

**COMMON HALF-YEARLY EXAMINATION - 2017**

**M**

**Standard XI  
MATHEMATICS**

Reg.No. 

--	--	--	--	--

Time: 2.30 hours.

Marks: 90

**Part - A**

**All questions are compulsory:**

20 x 1 = 20

**Choose the best answer:**

1. Matrix A is of order  $4 \times 2$  and B is of order  $3 \times 4$ , then order of a matrix BA is  
 a)  $2 \times 2$                       b)  $3 \times 3$                       c)  $4 \times 4$                       d)  $3 \times 2$
2. The solution of  $\begin{vmatrix} 2x & 3 \\ 2 & 3 \end{vmatrix} = 0$  is  
 a)  $x = 1$                       b)  $x = 2$                       c)  $x = 3$                       d)  $x = 0$
3. Two rows of a determinant  $\Delta$  are identical when  $x = -a$ , then the factor of  $\Delta$  is  
 a)  $x + a$                       b)  $x - a$                       c)  $(x + a)^2$                       d)  $(x - a)^2$
4. Which of the following vectors has the same direction as the vector  $\vec{i} - 2\vec{j}$   
 a)  $-\vec{i} - 2\vec{j}$                       b)  $2\vec{i} + 4\vec{j}$                       c)  $-3\vec{i} + 6\vec{j}$                       d)  $3\vec{i} - 6\vec{j}$
5. Let  $\alpha, \beta, \gamma$  be the angles made by  $\vec{OP}$  with the positive direction of co-ordinate axes OX, OY, OZ respectively. The  $\cos^2\alpha + \cos^2\beta + \cos^2\gamma =$   
 a) 0                      b) 1                      c) 2                      d) -1
6. The last term in the expansion of  $(2 + \sqrt{3})^8$  is  
 a) 81                      b) 27                      c)  $\sqrt{3}$                       d) 3
7. If  $nP_r = 720nC_r$ , then the value of r is  
 a) 6                      b) 5                      c) 4                      d) 7
8.  $e^{\log x}$  is equal to  
 a) x                      b) 1                      c) e                      d)  $\log e^x$
9. Which of the following is the equation of a straight line that is neither parallel nor perpendicular to the straight line given by  $x + y = 0$   
 a)  $y = x$                       b)  $y - x + 2 = 0$                       c)  $2y = 4x + 1$                       d)  $y + x + 2 = 0$
10. The number of points in which two circles touch each other internally is  
 a) 1                      b) 2                      c) 0                      d) 3
11. When the terms of a G.P are written in reverse order the progression formed is  
 a) A.P                      b) G.P                      c) H.P                      d) A.P and H.P
12. Which of the following point lies inside the circle  $x^2 + y^2 - 4x + 2y - 5 = 0$   
 a) (5,10)                      b) (-5,7)                      c) (9,0)                      d) (1,1)
13. The angle  $290^\circ$  lie in which quadrant?  
 a) I                      b) II                      c) III                      d) IV

(2)

14.  $s(s-a)(s-b)(s-c) =$   
 a)  $\Delta$                       b)  $\Delta^2$                       c)  $2\Delta$                       d)  $\Delta/s$
15. The range of a function  $y = e^x$  is \_\_\_\_\_.  
 a)  $(-\infty, \infty)$                       b)  $(0, \infty)$                       c)  $[0, \infty)$                       d)  $\mathbb{R} - \{0\}$
16. Which of the following is a function which is 'onto' ?  
 a)  $f: \mathbb{R} \rightarrow \mathbb{R} : f(x) = x^2$                       b)  $f: \mathbb{R} \rightarrow [1, \infty) : f(x) = x^2 + 1$   
 c)  $f: \mathbb{R} \rightarrow \{1, -1\} : f(x) = \frac{|x|}{x}$                       d)  $f: \mathbb{R} \rightarrow \mathbb{R} : f(x) = -x^2$
17. The function  $y = \tan x$  is continuous at  
 a)  $x = 0$                       b)  $x = \frac{\pi}{2}$                       c)  $x = \frac{3\pi}{2}$                       d)  $x = -\frac{\pi}{2}$
18. The derivative of  $f(x) = x^2|x|$  at  $x = 0$  is  
 a) 0                      b) -1                      c) -2                      d) 1
19.  $\int \cot x dx =$  \_\_\_\_\_  
 a)  $\log \sin x$                       b)  $\sin x$                       c)  $\cos x$                       d)  $\log \sec x$
20.  $\int \frac{dx}{e^x} =$  \_\_\_\_\_  
 a)  $\log e^x + c$                       b)  $\frac{-1}{e^x} + c$                       c)  $\frac{1}{e^x} + c$                       d)  $x + c$

**Part - B**

7 x 2 = 14

- i) Answer any 7 questions.  
 ii) Question no.30 is compulsory.

21. Solve: 
$$\begin{vmatrix} x-1 & x & x-2 \\ 0 & x-2 & x-3 \\ 0 & 0 & x-3 \end{vmatrix} = 0$$

22. Find a unit vector in the direction of  $i + \sqrt{3}j$

23. In how many ways 10 persons may be arranged in a i) line ii) circle ?

24. Find the indicated terms of the following sequences whose  $n^{\text{th}}$  term is  $(a_5, a_7)$

$a_n = 2 + \frac{1}{n} ; a_5, a_7$

25. Find the equation of the straight line parallel to  $3x + 2y = 9$  and which passes through the point  $(3, -3)$

26. Find the principal value of  $\cos^{-1}(\frac{1}{2})$

- 27. Find  $A \times B$  and  $B \times A$  if  $A = \{1, 2\}$ ,  $B = \{a, b\}$
- 28. Find the positive integer  $n$  such that  $\lim_{x \rightarrow 3} \frac{x^n - 3^n}{x - 3} = 108$

29. Integrate the following :  $\int \frac{\tan x}{\cos x} dx$

30. Prove that  $\cos^4 A - \sin^4 A = \cos 2A$

**Part - C**

i) Answer any 7 questions.

7 x 3 = 21

ii) Question no.40 is compulsory.

- 31. If  $\vec{a}$  and  $\vec{b}$  are position vectors of points A and B respectively, then find the position vector of points of trisection of AB.
- 32. Using Binomial theorem, find the value of  $(101)^3$ .
- 33. Find 5 Geometric means between 576 and 9.
- 34. If the point  $P(5t-4, t+1)$  lies on the line  $7x - 4y + 1 = 0$ , find (i) the value of  $t$  (ii) the co-ordinates of P
- 35. Find the length of the tangent from  $(2, 3)$  to the circle  $x^2 + y^2 - 4x - 3y + 12 = 0$
- 36. If  $\tan \alpha = \frac{1}{2}$  and  $\tan \beta = \frac{1}{7}$ , show that  $\alpha + \beta = \frac{\pi}{4}$ .
- 37. The two functions  $f: R \rightarrow R$ ,  $g: R \rightarrow R$  are defined by  $f(x) = x^2 + 1$ ,  $g(x) = x - 1$ , find  $f \circ g$  and  $g \circ f$  and show that  $f \circ g \neq g \circ f$ .
- 38. Find  $\frac{dy}{dx}$  when  $x = a \cos^3 t$ ,  $y = a \sin^3 t$
- 39. Integrate the following with respect to  $x$ ,  $5x^4 + 3(2x + 3)^4 - 6(4 - 3x)^5$
- 40. If  $A = \begin{bmatrix} 3 & -5 \\ -4 & 2 \end{bmatrix}$ , show that  $A^2 - 5A - 14I = 0$  where  $I$  is the unit matrix of order 2.

**Part - D**

Answer all the questions:

7 x 5 = 35

41. Prove that 
$$\begin{vmatrix} a^2 + \lambda & ab & ac \\ ab & b^2 + \lambda & bc \\ ac & bc & c^2 + \lambda \end{vmatrix} = \lambda^2(a^2 + b^2 + c^2 + \lambda)$$

(OR)

Prove by factor method : 
$$\begin{vmatrix} b+c & a-c & a-b \\ b-c & c+a & b-a \\ c-b & c-a & a+b \end{vmatrix} = 8abc$$

42. The vertices of a triangle have position vectors  $4\vec{i} + 5\vec{j} + 6\vec{k}$ ,  $5\vec{i} + 6\vec{j} + 4\vec{k}$ ,  $6\vec{i} + 4\vec{j} + 5\vec{k}$ .  
Prove that the triangle is equilateral.

(OR)

Resolve into partial fractions :  $\frac{7x-1}{6-5x+x^2}$

43. Prove by Mathematical induction  $1^2 + 2^2 + 3^2 + \dots + n^2 = \frac{n(n+1)(2n+1)}{6}$ , for all  $n \in \mathbb{N}$

(OR)

If the 5<sup>th</sup> and 12<sup>th</sup> terms of a H.P are 12 and 5 respectively. Find the 15<sup>th</sup> term.

44. Find the co-ordinates of orthocentre of the triangle formed by the straight lines  $x - y - 5 = 0$ ,  $2x - y - 8 = 0$  and  $3x - y - 9 = 0$

(OR)

Find the equation of the circle passing through the points (1,0), (0,-1) and (0,1)

45. If  $A + B = 45^\circ$ , show that  $(\cot A - 1)(\cot B - 1) = 2$  and deduce the value of  $\cot 22\frac{1}{2}^\circ$

(OR)

Find the value of  $\sin 18^\circ$

46. If  $x$  is real, prove that the range of  $f(x) = \frac{x^2 - 2x + 4}{x^2 + 2x + 4}$  is between  $\left[\frac{1}{3}, 3\right]$

(OR)

Integrate the following :

i)  $\int 5x^4 e^{x^5} dx$       ii)  $\int \frac{e^x}{5 + e^x} dx$

47. If  $y = (x^3 - 1)$ , prove that  $x^2 y_3 - 2x y_2 + 2y_1 = 0$

(OR)

Prove that  $\lim_{\theta \rightarrow 0} \frac{\sin \theta}{\theta} = 1$

\*\*\*\*\*

S. Saravana kumar

Teacher

Mary Ann Mat. Hr. Soc. Sch

K. pudur, Madurai-7