

RMP

Intro. (Kmit-H)-A-2019

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| Paper Code | 8 | 1 | 9 | 3 |
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(For all sessions)

Roll No. \_\_\_\_\_ to be filled in by the candidate.

## Mathematics (Objective Type)

Time: 30 Minutes

Marks: 20

NOTE: Write answers to the questions on objective answer sheet provided. Four possible answers A, B, C & D to each question are given. Which answer you consider correct, fill the corresponding circle A, B, C or D given in front of each question with Marker or pen ink on the answer sheet provided.

- 1-1. The centre of circle  $(x+1)^2 + (y-2)^2 = 26$  is:
- (A)  $(1, 2)$  (B)  $(-1, 2)$  (C)  $(-1, -2)$  (D)  $(1, -2)$
2. The equation of directrix of the parabola  $x^2 = 4ay$  is:
- (A)  $x = a$  (B)  $x = -a$  (C)  $y = -a$  (D)  $y = a$
3. The centre of Ellipse  $\frac{x^2}{4} + \frac{y^2}{16} = 1$  is:
- (A)  $(4, 1)$  (B)  $(1, 4)$  (C)  $(-1, 4)$  (D)  $(0, 0)$
4. If  $\vec{U}$  is any vector, then  $\vec{U} =$
- (A)  $\frac{\vec{U}}{|\vec{U}|}$  (B)  $\frac{|\vec{U}|}{\vec{U}}$  (C)  $\frac{|\vec{U}|}{-\vec{U}}$  (D)  $\vec{U} \cdot \vec{U}$
5. If  $2\vec{i} + \alpha\vec{j} + 5\vec{k}$  and  $3\vec{i} + \vec{j} + \alpha\vec{k}$  are perpendicular, then  $\alpha =$
- (A) 0 (B) 1 (C) -1 (D) 2
6. The domain of  $g(x) = 2x - 5$  is:
- (A) IR (B) the set of positive No. (C) the set of negative real No. (D) The set of non-negative real No.
7.  $\lim_{n \rightarrow \infty} \left(1 + \frac{1}{n}\right)^n =$
- (A)  $e$  (B)  $e^2$  (C)  $e^{\frac{1}{2}}$  (D)  $e^3$
8.  $\frac{d}{dx} (x-5)(3-x) =$
- (A)  $2x+8$  (B)  $-2x+8$  (C)  $2x-8$  (D)  $x+8$
9. If  $3x+4y+7=0$ , then  $\frac{dy}{dx} =$
- (A)  $\frac{4}{3}$  (B)  $\frac{3}{4}$  (C)  $\frac{-4}{3}$  (D)  $\frac{-3}{4}$

- Find the area of the triangular region whose vertices are A(5,3) B(-2,2) C(4,2).
- i. Find focus and directrix of the parabola  $x^2 = -16y$ .
- ii. Write an equation of parabola with focus (2,5) and directrix  $y = 1$ .
- iii. Find an equation of ellipse having centre (0,0) focus (0,3) vertex(0,4).
- ix. Find centre and foci of the ellipse  $x^2 + 4y^2 = 16$ .
- x. Find unit vector in the direction of vector  $\vec{v} = \frac{1}{2}\vec{i} + \frac{\sqrt{3}}{2}\vec{j}$ .
- xi. Define position vector.
- xii. Find a vector whose magnitude is 2 and parallel to  $-\vec{i} + \vec{j} + \vec{k}$ .
- xiii. Write vector triple product and scalar triple product.

## Section -II

Note: Attempt any three questions from the following.

5. (a) Prove that  $\lim_{x \rightarrow 0} \frac{a^x - 1}{x} = \log_e a$ .
- (b) Show that  $\frac{dy}{dx} = \frac{x}{y}$  if  $\frac{x}{y} = \tan^{-1} \frac{x}{y}$ .
6. (a) Evaluate the integral:  $\int^x \left( \frac{1 + \sin x}{1 + \cos x} \right) dx$ .
- (b) Find k so that the line joining the points A(7,3), B(k,-6) and the line joining the points C(-4,5), D(-6,4) are perpendicular.
7. (a) Find the area bounded by the curve  $y = x(x-1)(x+1)$  and the x-axis.
- (b) Find the corner points of the feasible region intersected by the lines:
- $$2x + y \leq 8; x \geq 0$$
- $$x + 2y \leq 14; y \geq 0$$

8. (a) Find equations of the circle of radius 2 and tangent to the line  $x - y - 4 = 0$  at A(1,-3).
- (b) Prove that the line segment joining the mid points of two sides of a triangle is parallel to the third side and half as long.

9. (a) Find Eccentricity foci and directrices of hyperbola  $4x^2 - 8x - y^2 - 2y - 1 = 0$ .
- (b) Find moment about A(1,1,1) of resultant of the concurrent forces  $i - 2j, 3i + 2j - k, 5j + 2k$  where P(2,0,1) is their point of concurrency.

# RWP

10. If " $w$ " is a cube root of unity, then  $(1 + w - w^2)(1 - w + w^2)$  will be equal to:

- (A) 3 (B) 4 (C) 2 (D) 1

11. If  $\frac{3}{(x-1)(x+2)} = \frac{1}{x-1} + \frac{A}{x+2}$ , then "A" is equal to:

- (A) -1 (B) 3 (C) 2 (D) 4

12. The  $n^{\text{th}}$  root of product of  $n$  Geometric Means between  $a$  and  $b$  is equal to:

- (A)  $(ab)^{\frac{1}{n}}$  (B)  $a^n b^n$  (C)  $n\sqrt{ab}$  (D)  $\sqrt{ab}$

13. If in an A.P;  $a_{n-3} = 2n - 5$ , then  $a_n$  will be equal to:

- (A)  $2n+1$  (B)  $2n-1$  (C)  $n+1$  (D)  $n-1$

14.  $\frac{n!}{(n-r)!r!}$  is equal to:

- (A)  ${}^nC_n$  (B)  ${}^rP_n$  (C)  ${}^nC_r$  (D)  ${}^nP_r$

15. Number of signals given by 5 flags of different colours using 3 flags at a time equals.

- (A) 30 (B) 40 (C) 50 (D) 60

16. Sum of even co-efficient in the expansion of  $(1+x)^n$  equals.

- (A)  $2^{n+1}$  (B)  $2^{n-1}$  (C)  $2^n$  (D)  $2^{1-n}$

17. Third term in the expansion of  $(1-2x)^{\frac{1}{3}}$  is equal to:

- (A)  $-\frac{9x^2}{4}$  (B)  $\frac{9x^2}{4}$  (C)  $\frac{4x^2}{9}$  (D)  $-\frac{4x^2}{9}$

18. The area of a sector of circular region of radius  $r$  and angle  $\theta$  is equal to:

- (A)  $\frac{1}{2}r\theta^2$  (B)  $\frac{1}{2}r^2\theta$  (C)  $r\theta^2$  (D)  $r^2\theta$

19. If  $6\cos^2\theta + 2\sin^2\theta = 5$ , then  $\tan^2\theta$  will be equal to:

- (A)  $\frac{3}{2}$  (B) 3 (C)  $\frac{1}{3}$  (D)  $\frac{2}{3}$

20. Period of  $\sin\frac{x}{5}$  is equal to:

- (A)  $10\pi$  (B)  $5\pi$  (C)  $2\pi$  (D)  $\frac{2\pi}{5}$

RMP

(For all sessions)

Inter - (Part-II) - A-2019

to be filled in by the candidate.

Roll No.

Mathematics (Essay Type)

Time: 2:30 Hours

# Section - I

2. Write short answers of any eight parts from the following.

2x8=16

ii. Discuss the continuity of  $f(x) = \frac{x^2-9}{x-3}$  if  $x \neq 3$

iv. Prove that  $\frac{d}{dx} \cot^{-1} x = \frac{-1}{1+x^2}$

vi. Find  $y_2$  if  $x^2 + y^2 = a^2$

viii. Differentiate  $\sin^2 x$  w.r.t  $\cos^4 x$

x. Find  $f'(x)$  if  $f(x) = \frac{e^x}{e^x + 1}$

xi. Express Area "A" of a circle as a function of its circumference "C".

xii. Determine the intervals for which  $f(x)$  is decreasing and increasing  $f(x) = \cos x; x \in \left(-\frac{\pi}{2}, \frac{\pi}{2}\right)$

2x8=16

ii. Evaluate:  $\int \sqrt{1 - \cos 2x} dx, (1 - \cos 2x > 0)$

iv. Evaluate:  $\int x \sin x \cos x dx$  by parts.

vi. Evaluate:  $\int \frac{e^{\tan^{-1} x}}{(1+x^2)} dx$

viii. Define feasible region.

x. Evaluate:  $\int_2^1 \frac{x}{x^2+2} dx$

xi. Find  $\delta y$  and  $\delta y$  of the function defined as  $f(x) = x^2$ , when  $x = 2$  and  $dx = 0.01$ .

xii. Use differentials to approximate the value of  $\sqrt[4]{17}$ .

4. Write short answers of any nine parts from the following.

2x9=18

i. Find the points trisecting the join of A(-1,4) and B(6,2).

ii. Define inclination and slope of a line.

iii. Derive slope-intercept form of equation of straight line.