

**M.Sc. MATHEMATICS**  
**THIRD SEMESTER**  
**GENERAL MATHEMATICS (MDC)**  
**MSM-306**

Duration: 3 Hrs.

Marks: 70

PART : A (OBJECTIVE) = 20  
PART : B (DESCRIPTIVE) = 50

**[ PART-B : Descriptive ]**

Duration: 2 Hrs. 40 Mins.

Marks: 50

**[ Answer question no. One (1) & any four (4) from the rest ]**

1. Write nth term of AP and GP series. The sum of first n terms of a series is  $3n^2 - n$ . Find the second and 3<sup>rd</sup> term of the series. (2+8=10)
2. What is the no of permutation of 100 things by taking all of them at a time, when 6 of them are alike of first type, 7 of them are alike of second type, 3 of them are alike of 3<sup>rd</sup> type? (10)
3. Solve : (5+5=10)
  - (i)  $\frac{dx}{z(x+y)} = \frac{dy}{z(x-y)} = \frac{dz}{x^2 + y^2}$ .
  - (ii)  $\frac{dx}{x^3 + 3xy^2} = \frac{dy}{y^3 + 3x^2y} = \frac{dz}{2z(x^2 + y^2)}$
4. What is definition of Set? Give two example. If  $U = \{a, b, c, d, e\}$ ,  $A = \{a, b, d\}$ ,  $B = \{b, d, e\}$  show that  $B - A' = B \cap A$  (2+2+6=10)
5. Prove that: (5+5=10)
  - (i)  $\int e^{ax} \cos bx \, dx = \frac{1}{a^2 + b^2} e^{ax} (a \cos bx + b \sin bx)$
  - (ii)  $\int \sqrt{x^2 + a^2} \, dx = \frac{x \sqrt{x^2 + a^2}}{2} + \frac{a^2}{2} \sinh^{-1} \frac{x}{a}$
6. What is the difference between Matrix and Determinant? Write 6 properties of Determinant. (4+6=10)
7. (i) The portion of a straight line intercepted between the co-ordinate axes is bisected by the point  $(2, -2)$ . Find the equation of the line. (5+5=10)  
(ii) Prove that the points  $(4, -5)$ ,  $(1, -1)$ ,  $(0, -3)$  and  $(1, -5)$  are concyclic. Find the radius and centre of the circle.

8. (i) Prove that  $[\vec{a} \times \vec{b}, \vec{b} \times \vec{c}, \vec{c} \times \vec{a}] = [\vec{a}, \vec{b}, \vec{c}]^2$

(ii) Prove that  $\vec{a} \times (\vec{b} + \vec{c}) = \vec{a} \times \vec{b} + \vec{a} \times \vec{c}$

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**[ PART-A : Objective ]**

**Choose the correct answer from the following :**

**1×20=20**

1. Set is a collection of:
  - a. Infinite object.
  - b. Finite object.
  - c. Distinct object.
  - d. Distinct and definite object.
2. If  $A = \{x : 1 < x < 4\}$ ,  $B = \{x : 2 < x < 4\}$ , then  $A \cap B = ?$ 
  - a. 4
  - b. 1
  - c. 3
  - d. 2
3. If 1, 2, 3 be in AP, then AM=?
  - a. 2
  - b. 3
  - c. 1
  - d. Both 1 and 2
4. The normal form of a straight line is:
  - a.  $x \cos a + y \sin b = p$
  - b.  $x \cos a - y \sin b = 0$
  - c.  $x \cos a + y \sin b = 0$
  - d. None of these
5. For parallel lines:
  - a.  $m_1 m_2 = 1$
  - b.  $m_1 m_2 = -1$
  - c.  $m_1 m_2 = 0$
  - d.  $m_1 = m_2$
6. For perpendicular lines:
  - a.  $m_1 m_2 = 1$
  - b.  $m_1 m_2 = -1$
  - c.  $m_1 m_2 = 0$
  - d.  $m_1 = m_2$
7. If  $y = m_1 x + c_1$  and  $y = m_2 x + c_2$  be two straight lines , then the angles between them is:
  - a.  $\theta = \tan^{-1} \left( \frac{m_1 - m_2}{1 - m_1 m_2} \right)$
  - b.  $\theta = \tan^{-1} \left( \frac{m_1 + m_2}{1 - m_1 m_2} \right)$
  - c.  $\theta = \tan^{-1} \left( \frac{m_1 + m_2}{1 + m_1 m_2} \right)$
  - d. None of these
8. Equation of a circle whose the extremities of any diameter are  $(x_1, y_1)$  and  $(x_2, y_2)$  is:
  - a.  $(x - x_1)(x - x_2) - (y - y_1)(y - y_2) = 0$
  - b.  $(x - x_1)(x - x_2) + (y - y_1)(y - y_2) = 0$
  - c.  $(x + x_1)(x - x_2) - (y + y_1)(y - y_2) = 0$
  - d.  $(x + x_1)(x + x_2) - (y + y_1)(y + y_2) = 0$
9. Three or more vectors are said to be co-planer if they are parallel to the same:
  - a. Plane
  - b. Line
  - c. Axes
  - d. None of these
10. The null vector is defined to be a vector whose..... is zero.
  - a. Module
  - b. Direction
  - c. Axes
  - d. None of these
11. The vectors having same .....are said to be like vectors.
  - a. Magnitude
  - b. Direction
  - c. Magnitude and direction
  - d. None of these
12.  $\left[ \begin{matrix} \vec{a} & \vec{b} & \vec{c} \end{matrix} \right] = - \left[ \begin{matrix} \vec{b} & \vec{a} & \vec{c} \end{matrix} \right] = ?$ 
  - a.  $- \left[ \begin{matrix} \vec{a} & \vec{c} & \vec{b} \end{matrix} \right]$
  - b.  $\vec{b}$
  - c.  $\vec{c}$
  - d. None of these

13. Two vectors are said to be co-linear if they are parallel to the same:

- a. Line
- b. Plane
- c. Axes
- d. None of these

14. Sum of first n terms of an AP is:

- a.  $S_n = \frac{a(1-r^n)}{1-r}$
- b.  $S_n = \{2a + (n-1)d\}$
- c.  $S_n = \frac{n}{2}\{2a + (n-1)d\}$
- d.  $S_n = \frac{a(1-r^n)}{1+r}$

15.  $ar^{n-1}$  is nth term of:

- a. AP series
- b. GP series
- c. HP series
- d. AM

16. For what value of x 1, 2, x are in GP?

- a. 0
- b. 1
- c. 4
- d. 3

17. When we take 2 object out of 3 object, then no of Permutation is:

- a. 6
- b. 5
- c. 4
- d. 2

18. If  $A = \begin{bmatrix} 1 & 2 \\ 3 & 4 \end{bmatrix}$  then  $|A| = ?$

- a. 2
- b. -2
- c. 4
- d. 6

19. If 3 boys selected from 10 boys then no of combination:

- a. 100
- b. 120
- c. 90
- d. 50

20. Row Matrix contains:

- a. two column.
- b. only one column.
- c. only one row.
- d. none of the above.

# UNIVERSITY OF SCIENCE & TECHNOLOGY, MEGHALAYA



## [PART (A) : OBJECTIVE]

Duration : 20 Minutes

Serial no. of the  
main Answer sheet

Course : .....

Semester : ..... Roll No : .....

Enrollment No : ..... Course code : .....

Course Title : .....

Session : ..... 2017-18 ..... Date : .....

### Instructions / Guidelines

- The paper contains twenty (20) / ten (10) questions.
- Students shall tick (✓) the correct answer.
- No marks shall be given for overwrite / erasing.
- Students have to submit the Objective Part (Part-A) to the invigilator just after completion of the allotted time from the starting of examination.

Full Marks	Marks Obtained
10	

Scrutinizer's Signature

Examiner's Signature

Invigilator's Signature