company has purchased 3 new machines (A, B, C) of different makes and wishes to determine whether one of them is faster than the other in producing a certain item. From hourly production figures are observed at random from each machine and results are given below : 15

A	B	C
20	18	25
21	20	28
23	17	22
16	25	28
20	15	32

Use analysis of variance to test whether machines differ significantly. (Table value 5% level for $\nu_1 = 2$ and $\nu_2 = 12$ is 3.89).

May 2024

B. Tech. (CE(DS)) (Fourth Semester)

Essentials of Data Mining (PCC-DS-401)

Time : 3 Hours] [*Maximum Marks : 75*

Note : It is compulsory to answer all the questions (1.5 marks each) of Part A in short. Answer any *four* questions from Part B in detail. Different sub-parts of a question are to be attempted adjacent to each other.

Part A

1. (a) Differentiate between Database and Datawarehouse. **1.5**

(b) Differentiate between supervised and unsupervised learning. **1.5**

(c) Differentiate between Data Characterization and Data Discrimination. **1.5**

(d) What is the difference Classification and Prediction ? **1.5**

(e) What is Information Gain in Decision Tree ? **1.5**

(f) Explain Bias and Learning rate of Neural Network. **1.5**

(g) What do you mean by Elbow method of clustering ? **1.5**

(h) What do you mean by Confusion Matrix, TP, TN, FN and FP ? **1.5**

(i) Find Precision, Recall and F1-Score for given Confusion Matrix : **1.5**

Actual Class\ Predicted class	**cancer = yes**	**cancer no**
cancer = yes	90	210
cancer = no	140	9560

(j) Given dataset = [1, 2, 2, 2, 3, 3, 4, 5, 5, 5, 6, 6, 6, 6, 7, 8, 8, 9, 27] Draw and annotate Boxplot using this dataset. **1.5**

Part B

2. (a) Explain in detail KDD process. **10**

(b) Find the Equation using Linear Regression from the following data : **5**

X	Y
1	1.2
2	1.8
3	2.6
4	3.2
5	3.8

3. (a) Apply k-means on the following 1-dimensional data set for K-2. And find the clusters. Data set {40, 20, 30, 10, 22, 94, 66} **5**

(b) A database has six transactions. Let min_support= 33.33% and confidence = 60%

Transaction ID	**Items**
T1	Hot Dogs, Buns, Ketchup
T2	Hot Dogs, Buns
T3	Hot Dogs, Coke, Chips
T4	Chips, Coke
T5	Chips, Ketchup
T6	Hot Dogs, Coke, Chips

Find all the frequent item-sets and association rules using A-priori algorithm. **10**

4. What do you mean by Artificial Neural Network ? Explain with the help of suitable example. **15**

5. (a)

	S1	S2	S3	S4	S5	S6	S7	S8
S1	0							
S2	4.24	0						
S3	4.47	5.1	0					
S4	3.16	4	1.41	0				
S5	2	5.83	4	3.16	0			
S6	1	3.61	5	3.61	3	0		
S7	6.08	3.61	3.61	3.61	6.71	6	0	
S8	2	3.16	2.83	1.41	2.83	2.24	4.12	0

Consider Epsilon =3.5 and minpoints=3, find core points, Border points and outlier using DBSCAN algorithm. **5**

(b) What do you mean by Genetic Algorithm ? Explain with the help of suitable example. **10**

6. (a) Consider the following dataset. Find out whether the object with attributes : **10**

Confident = Yes, studied Yes, Sick = No will Fail or Pass using Bayesian classification.

Confident	Studied	Sick	Result
Yes	No	No	Fail
Yes	No	Yes	Pass
No	Yes	Yes	Fail
No	Yes	No	Pass
Yes	Yes	Yes	Pass

Data set for classification

(b) Given the following training instances, Compute class label for : **5**

|Query : (X = Maths = 6, Biology = 8), K = 3 using K–Nearest Neighbour Classification

Maths	Biology	Result
4	3	Fail
6	7	Pass
7	8	Pass
5	5	Fail
8	8	Pass

7. Write short notes on the following : **15**

(i) Web content Mining

(ii) Social Network Analysis

(iii) OLTP *vs.* OLAP.

May 2024

B.Tech. (CEDS) (Fourth Semester)
Computer Networks (PCC-CS-602)

Time : 3 Hours] [*Maximum Marks : 75*

Note : It is compulsory to answer all the questions (1.5 marks each) of Part A in short. Answer any *four* questions from Part B in detail. Different sub-parts of a question are to be attempted adjacent to each other.

Part A

1. (a) What is piggybacking ? **1.5**

   (b) What are the number of cables required in mesh topology ? **1.5**

   (c) The subnet mask for a particular network is 255.255.31.0. Which of the following pairs of IP addresses could belong to this network ? **1.5**

   (i) 172.57.88.62 and 172.56.87.233

   (ii) 10.35.28.2 and 10.35.29.4

(iii) 191.203.31.87 and 191.234.31.88

(iv) 128.8.129.43 and 128.8.161.55

(d) DSSS system spreads the baseband signal by.....the baseband pulses with a pseudo noise sequence. **1.5**

(e) What is the purpose of IEEE 802.11 specifications ? **1.5**

(f) A network using CSMA/CD has a bandwidth of 10 Mbps. If the maximum propagation time (including the delays in the devices and ignoring the time needed to send a jamming signal) is 25.6 μs, what is the minimum size of thcce frame ? **1.5**

(g) Station A uses 32 byte packets to transmit messages to Station B using a sliding window protocol. The round trip delay between A and B is 80 milliseconds and the bottleneck bandwidth on the path between A and B is 128 kbps. What is the optimal window size that A should use ? **1.5**

(h) What is the purpose of DHCP protocol ? **1.5**

(i) What is the purpose of SNMP protocol ? **1.5**

(j) What is the difference between physical address and logical address ? **1.5**

Part B

2. (a) What is the minimum hamming distance of the following strings 010, 011, 101 and 111. **10**

(b) Explain the FHSS technique for data transmission. **5**

3. (a) Explain the CRC coding and decoding mechanism by taking example of 1001 as dataword in C(7, 4) scheme. **5**

(b) Assume in stop and wait ARQ system, the bandwidth of the line is 1 Mbps and 1 bit takes 30 ms to make a round trip. What is the bandwidth delay product ? If the system data frames are 1000 bits in length, what is the utilization percentage of the link. **10**

4. (a) Explain why the window size should be < 2 m in Go back n ARQ. where m is the size of the sequence number field in bits. **5**

(b) Draw the flowchart of the CSMA/CD protocol. 5

(c) What is the difference between OSI model and TCP/IP model ? 5

5. (a) What is the difference between UDP and TCP ? 5

(b) A slotted ALOHA network transmits 200-bit frames on a shared channel of 200 kbps. What is the throughput if the system (all stations together) produces : 10

(i) 1000 frames per second

(ii) 500 frames per second

(iii) 250 frames per second.

6. (a) What is the difference between IPv4 and IPv6 addressing ? 10

(b) Explain the basic concepts of cryptography. 5

7. (a) Explain the token bucket algorithm in detail. 5

(b) Write short notes on the following : 10

(i) DNS

(ii) WWW.

May 2024

B.Tech. (CE/CE(HINDI)/CE(DS)/CSE(AIML))

(Fourth Semester)

ECONOMICS FOR ENGINEERS (HSMC-02)

Time : 3 Hours] [*Maximum Marks : 75*

Note : It is compulsory to answer all the questions (1.5 marks each) of Part A in short. Answer any *four* questions from Part B in detail. Different sub-parts of a question are to be attempted adjacent to each other.

Part A

1. (a) What is Time Value of Money (TVM) ? **1.5**

(b) How does technological advancement affect economic development ? **1.5**

(c) Define the Law of Demand and provide an example to illustrate it. **1.5**

(d) Discuss the role of engineering in fostering economic development. **1.5**

(e) What are the factors affecting the elasticity of demand of a product ? **1.5**

(f) What are the various factors of production ? 1.5

(g) Explain the concept of opportunity cost. 1.5

(h) Describe the purpose of break-even analysis. 1.5

(i) Define a market and list its two basic components. 1.5

(j) What distinguishes a central bank from commercial banks in India ? 1.5

Part B

2. (a) Describe the Production Possibility Curve (PPC) and what does it illustrate about an economy's resource allocation ? 10

(b) What is the difference between micro and macroeconomics ? 5

3. (a) Explain the nature of economic laws. 5

(b) Briefly explain the concept of demand forecasting and its significance for businesses. 10

4. What is the Law of Variable Proportions, and how does it apply to the short-run production process ? 15

5. (a) What is the Accounting Rate of Return (ARR) and how is it calculated ? 5

(b) What are the primary objectives of fiscal and monetary policies in managing the Indian economy ? 10

6. (a) What distinguishes a monopoly from monopolistic competition ? 10

(b) How do demand and supply determine the price of a good or service in a market ? 5

7. Describe the key components of LPG reforms in the context of the Indian economy. 15

May 2024

B.Tech (Fourth) Semester)

Environmental Science (MC-03)

Time : 3 Hours] *[Maximum Marks : 75*

Note : It is compulsory to answer all the questions (1.5 marks each) of Part A in short. Answer any *four* questions from Part B in detail. Different sub-parts of a question are to be attempted adjacent to each other.

Part A

1. (a) Define HIV/AIDS. **1.5**

   (b) Differentiate contaminants and pollutants. **1.5**

   (c) Why is India considered a mega-biodiversity nation ? **1.5**

   (d) What is the process of ecological succession ? **1.5**

   (e) How many national parks, sanctuaries and biosphere reserves in India ? **1.5**

   (f) What are the Articles 48A and 51A ? Explain its importance. **1.5**

(g) What is Ozone ? Explain its importance in the stratosphere. 1.5

(h) Name three diseases that are caused by heavy metals. 1.5

(i) Explain in detail about the holocaust. 1.5

(j) What is the difference between an earthquake and a cyclone ? 1.5

Part B

2. (a) Write short notes on the following : 4×2.5=10

(i) Acid rain

(ii) Global warming.

(b) Discuss the government's and individuals' roles and steps for natural resource conservation and management. 5

3. (a) What is a red data book ? Write about extinct, endangered, vulnerable and rare species in detail. 5

(b) Explain biodiversity and its values and conservation approach. 10

4. What is Solid waste management ? Explain its causes, effects, rules, and control measures. 15

5. (a) Write short notes on the following : 2×2.5=5

(i) Food web

(ii) Ecological pyramid.

(b) What is a biogeochemical cycle ? Explain the carbon cycle in the environment. 10

6. (a) Write short notes on the following : 2×5=10

(i) Bhopal gas tragedy

(ii) Biomagnification.

(b) What are the major sources of air pollution ? Discussed its effects and control measures. 5

7. (a) Discuss the role of information technology in the environment and human health. 5

(b) Write short notes on the following : 10

(i) Family welfare program

(ii) Rainwater harvesting.

May 2024

B. Tech. (CE(DS)) (Fourth Semester)

Object Oriented Programming with Java

(PCC-DS-402)

Time : 3 Hours] [*Maximum Marks : 75*

Note : It is compulsory to answer all the questions (1.5 marks each) of Part A in short. Answer any *four* questions from Part B in detail. Different sub-parts of a question are to be attempted adjacent to each other.

Part A

1. (a) What is the difference between class and object ? **1.5**

   (b) What is multithreading ? **1.5**

   (c) What is the difference between method overloading and method overriding ? **1.5**

   (d) What is event handling ? **1.5**

   (e) What is an adapter class ? **1.5**

   (f) What is JNDI in java ? **1.5**

(g) What do you mean by Design Patterns ? 1.5

(h) What is URLConnection class ? 1.5

(i) What is object serialization ? 1.5

(j) Why do we use constructors ? 1.5

Part B

2. (a) What are packages ? How are they created and used ? Explain it with an example. 8

(b) What is an interface ? Why the methods of interface are public and abstract by default ? Write a program to illustrate how to achieve multiple inheritances using multiple interfaces. 7

3. (a) What is an applet ? Explain the lifecycle of an applet. Write the security advantages of the applets. 8

(b) What is a Java database driver ? Write a program to connect to a database, query it and display the result from the database. 7

4. (a) What is the role of layout in Java ? Explain the card layout by taking a suitable example. 6

(b) What are the advantages of the JSP over the servlet ? List and explain the various stages of JSP life cycle. 9

5. (a) What do you mean by RMI ? Explain the various steps to implement the RMI application by taking a suitable example. 8

(b) What is a Socket ? How can you create two-way communication between the server and client ? Explain it by taking a suitable example. 7

6. (a) What do you mean by Swing ? How is the tree created in Java using Swing ? Explain it by taking an example. 8

(b) What do you mean by the bound properties of the Java beans ? Explain it by taking a suitable example. 7

7. Write short notes on the following : 3×5=15

(a) Exception Handling

(b) Action Tags in JSP

(c) Enterprise Java Beans (EJB)

J.C.Bose University of Science &Technology

Time: 60 Minutes | Sessional Exam-I | MM: 15

Subject: Environmental Science

Note: Attempt all three questions. Each question carries equal marks. There are 05 marks for each question.

Q1. Answer the following questions

a. Define Ecosystem. (CO3)
a. Define Food Chain. (CO3)
b. Define Noise Pollution. (CO5)
c. Types of air pollutants. (CO5)
d. Define environment. (CO1)

Q2. Define water pollution, its cause and effects on human and environment. (CO5)

Q3. Discuss Solid Waste Management in detail. (CO5)

OR

Q4. Discuss in detail ecological succession. (CO3)

J.C. Bose University of Science and Technology, YMCA, Faridabad
B.Tech.-CE(DS), 4th Sem and CE61, Sessional –II
Computer Networks (PCC-CS-602)

Time: 90 mins **M.Marks: 30**

Note: ***Attempt all questions.***

Q1	(a)	What is the difference between classful and classless IP addressing?	(CO3)	(2)
	(b)	Draw the flowchart of DHCP operation.	(CO3)	(2)
	(c)	What are the functions of BOOTP protocol?	(CO3)	(2)
	(d)	A block of addresses is granted to a small organization. We know that one of the addresses is 205.16.37.39/28. What is the first and last address in the block?	(CO3)	(2)
	(e)	What is the output of the ping command?	(CO3)	(2)
Q2	(a)	An ISP is granted a block of addresses starting with 190.100.0.0/16 (65,536 addresses). The ISP needs to distribute these addresses to three groups of customers as follows: a. The first group has 64 customers; each needs 256 addresses. b. The second group has 128 customers; each needs 128 addresses. c. The third group has 128 customers; each needs 64 addresses. Design the subblocks and find out how many addresses are still available after these allocations.	(CO3)	(5)
	(b)	Draw the TCP segment format and explain various control field flags.	(CO4)	(5)
Q3	(a)	Explain connection establishment in TCP using diagram.	(CO4)	(3)
	(b)	Explain the SCTP protocol along with SCTP association termination.	(CO4)	(5)
	(c)	How name address resolution is done in DNS?	(CO4)	(2)

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B. Tech (CE 41, CE 42, CEDS) - IV SEMESTER

Economics for Engineers (HSMC-02), April 2024

Time: 1.5 Hours **Max. Marks:30**

Q1 Explain the law of demand. What are the reasons of law of demand? What are the situation when law of demand is not applicable? (10)

Q2 Write detailed note on:

(a) Concepts of short term cost (5)

(b) Role of supply and demand in determination of price (5)

Q3 (a) How Monopoly market is different from monopolistic market? (5)

(b) Explain the basic features of Indian Economy. (5)

J.C. Bose University of Science and Technology, YMCA, Faridabad

Essentials of Data Mining (2nd Sessional)

B.Tech – CEDS 4th sem.

Note: All questions are compulsory **Max Marks: 30**

1. Formulate equation using Linear Regression for following dataset:

x	y
1	1
2	2
3	1.3
4	3.75
5	2.25

[8]

2. Write short note on Web Mining. [5]

3. Explain in detail Genetic algorithm. [10]

4. Given the following training instances, Compute class label for test instance $M1 = (3,7)$ using k-nearest neighbors (KNN, K=3)

Training Instance	X1	X2	Output
T1	7	7	0
T2	7	4	0
T3	3	4	1
T4	1	4	1

[7]

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JC BOSE UNIVERSITY OF SCIENCE AND TECHNOLOGY, YMCA FARIDABAD

SECOND SESSIONAL EXAM (APRIL 2024)

B.Tech. (DS) 4TH SEMESTER

SUBJECT – STATISTICS-II

TIME: 1:30 Hrs. MM: 15

Q.1 For the double Poisson distribution:

$$p(x) = P(X = x) = \frac{1}{2}\frac{e^{-m_1}{m_1}^x}{x!} + \frac{1}{2}\frac{e^{-m_2}{m_2}^x}{x!}; \text{ x = 0, 1, 2, ...}$$

Find the estimates for $m_1 and\ m_2$. (5)

Q.2 If x ≥ 1 is the critical region for testing $H_0: \theta = 2$ against the alternative $\theta = 1$, on the basis of single observation from the population, $f(x, \theta) = \theta . e^{-\theta x}, 0 \leq x \leq \infty$. Obtain the values of Type I and Type II errors. (5)

Q.3 The marks obtained by a number of students for a certain subject are assumed to be approximately normally distributed with mean value 65 and with a standard deviation of 5. If 3 students are taken at random from this set, what is probability that exactly 2 of them will have marks over 70? (3)

Q.4 Write the pdfs of beta distributions of first and second kind. (1)

Q.5 State Neymann Pearson Lemma. (1)