Date of showing evaluated answer books:

No. of Printed Pages: 3

Roll No.

HARCOURT BUTLER TECHNICAL UNIVERSITY, KANPUR

B.Tech(CS/IT)

Mid Semester Examination-II

Odd Semester (I), 2022-23

ECS-359: DATA SCIENCE

Time: 1:00 Hours

Max. Marks: 15

Note: 1. Attempt all questions. All questions carry marks as shown against them.

Please mention all the Course Outcomes (CO) in statement form

1. Understand the core concepts and methods in data science.
2. Understand the issues and challenges in data collection, storage and management.
3. Understand and Apply various techniques for data analysis.
4. Understand various data visualization techniques.
5. Understand Learn Python programming tools for data science.

		Related CO	Marks
1	Explain Central Limit Theorem (~~CLT~~).	CO1	(02)
2	Define following terms: • Hypothesis • Degrees of Freedom	CO2	(02)
3	A company is reaching out to customers who bought a pedometer watch. It wants to construct a 80% confidence interval for the mean rating of its pedometer watch. It is known that the standard deviation for ratings of the pedometer watch is about 1.2. The company would like the margin of error to be 0.2. How many people should they contact to obtain this margin of error?	CO3	(03)
4	Explain the purpose of following commands: Dataset.head() Dataset.head(n) Dataset.describe() Dataset.info()	CO5	(04)
5	A website claims that the mean time spent playing a game on phone is less than 24 minutes. A random sample of 25 ppl has a mean of 25 minutes. Assume std. deviation of 5 minutes and population to be normally distributed, is there enough evidence to support the claim at level of confidence = 0.01?	CO3	(04)

Harcourt Butler Technical University, Kanpur
Second Mid-Semester Examination 2022-2023
Branch Third Year CS&IT
Theory of Automata and Formal Languages (ECS-357)

MM: 15 **Time: 1 Hour**

Note: All questions are compulsory

Q1. Construct a Grammar for the $L= \{a^n b^m c^m d^n / m, n>=1\}$. (2.5)

Q2. Remove the useless productions from the following grammar 'G' (2.5)

S→ABC/BaB
A→aA/BaC/aaa
B→bBb/a
C→ CA/AC

Q3. Draw the context-free grammar for the given language $L= \{WW^R / W \in (a,b)^+\}$, and also draw the corresponding PDA. (5)

Q4. Convert the following Grammar in CNF form (2.5)

S→bA/aB
A→bAA/aS/a
B→aBB/bS/b

Q5. Construct a PDA for the given language $L= \{a^{2n}b^n / n>=1\}$. (2.5)

**********Good Luck**********

Roll No. .....

HARCOURT BUTLER TECHNICAL UNIVERSITY, KANPUR

II Mid Semester Examination
Odd Semester (III B.Tech. CE/EE/ME/ET/IT/CS) 2022-23
Operations Research (BMA 351)

Time: 1 hr. **Max. Marks: 15**

Note: *1. Attempt all questions.*
2. All questions carry marks, as shown against them.

Q.No. 1 Machine A costs Rs. 9,000. Annual operating cost is Rs. 200 for the first year and then increases by Rs. 2,000 every year. Determine the best age to replace the machine. If the optimum replacement policy is followed, what will be the average yearly cost of owning and operating the machine? 4

Machine B costs Rs. 10,000. Annual operating cost is Rs. 400 for the first year and then increases by Rs. 800 every year. You now have a machine of type A, which is one year old. Should you replace it with B, if so, when?

Q.No. 2 Four jobs 1,2,3 and 4 are to be processed on each of the five machines A, B, C, D and E in the order A, B, C, D, E. Find the total minimum elapsed time, if no passing of job is permitted. Also find the idle time for each machine. 3

Machines	Jobs			
	1	2	3	4
A	7	6	5	8
B	5	6	4	3
C	2	4	5	3
D	3	5	6	2
E	9	10	8	6

Q.No. 3 What do you mean by Integer Programming Problem? Give some applications of IPP and write the computational procedure of Branch and Bound Method to solve IPP. 4

OR

Find the optimum integer solution to the following IPP by using Gomory's Algorithm (Cutting Plane Method):

$$\text{Max } z = x_1 + x_2$$

Subject to constraints: $3x_1 + 2x_2 \leq 5$

$$x_2 \leq 2$$

$$x_1, x_2 \geq 0 \text{ and are integers}$$

Q.No. 4 What do you mean by a project? What are the three main phases of a project? Distinguish between CPM and PERT. 4

Tasks A, B, ...H, I constitute a project. The notation X<Y means that the task X must be completed before Y is started. With the notation,

A< D, A< E, B< F, D< F, C< G, C< H, F< I, G < I

Draw the network diagram of this project, find the minimum time of completion of the project, Float for each activity, EST, LST, EFT, LFT and critical path of the project when the time (in days) of completion of each task is as follows:

Task	A	B	C	D	E	F	G	H	I
Time (days)	8	10	8	10	16	17	18	14	9