Tribhuvan University
Institute of Science and Technology
2076

I Semester
(1)

Subject: Statistics & Data Analysis I
Course No: MSST 101
Level: B. Math. Sc. /I Year /I Semester

Full Marks: 45
Pass Marks: 18
Time: 2hrs

Candidates are required to give their answer in their own words as far as practicable.
Attempt ALL questions.

Group A **[5 × 3 = 15]**

1. Calculate the Karl Pearson's correlation coefficient for the following data and test its significance.

X	17	35	41	19	25	20	10	15
Y	47	64	68	50	60	55	30	33

2. The data represent the amount of grams of carbohydrates in a serving of breakfast cereal.

8	15	23	26	19	22	21	20	15	25	17	5

Provide a box and whisker plot and then describe the shape.

3. The HAL Corporation wishes to improve the resistance of its personal computer to disk-drive and keyboard failures. At present, the design of the computer is such that disk-drive failure occur only one-third as often as keyboard failures. The probability of simultaneous disk-drive and keyboard failures is 0.05.
   a) If the computer is 80% resistant to disk-drive and/or keyboard failure, how low must the disk-drive failure probability be?
   b) If the keyboard is improved so that it fails only twice as often as the disk- drive (and the simultaneous failure probability is still 0.05), will the disk-drive failure probability from part (a) yield a resistance to disk-drive and/or keyboard failure higher or lower than 90%?

4. For an assignment if equipment is working the density function of outcome X is given by
$$f(x) = 2(1-x) ; 0< x <1$$
$$= 0; \text{otherwise.}$$
Find mean, variance and standard deviation of X.

5. For a pair of jointly distributed random variables X and Y, derive the result:
$$V(X+Y) = V(X)+V(Y)+2\ Cov\ (X,Y)$$
If the random variables X and Y are jointly distributed with Standard deviation of 5 and 7 respectively and correlation(X,Y) = - 3/7. Calculate the standard deviation of 3X-2Y+5.

Group B **(5×6 = 30)**

6. The One hundred and twenty students appeared for a certain test and the following marks distribution was obtained.

Marks	0-20	20-40	40-60	60-80	80-100
Students	10	30	36	30	14

Find
   a) The range of marks of middle 60% students.
   b) The minimum marks of top 12% students.
   c) The maximum marks of initial 39% students.

d) The number of students who fail, if 42marks are required for passing

OR

The profit earned by two types of companies is given as follows:

Profit earned (Rs '00')		0-4	5-9	10-14	15-19	20-24	25-29
Types of companies	A	4	20	46	18	10	2
	B	9	16	40	19	11	5

Which type of company has more uniform profit? If you have to invest, in which type of company will invest and why? Give reason.

7. In a college the geographical distribution of students is as follows: 50% come from central development region, 30% come from eastern, 10% come from western, 8% come from mid-western and 2% come from far western. The following proportion of students have black hair; 80% of central, 70% of eastern, 60% of western, 65% of mid-western and 75% of far western.
   a) Find the probability that a randomly selected student has a black hair.
   b) Find the probability that a student who has black hair come from the central region and far western region.

8. The Orange County Transportation Commission is concerned about the speed motorists are driving on a section of the main highway. The U.S. Department of Transportation reports that, nationally, no more than 10 percent of the motorists exceed 55 mph. Here are the speeds of 45 motorists

15	32	45	46	42	39	68	47	18
31	48	49	56	52	39	48	69	61
44	42	38	52	55	58	62	58	48
56	58	48	47	52	37	64	29	55
38	29	62	49	69	18	61	55	49

   a) Form stem and leaf display of the given data set and interpret the result.
   b) Construct the frequency distribution table by classifying the data into appropriate number of classes.
   c) Prepare the cumulative frequency curve and identify the value of third quartile.
   d) Do Orange County motorists follow the U.S. Department of Transportation report about national driving pattern?

OR

A National Associations of Real states seller has collected these data on a sample of 130 Salespeople representing their total commission earning annually.

Commission ($000)	Less than 5	5-10	10-15	15-20	20-30	30-40	40-50	More than 50
Frequency	5	9	11	33	37	19	9	7

Constructs an ogive that will help you answer these questions

   a) About what proportion of the salespeople earns more than $28000?
   b) About what proportion of the salespeople earns between $17000 and $42000?
   c) About what does the middle salesperson in the sample earn?
   d) Approximately how much could real estate salespersons whose performance was about 12% from the top expect to earn annually.

9. For a continuous distribution, $dF(x) = K(x-x^2)dx$; $0<x<1$. Find mean and variance. Also determine β_1 and β_2 and discuss the shape of the distribution.

10. The research farm believes that the job satisfaction of employees in business firm is mainly due to working experience and income. The firm has assessed the satisfaction of five employees of the business firm and found the following information regarding satisfaction score, working experience and annual income.

Job satisfaction	10	5	10	4	8
Experience (in years)	16	13	21	10	13
Annual income(Rs. 100,000)	3	6	4	5	3

a) Estimate the equation to predict the job satisfaction from experience and annual income.
b) Predict the job satisfaction of an employee who has spent 18 years on job and has annual income of Rs 800,000.
c) Compute standard error of the estimate and interpret its meaning.
d) How much variation in job satisfaction can be explained by experience and annual income?

I st Sem.
(2)

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2076
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Subject: Calculus with Analytical Geometry I
Course No: MSMT 101
Level: B. Math. Sc. /I Year /I Semester

Full Marks: 45
Pass Marks: 18
Time: 2hrs

Candidates are required to give their answer in their own words as far as practicable.
Attempt ALL questions.

Group A [5 × 3 = 15]

1. Define asymptote to the curve $y = f(x)$. Find the possible asymptotes of the curve $y = \dfrac{x^2+1}{2x^2-3x-2}$.
2. Prove that every differentiable function is continuous. Does continuity imply differentiability? Justify.
3. Define local maximum and local minimum of a function f. If f has a local maximum at c, and if $f'(c)$ exists, then prove that $f'(c) = 0$.
4. Define Riemann Sum. Evaluate the integral $\int_{-2}^{0}(x^2+x)dx$ using limit of a sum.
5. State the Mean Value Theorem for integrals. Interpret it geometrically. Find the average value of the function $f(x) = x^2\sqrt{1+x^3}$ on the interval [0, 2].

Group B [5 × 6 = 30]

6. Define continuity of a function at a point. Show that the function $f(x) = 1 - \sqrt{1-x^2}$ is continuous on the interval $[-1, 1]$. Give the precise definition of limit. Use it to prove that $\lim_{x\to -3}(1-4x) = 13$.

OR

State L'Hospital rule. Evaluate $\lim_{x\to 0}\left(\dfrac{\tan x}{x}\right)^{1/x}$. If $4x-9 \le f(x) \le x^2-4x+7$ for $x \ge 0$, find $\lim_{x\to 4} f(x)$.

7. Find the n^{th} derivative of $y = \sin(ax+b)$. If $y = (x^2-1)^n$ then show that
   a) $(x^2-1)y_2 + (2x-2nx)y_1 = 2ny$.
   b) $(x^2-1)y_{n+2} + 2xy_{n+1} - n(n+1)y_n = 0$.

8. If $C(x) = 16000 + 200x + 4x^{3/2}$ is the cost of producing x units of commodity, then find the production level that will minimize the average cost. Sketch the curve $y = xe^x$.

OR

State and prove Rolle 's Theorem. Let $f(x)=(x-3)^{-2}$. Show that there is no value of c in (1,4) such that $f(4)-f(1)=f'(c)(4-1)$. Why does this not contradict the Mean Value Theorem?

9. Evaluate $\int \frac{x^3}{\sqrt{x^2+9}}dx$. Find the reduction formula for $\int_0^{\frac{\pi}{2}} \sin^n x dx$ and hence find the value of $\int_0^{\frac{\pi}{2}} \sin^5 x dx$.

10. Find the area enclosed by the line $y=x-1$ and the parabola $y^2=2x+6$. Also find the volume of solid obtained by rotating the region bounded by $y=e^{-x^2}$, $y=0, x=0$ and $x=1$ about y-axis.

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1st Sem. (3)

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Subject: **Communication Skill I**
Course No: **MSEN 101**
Level: **B. Math. Sc. /I Year /I Semester**

Full Marks: 45
Pass Marks: 18
Time: 2hrs

Candidates are required to give their answer in their own words as far as practicable.
Attempt ALL Questions.

Group A **[5 × 3 = 15]**

1. "Great Scott! Gadzooks!" is against the screen-addiction. Summarize with its punch lines.
2. List the six rules to keep errors at bay suggested by Bertrand Russel.
3. How did the sentence 'Mencken is a fool' spark Richard Wright up with reading?
4. Correct the sentences:
   a) The Prime Minister has courting a taxpayers revolt.
   b) The town, which I grew up in, only had one school.
   c) There is no life on Mars, Jupiter, or in Venus.
   d) Arthur Gunn wow the jury panel whenever. He sings Bob Dylan's 'Girl from....'
   e) Katy Perry was not an outstanding success at her first job, she was not a complete failure either.
   f) Restlessly pacing the floor, her thoughts were on the final test.
5. Use **MLA format** to document the following information in a work-cited list:
   Book title: Monsoon
   Author: Subin Bhattarai
   Publisher: Fine Print
   Publish Year: 2016
   City/place: Kathmandu

Group B **[5 × 6 = 30]**

6. Discuss your views about 'going to university' that education is supremely valuable. Is Moti Nissani overselling, underselling or providing a balanced view of higher education?

OR

Punishment is a rather ineffective way of teaching either animals or humans. Elucidate. (Who Was to Blame?)

7. "Third Thoughts" is about bargaining with own soul. Explain your answer on the bases of the followings:
   a) "So my thoughts ran."
   b) "Impulse is the negation of magnetism."
   c) "Good luck should be shared."
   d) "Buying and selling are a perfectly straightforward matter between dealer and customer."
   e) "The incident is closed."
8. Would you say that marriage in Nepal is a private affair? Give your answer connecting shortly to "Marriage is a Private Affair."

OR

We cannot conclude that Yanomamo women want to be beaten but it can be said that they expect to be beaten. Explain. (The Savage Male)

9. "A Tale" reads like an old myth. How does B.P. Koirala clothe a modern narrative in such an ancient story?
10. Did Anuradha Chaudhary answer her own question, "How Sane Are We?" Give facts and examples.

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1st Semester (4)

Subject: **Fundamental of Computer Science** *Full Marks*: 45
Course No: **MSCS 101** *Pass Marks*: 18
Level: **B. Math. Sc. /I Year /I Semester** *Time*: 2hrs

Candidates are required to give their answer in their own words as far as practicable.
Attempt ALL questions.

Group A [5 × 3 = 15]

1. What is an analog computer? Explain 1st and 2nd generation of computer with respect to hardware and software.
2. What do you mean by human entry devices? Explain about different human entry devices.
3. How does the operating system manage the computer resources? Explain different functions of Operating System?
4. What is system software? Explain about different multimedia software used in actuarial sciences.
5. What is an internet? Explain different types of internet connection used for internet access.

Group B [5 × 6 = 30]

6. What is microprocessor? What are its types? Explain about different types of ROM.
7. Why computer use binary number system? How computer represent signed and unsigned binary number? Explain about AND, OR, NOT gates with truth table and logical symbol.

   OR

   What do you mean by logical gates? Convert the following as accordingly.
   a) $(65)_{10} = (?)_2$ b) $(CAB.ACE)_{16} = (?)_{10}$ c) $(147)_8 = (?)_2$
8. List the importance of computer network? Explain any three types of network topology with advantages and disadvantages.

   OR

   Why protocol is required in communication? Explain any three layers in OSI reference model.
9. What is RDBMS? Explain different database architecture with an example.
10. What is computer security? Explain about security services and security mechanisms.

First Sem.
(5)

Tribhuvan University
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Subject: **Mathematics Software (MATLAB)**
Course No: **MSCS 102**
Level: **B. Math. Sc. /I Year /I Semester**

Full Marks: 45
Pass Marks: 18
Time: 2hrs

Candidates are required to give their answer in their own words as far as practicable.
Attempt ALL questions.

Group A **[5 × 3 = 15]**

1. Is MATLAB interpreter or compiler? Support your answers with proper reasoning. What are the benefits and applications of MATLAB.
2. Is matrix multiplication an array operation? Give proper reason to support your answer. What are the scalar operations that you can perform on matrices.
3. Explain two kinds of program files available in MATLAB.
4. What do you mean by menu driven program? Explain different types of decision making statements along with its flowchart.
5. A chemistry professor teaches three classes. These are the course numbers and enrollments:

Course number	Enrollments
101	256
105	440
110	120

Use subplot to show this information using pie charts. The pie-chart on the right should show the % of students and on the left course numbers. Put appropriate titles on them.

Group B **[5 × 6 = 30]**

6. Write a script file to solve the given system of equations by using Gauss elimination **OR** Gauss Seidal method $4x+2y+3z=1$, $2x-3y+5z=-14$, $6x-y+4z=1$.
7. Write a script file to find the solution for the given equation $x^3+3x-7=0$ by using secant method.
8. Write a script file to find the numerical integration of $\int_0^1(x^3-x^2+1)dx$ by using Simpson's 3/8 **OR** Simpson's 1/3 rule.
9. Write a script file to find the sum of prime numbers from 5 to 500.
10. What do you mean by interpolation? Write down a script file to find the interpolated value of y at $x = 2.4$ for the given sets of data by using Lagrange's interpolation.

x:	0	1	2	3
y:	6.3	8.2	9.6	11.9