

B.Sc. DEGREE EXAMINATION —
DECEMBER, 2019.

Second Year

Mathematics

STATISTICS AND MECHANICS

Time : 3 hours

Maximum marks : 75

SECTION A — (5 × 5 = 25 marks)

Answer any FIVE of the following.

1. Find the AM of the following set of observations:
25,32,28,34,24,31,36,27,29,30.
2. Find the rank correlation coefficient for the following data:
X : 92 89 87 86 86 77 71 63 53 50
Y : 86 83 91 77 68 85 52 82 37 57
3. Using Newton's Backward formula, find the annual premium at the age of 33 from the following data:
Age in years 24 28 32 36 40
Annual Premium 28.6 30.19 32.75 34.94 40
in Rs.

4. In turning out certain toys in a manufacturing process in a factory, the average number of defective is 10%. What is the probability of getting exactly three defective toys in a sample of 10 toys chosen at random by using the poisson distribution?
5. Why is the path of a projectile a parabola? Explain.
6. Obtain the two regression lines from the following data:
 $n = 20, \sum x = 8, \sum y = 40$
 $\sum x^2 = 1680, \sum y^2 = 320, \sum xy = 480.$
7. State the properties of correlation coefficient.

SECTION B — (5 × 10 = 50 marks)

Answer any FIVE of the following.

8. Obtain any one of skewness for the distribution.

Class interval 0-9 10-19 20-29 30-39 40-49

Frequency 8 15 23 16 9

9. Find the line of regression of y on x:

X: 1 2 3 4 5 8 10

Y: 9 8 10 12 14 16 15

10. Given the pdf of a continuous random variable X as follows

$$f(x) = \begin{cases} kx(1-x) & \text{for } 0 < x < 1 \\ 0 & \text{otherwise} \end{cases}$$

Find k and the cdf.

11. A random sample of employee of a large company was selected and the employees were asked to complete a questionnaires. One question asked was whether the employees was in favour of the introduction of flexible working hours. The following table classifies the employees by their response and by their area of work.

Response	Area of work	
	Production	Non-Production
In Favour	129	171
Not in Favour	31	69

Test whether there is evidence of a significant association between the response and the area of work.

12. Find the range on an inclined plane.

13. A bag contains 4 white and 6 balls. Two balls are drawn at random. What is the probability that
- (a) both are white,
 - (b) both are black,
 - (c) one white and one black.

14. Find the Quartiles from the following distribution:

Age (years)	Number of employees
Below 20	13
20-25	29
25-30	46
30-35	60
35-40	112
40-45	94
45-50	45
55 and above	21

UG–331 BMS–21/BMC–21

B.Sc. DEGREE EXAMINATION —
DECEMBER, 2019.

Second Year

Mathematics/Mathematics with Computer
Applications

GROUPS AND RINGS

Time : 3 hours

Maximum marks : 75

PART A — (5 × 5 = 25 marks)

Answer any FIVE questions.

1. Prove that the function $f: \mathbb{R} \rightarrow \mathbb{R}$ defined by $f(x) = 3x - 5, \forall x \in \mathbb{R}$ is bijective. Also find f^{-1} .
2. Show that the set $G = \left\{ \begin{pmatrix} a & b \\ 0 & d \end{pmatrix} : a, b, d \in \mathbb{R}, ad \neq 0 \right\}$ forms a non-abelian group under matrix multiplication.
3. Let G be a group. Prove that
 - (a) $(a^{-1})^{-1} = a, \forall a \in G$, where a^{-1} stands for inverse of a .
 - (b) $(ab)^{-1} = b^{-1}a^{-1}, \forall a, b \in G$

4. Prove that N is a normal subgroup of G if and only if $gNg^{-1} = N$ for every $g \in G$.
5. If f is a homomorphism of G into G' with kernel K , prove that K is a normal subgroup.
6. Prove that a field is an integral domain.
7. Show that the set of Gaussian integers $\mathbb{Z}(i) = \{a + ib : a, b \in \mathbb{Z}\}$ is an integral domain but not a field.
8. Let R be an integral domain with unit element and suppose that for all $a, b \in R$ both $a|b$ and $b|a$ are true, prove that $a = ub$, where u is a unit in R .

PART B — ($5 \times 10 = 50$ marks)

Answer any FIVE questions.

9. If $f : A \rightarrow B$ and $g : B \rightarrow C$ are invertible functions, prove that $g \circ f$ is invertible function. Also prove that $(g \circ f)^{-1} = f^{-1} \circ g^{-1}$.
10. State and prove Lagrange's theorem.
11. Let G be a group. If H and K are finite subgroups of order $o(H)$ and $o(K)$ respectively, prove that
$$o(HK) = \frac{o(H) o(K)}{o(H \cap K)}.$$

12. Let G be a group. Prove that a subgroup N of G is a normal subgroup of G if and only if the product of two right coset is again a right coset of N in G .
 13. State and prove fundamental theorem of group homomorphism.
 14. If R is a commutative ring with unit elements and M is an ideal of R , prove that M is maximal if and only if R/M is a field.
 15. Prove that an ideal $A = (a_0)$ is a maximal ideal of the Euclidean ring R if and only if a_0 is a prime element of R .
 16. If R is a Euclidean ring, prove that any two elements a and b in R have a greatest common divisor.
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UG-333

BMS-23

**B.Sc. DEGREE EXAMINATION –
DECEMBER, 2019.**

Second Year

Mathematics

**CLASSICAL ALGEBRA AND NUMERICAL
METHODS**

Time : 3 hours

Maximum marks : 75

PART A — (5 × 5 = 25 marks)

Answer any FIVE questions.

1. Find the sum to infinity of the series
 $\frac{5}{1!} + \frac{7}{3!} + \frac{9}{5!} + \dots$
2. Solve the equation $x^4 + 4x^3 + 5x^2 + 2x - 2 = 0$ of which one root is $-1 + i$.
3. If $\alpha, \beta, \gamma, \delta$ are the roots of the equation $x^4 + px^3 + qx^2 + rx + s = 0$, find
 - (a) $\sum \alpha^2$
 - (b) $\sum \alpha^2 \beta \gamma$.

4. Find a positive root of the equation $x^2 - 5x + 2 = 0$ correct to three decimal place by Newton-Rhapson method.
5. Find the value of $f(2.5)$ from the following data.
- | | | | | |
|--------|------|------|------|----|
| x | 2 | 3 | 4 | 5 |
| $f(x)$ | 14.5 | 16.3 | 17.5 | 18 |
6. Show that $\Delta^2 \cos(2x) = -4 \sin^2(h) \cos(2x + 2h)$.
7. Evaluate $\int_0^1 \frac{1}{1+x^2} dx$, by dividing the interval into four equal parts, using Simpson's $\frac{1}{3}$ rd rule.
8. Use Taylor's method to find $y(1.2)$, given $\frac{dy}{dx} = x^2 + y^2$ and $y(1) = 2.3$.

PART B — (5 × 10 = 50 marks)

Answer any FIVE questions.

9. Sum the series to infinity
- $$\frac{1}{1.4.7} + \frac{1}{4.7.10} + \frac{1}{7.10.13} + \dots$$
10. Solve : $6x^5 - x^4 - 43x^3 + 43x^2 + x - 6 = 0$.

11. Solve the equation $81x^3 - 18x^2 - 36x + 8 = 0$ whose roots are in harmonic progression.
12. Find a positive root of $x - \cos x = 0$ by bisection method.
13. Solve the system of equations using Gauss-Seidel method

$$\begin{aligned} 8x - y + z &= 18 \\ 2x + 5y - 2z &= 3 \\ x + y - 3z &= -6 \end{aligned}$$

14. Find $f(x)$ from the table below. Also find $f(6)$

x	0	1	2	3
$f(x)$	-3	6	8	12

15. Using Newton's formula find $y(43)$ and $y(84)$.

x	40	50	60	70	80	90
y	184	204	226	250	276	304

16. Find $y(0.1)$ using Runge-Kutta method, given $\frac{dy}{dx} = \frac{1}{x+y}$ and $y(0) = 1$.
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UG-046

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B.Com./B.B.A. DEGREE EXAMINATION —
DECEMBER, 2019.

ENVIRONMENTAL STUDIES

Time : 3 hours

Maximum marks : 75

PART A — (3 × 5 = 15 marks)

Answer any THREE questions.

All questions carry equal marks.

1. Write about the importance of environmental studies.

சுற்றுச்சூழலியலின் முக்கியத்துவத்தைப் பற்றி எழுதுக.

2. Discuss the over-exploitation of natural resources.

இயற்கை வளங்களை அதிகமாக சுரண்டுவதைப் பற்றி விவாதி.

3. Write about the eco system.

சுற்றுச்சூழல் பற்றி எழுதுக.

4. Give an account on conservation of biodiversity.

பல்லுயிர் பாதுகாப்பு பற்றி எழுதுக.

5. Write about the land resources.

நில வளங்களை பற்றி எழுதுக.

PART B — (4 × 15 = 60 marks)

Answer any FOUR questions.

All questions carry equal marks.

6. Describe the food resources.

உணவு வளங்களை பற்றி எழுதுக.

7. Describe the structure and function of ecosystem.

சுற்றுச்சூழலின் கட்டமைப்பு மற்றும் செயல்பாட்டை பற்றி விவரி.

8. Explain the energy flow in the ecosystem.

சுற்றுச்சூழலில் ஆற்றல் ஓட்டத்தைப் பற்றி விளக்குக.

9. Give brief account on India as a mega diversity nation.

இந்தியாவைப் பொறுத்தவரையில் ஒரு மிகப்பெரிய பன்முகத் தன்மை கொண்ட நாடு எனக் குறிப்பிடுக.

10. Discuss the types and effects of air pollution.

காற்று மாசுபாட்டின் வகைகள் மற்றும் விளைவுகளை பற்றி விவாதி.

11. Discuss any five legal provisions to protect the environment.

சுற்றுச்சூழலைப் பாதுகாப்பதற்கான ஏதேனும் ஐந்து சட்ட விதிகளைப் பற்றி விவாதி.

12. Discuss the role of information technology in environment and human health.

சுற்றுச்சூழலுக்கும் மனித ஆரோக்கியத்திற்கும் உள்ள தகவல் தொழில் நுட்ப பங்கு பற்றி விவாதி.
