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| **FE/MA/1119A 01/03/2020** |

**EEE CONSORTIUM**

**FINAL EXAMINATION (2019-20)**

**Subject- Mathematics**

**Class- XI**

Time:- 3 hours Maximum Marks- 80

**General Instructions:-**

1. All questions are compulsory
2. This question paper contains **36** questions.
3. Question **1 – 20** in **Section A** are very short–answer type questions carrying **1** mark each.
4. Question **21-26** in **Section B** are short-answer type questions carrying **2** marks each.
5. Question **27-32** in **Section C** are long –answer-I type questions carrying **4** marks each.
6. Questions **33-36** in **Section D** are long-answer-II type questions carrying **6** marks each.

**Section- A**

**(*Question numbers 1 to 20 carry 1 mark each*)**

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| **MULTIPLE CHOICE QUESTIONS**  Select the correct option out of the four possible options given after the statement of the Question: |

1. Find the domain of the function R a) R b) (0,1) c) [0,1) d) [1, )
2. If where a and b are integers , f ( -1 ) = -5 and f (3) = 3 , then a and b are equal to

a) 2 ,3 b) 2 , -3 c) 2, 2 d) 3, -3

1. Value of is a) 2 b) -2 c) 1 d) -1
2. Value of sin40º. cos 10º - cos40º. sin 10º is a) b) c) d)
3. According to principle of mathematical induction, if P(k+1) = m(k+1) + 5 is true then \_\_\_\_\_ must be truea) P(k) = 3m(k)  
   b) P(k) = m(k) + 5  
   c) P(k) = m(k+2) + 5  
   d) P(k) = m(k)
4. Solution set of the inequalities 3*x* -7 5 + x and 11- 5*x* 1 is a) -1≤*x*≤ 2 b) -2≤*x*≤ 2 c) *x*≤ 2 d)*x* ≥ 2
5. Value of if = is a) 20 b)14 c)10 d)5
6. Given that the coefficients of 3rth and ( r + 2)thterms in the binomial expansion ( 1+ x) 2n are equal. Then

a) n = 2r b) n = 3r c) n = 2r + 1 d) None of these

1. The 4th term of a G.P. is the square of its second term, and the first term is -3. Determine its 5th term

a) -850 b) - 243 c) -81 d) - 512

1. If x, y, z are in A.P then, (x + 2y – z) (2y + z – x) (z + x + y) =

a) 4*xyz* b) 2*xyz* c) 12*xyz* d) 3*xyz*

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| **FILL IN THE BLANKS**  Complete the following statements with appropriate answer(s) in the blank space(s) : |

1. The equation of straight line parallel to x-axis and passing through the point ( 2, -7) is --------------

**(OR)**

The area of triangle formed by the co-ordinate axes and the straight line *2x + 3y* = 6 is -------------

1. Latus rectum of the hyperbola is …………………
2. Length of the latus rectum of the ellipse + =1 is ------------------
3. Let A, B,C be the feet of perpendiculars from a point P on the x, y, z-axis respectively. Coordinates of B is……………. where P is (-5,3,7)
4. If the distance between A , 2 ,1 ) and B ( 1, -1, 1) is 5 , then = …….

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| **VERY SHORT ANSWER QUESTIONS**  Each of the following questions have to be answered in one word or one sentence or as per the exact requirement of the question : |

1. Find the derivatives of
2. Find
3. Coefficients of variation of a distribution is 70, and its standard deviations is 16. What is its arithmetic means?

Find the mean deviation from the median: 12, 5, 14, 6, 11

1. In a lot of 12 Microwave ovens, there are 3 defective units. A person has ordered 4 of these units and since each is identically packed, the selection will be random. What is the probability that exactly 3 units are good.
2. While shuffling a deck of cards accidently two cards are dropped down. Find the probability that the missing cards are of different colour.

**Section- B**

**(*Question numbers 21 to 26 carry 2 marks each*)**

1. Let R be a relation from Q to Q defined by R = { and } . Show that a) for all b) implies that

**(OR)**

Let  be a function from R to R. Determine the range of

1. Find the 7th term from the end in the expansion of 

**(OR)**

Find the coefficient of *x*10 in the expansion of 

1. Find the equation of the straight line which passes through the point (5, 6) and has intercepts equal in magnitude but opposite in sign. Find also the co-ordinates of the point at which the ordinate is double of the abscissa
2. Evaluate
3. A committee of two persons is selected from two men and two women. What is the probability that the committee will have no man?

**(OR)**

The letters of the word SOCIETY are placed at random in a row. What is the probability that the three vowels come together?

1. In a lottery 10000 tickets are sold and ten equal prizes are awarded. What is the probability of not getting a prize if you buy i) one ticket ii) two tickets iii) 10 tickets

**Section- C**

**(*Question numbers 27 to 32 carry 4 marks each*)**

1. Find the general solution of the equation *sin2x + sin 4x + sin 6x* = 0

**(OR)**

Prove that sin10 sin50 sin60 sin 70 =

1. Prove by Principal of Mathematical Induction that 4n + 15n – 1 is divisible by 9, for all
2. Solve the following system of inequalities graphically:***(Use graph paper)***
3. Find the number of arrangements of the letters of the word INDEPENDENCE. In how many of these arrangements

i) do the words start with P

ii) do all the vowels always occur together

iii) do all the vowels never occur together

iv) do the words begin with I and end in P?

**(OR)**

What is the number of ways of choosing 4 cards from a pack of 52 playing cards? In how many of these- i) four cards are of the same suit

ii) four cards belong to four different suits iii) are face cards iv) two are red cards and two are black cards

1. The grinder of a railway bridge is in the form of a parabolic arch with a vertical axis. The bridge is 10 m high and 5 m wide at the base. How wide is it 2 m from the vertex of the parabola?
2. Find the distance of the point (1,2,0) from the point where the line joining A (2, -3,1) and B(3,-4,-5) cuts the plane *2x + y + z* = 7.

**Section- D**

**(*Question numbers 33 to 36 carry 6 marks each*)**

1. Find the sum up to n terms of the series: 
2. A ray of light passing through the point (1, 2) reflects on the axis at point A and the reflected ray passes through the point (5, 3). Find the coordinates of A.

**(OR)**

Prove that the product of the lengths of the perpendiculars drawn from the points and to the line , is

1. Find the derivative of by first principle

(OR)

Prove that: = - 4

1. The mean and standard deviation of 20 observations are found to be 10 and 2, respectively. On checking, it was found that an observation 8 was incorrect. Calculate the correct mean and standard deviation in each of the following cases: (i) If wrong item is omitted (ii) If it is replaced by 12.

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ANSWER KEY (Set-2)

Class- XI Subject- Mathematics

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| Sl.No. | Value points/ Solutions/ Answer | M |
| 1 | [1, )**( Ans.- d**) | 1 |
| 2 | 2 , -3 **( Ans.- b**) | 1 |
| 3 | -1 **( Ans.-d)** | 1 |
| 4 | **( Ans.-b)** | 1 |
| 5 | P(k) = m(k) + 5**( Ans.-b)** | 1 |
| 6 | **( Ans.-b)** | 1 |
| 7 | **( Ans.-c)** | 1 |
| 8 | **( Ans.-a)** | 1 |
| 9 | -243**( Ans.-b)** | 1 |
| 10 | 12**( Ans.-c)** | 1 |
| 11 | y+7=2  OR  6 sq.units | 1 |
| 12 |  | 1 |
| 13 | 9 | 1 |
| 14 | B (0,3,0) | 1 |
| 15 | 5 or -3 | 1 |
| 16 |  | 1 |
| 17 |  | 1 |
| 18 | = 22.85  **(OR)**  2.5 | 1  1 |
| 19 | Since a number greater then 5000 is formed so leftmost numbers are 7 or5.  The remaining 3 digits can be filled by digits 0, 1 , 3 , 5and 7 as repetition of digit is allowed.  So total number of 4 digits to make a number greater than 5000 = 2X 5X5X5 -1   * 250 -1 =249   Number is divisible by 5 if unit place has digits 0 or 5.  Total number of digits divisible by 5 is 2 X 5 x 5 x1 -1= 99  So probability = = | 1 |
| 20 | S = 6 +4 +8 = 18  n(S) = 18C3 = 816  E1 – Event all the three balls are red  n(E1)= 6C3 = 20  P(E1)= = | 1 |
| 21 | (a) R = { (a,b) : a,b N and a = b2 }  Since 2 but 2 22 => 2 4  So it is not true that (a, a) R for all a N  (b) Let (9 ,3 ) because 9 = 32 but (3 ,9) does not part of R because 3 92  So it is not true that (a, b ) R implies that (b, a) R.  **OR**  Let  Since x R, 0 🢧 0 🢧 0  🢧 . Hence Range of f = [0, 1) | 1+1  1+1 |
| 22 | T7 = 8C6()(2x2)6  = 28 x x 26 x x12  =4032 x10  **(OR)**  Tr = 20Cr(2x2)20-r ()  X40-3r = x10  R = 10  Coeff= 20C10210 | 1  1  1  1 |
| 23 | Let the equation of the given straight line be + = 1  By question, b = -a; hence, equation (1) reduced to x- y =a  Since line(2) passes through the point (5, 6) hence,  5 – 6 = a or a = -1  Therefore, the equation of required straight lie is x – y = -1 or x – y + 1 = 0.  Now, we are to find the co-ordinates of the point at which the ordinate is double the abscissa.  So, let the point be (a, 2a) and it lies on the line x – y + 1 = 0 | 1  1 |
| 24 | We have,  =  =  = | 1  1 |
| 25 | Total number of ways  No man  P(no man) = =  **(OR)**  Number of ways vowels come together = 5!.3!  Total number of ways 7!  P(E) = = | 1  1  1  1 |
| 26 | In a lottery 10000 tickets are sold and ten equal prizes are awarded. What is the probability of not getting a prize if you buy i) one ticket ii) two tickets iii) 10 tickets   1. Probability of not getting price if he buys one ticket= 2. Probability of not getting price if he buys 2 tickets= | 1  1 |
| 27) | . Find the general solution of the equation sin2x + sin 4x + sin 6x = 0  Sin2x + sin6x + sin4x =0  2sin4xsin2x + sin 4x = 0  Sin4x (2sin2x+1)= 0  Sin4x =0 or sin2x = - = sin (π+)  X = nπ /4 or x = nπ + (1)n  OR  Prove that sin10 sin50 sin60 sin 70 =  sin10 sin50 sin 70  sin10  sin10  = sin10  = | 1  1  1  1  1  2  1 |
| 28) | P (1) is true  4+15-1=18=9(2)  P (1) is true  Assume P(k) is true i.e.  4K+15k – 1 = 9(m), m  4K= -15k + 1 + 9(m)  To prove P(k+1) is true i.e.  4K+1+15(k+1) – 1 = 9(n), n  4.4K+15(k+1) – 1 = (9m-15k+1)4+15k+15-1  = 36m-60k+4+15k+14  = 36m-45k+18  = 9(4m-5k+18)  9(n) n  P(n) is true | 1  1  1  1 |
| 29) | ……(1)  ……(2)  ……(3)  The graphs of linear equations =10; = 1; =0 are drawn below.  Inequality (1) represents the region below the line, + 2 = 10 (including the line  + 2 = 10). Inequality (2) represents the region above the line, + = 1 (including the line + = 1). Inequality (3) represents the region above the line, – = 0 (including the line – = 0).  Since ≥ 0 and ≥ 0, every point in the common shaded region in the first quadrant including the points on the respective lines and the axes represents the solution of the given system of linear inequalities. | For table 2  For shading 2 |
| 30) | There are 12 letters, of which N appears 3 times, E appears 4 times and D appears 2 times and the rest are all different. Therefore  The required number of arrangements =   1. The required number of words starting with P are = . 2. Using multiplicative principle, the required number of arrangements= 3. The required number of arrangements = the total number of arrangements (without any restriction) – the number of arrangements where all the vowels occur together   = 1663200 –16800 = 1646400   1. The required number of arrangements =   **OR**  There will be as many ways of choosing 4 cards from 52 cards as there are combinations of 52 different things, taken 4 at a time. Therefore  The required number of ways = 52C4 = = = 270725   1. The required number of ways = 13C4 + 13C4 +13C4 +13C4   =4! =2860   1. The required number of ways are = 13C113C113C113C1   = 134   1. The required number of ways are 12C4 = 2. The required number of ways are = 26C2 x 26C2   = .   1. The required number of ways are = 26C4 + 26C4   = | 1  1  1  1  1  1  1  1 |
| 31) | This parabola has its axis on the y axis and it opens downward. so it  equation is of the type  x 2 = - 4 a y    The top of the parabola is its vertex passing through the origin. The width of the base is 5 mt, therefore the coordinates of the points P and Q are (-2.5, -10) and (2.5, 10) respectively. P and Q lie on the parabola.  Substituting the ccordinates of the point P in the equation of the  parabola, we have  (-2.5) 2 = -4a (-10)  6.25 = 40 a  a = =  Let 2w be the width of the arch at 2 m below the vertex. Therefore the coordinates of the points A and B A (-w, -2) and B (w, -2)  A and B lie on the parabola.  Substituting the coordinates of the point A in the equation of the parabola, we have  w 2 = - 4 () (-2)  w2=  w = x 0.5  2w= 2.23m | 1  1  1  1 |
| 32) | A (1,2,0)  Let the ratio be K:1  B (,,)  It cuts the line  2 (+)=7  6k+4-4k-3-5k+1=7k+7  -5=10k  K=-1/2  B (1, -2,7)  AB = = units | 1  1  1  1 |
| 33) | Tn= =  = = =  = =  Sn=  =  =  = | 1  1  1  1  1  1 |
| 34) | Let the coordinates of point A be (a, 0). Draw a line (AL) perpendicular to the x-axis. We know that angle of incidence is equal to angle of reflection. Hence, let ∠BAL = ∠CAL = Φ Let ∠CAX = θ ∴∠OAB = 180° – (θ + 2Φ) = 180° – [θ + 2(90° – θ)] = 180° – θ – 180° + 2θ = θ ∴∠BAX = 180° – θ  Now slope of line AC  …..(1)  Slope of the line AB =  …(2)  From equations (1) and (2), we obtain  Thus the coordinates of point A ).  **OR**  The perpendicular distance 1 from and 2 from to the line .  1 2  12 =  =  =  =  =  = . | 1  1  1  1  1  1  1  1  1  1  1  1 |
| 35) | , f(x+h) =  [f(x)] = lim  =  =  =  =  =  = =  **(OR)**  = -  = - | 1  1  1  1  1  1  1  1  1  1  1  1 |
| 36) | Given observed mean = 10 and observed S.D.= 2 = 10  Observed sum of the observation= 200 ………………..(1)  Also = 🢧 Observed sum of squares = 20 = 2080 ………………..(2)   1. When the wrong entry is omitted then the correct sum of remaining 19 observation= 200- 8 = 192 and correct sum of squares of remaining 19 observations = 2016   So correct mean = = 10.1  And correct S.D.= = 1. 997   1. When the incorrect entry 8 is replaced by 12, then correct sum = 200- 8 + 12 = 204 and correct sum of squares = 2080 – 64 + 144 = 2160   Therefore correct mean = = 10.2 and correct S.D.= = 1.99 | 1  1  2  2 |