INSTITUTE OF MATHEMATICS EDUCATION, THANE

JMO / HPR LEV / 02022020 / VII / VIII (7) (8) **Marks 100**

Time : 2 Hours : 10.00 To 12.00

Full Name of the Student (Use CAPITAL letters in each box)

Residential Postal Address

Pin Code : _____

School Name (In short)

Place / City : _____ District : _____

Seat No:

Invigilator's Signature:

Instructions :

1. **Attempt all questions. Ensure that there are 13 questions in this question paper.**
2. **Write solution with explanation or steps in the space provided below for each question.**
3. **Separate answerbook or sheet is not allowed. Use provided space given in the page and also last blank pages for rough work.**
4. **Use of calculator is prohibited.**

Q. No.	Actual Score	Out of
1		6
2		6
3		6
4		6
5		6
6		8
7		8
8		8
9		8
10		8
11		10
12		10
13		10
Total Marks		100
Examiner's Signature		

Q. 1. Show that 2^3 always divides the product of sum and difference of two odd natural numbers. (6 marks)

<u>Solution with explanation</u> :-

(For Rough work)

Q. 2. If (x + 2) (x + 4) (x + 6) (x + 8) = 945 and x is an integer, then find values of x.
(6 marks)

Solution with explanation :-

Ans. **x =**

(For Rough work)

Q. 3. Find domain and range of the function $f(x) = \dfrac{2x^2 - x}{2x - 3x^2}$. **(6 marks)**

Solution with explanation :-

Ans. **Domain**

Range

(For Rough work)

Q. 4. In a triangle ABC, $\frac{2\cos A}{a}+\frac{\cos B}{b}+\frac{2\cos C}{c}=\frac{a}{bc}+\frac{b}{ac}$, where a, b and c are lengths of sides opposite vertices A, B and C. Prove that $\angle A = 90°$. (6 marks)

<u>Solution with explanation</u> :-

(For Rough work)

Q. 5. Find the sum of even divisors of 2020. **(6 marks)**

Solution with explanation :-

Ans.

(For Rough work)

Q. 6. If the coefficients of the second, third and fourth terms in the expansion of $(1 + x)^{2n}$ are in arithmetic progression, then find the value of n. (8 marks)

<u>Solution with explanation</u> :-

Ans. **n =**

(For Rough work)

Q. 7. An examination consists of 160 questions. One mark is given for every correct answer. If one fourth mark is deducted for every wrong answer and half mark is deducted for every question left unsolved, the student scores 79 marks. However, if half mark is deducted for every wrong answer and one fourth mark is deducted for every question left unsolved, then the student scores 76 marks. Find the number of questions student attempted correctly, solved wrong and left unsolved.

(8 marks)

Solution with explanation :-

Ans. Number of questions students attempted.

Correctly	Wrongly	Unsolved

Q. 8. LCM of a and 36 is 900. Write all possible values of a. GCD of b and 36 is 9. Write any five possible values of b. Here a, b ∈ N. 'A' is the largest possible value of 'a' less than 900 and 'B' is the smallest possible value of 'b' greater than 9. Find LCM and GCD of A and B. (8 marks)

Solution with explanation :-

Ans. **LCM =** **GCD =**

(For Rough work)

Q. 9. Let ΔABC be an acute angled triangle and CD be the altitude through C. If AB = 8 units and CD = 6 units, find the distance between the mid point of BC and mid point of AD. (8 marks)

Solution with explanation :-

Ans.

(For Rough work)

Q.10. Study the following number series and find the next two numbers in each series. **(8 marks)**

(i) H_{17} = 476, 629, 782, 935, 1088, ……..
(ii) H_{21} = 399, 588, 777, 966, 2289, ……..

<u>Solution with explanation</u> :-

Ans. **(i)** _____ , _____ **(ii)** _____ , _____

(For Rough work)

Q. 11.(i) In how many ways, letters of the word 'SANTANU' can be arranged?
(ii) In how many arrangements, two A's are not together?
(iii) In how many arrangements, neither two A's nor two N's are together?
(10 marks)

Solution with explanation :-

Ans. **(i)** | **(ii)** | **(iii)**

(For Rough work)

Q. 12. Three circles C_1, C_2, C_3 with radii r_1, r_2, r_3 ($r_1 < r_2 < r_3$) respectively are given. They are placed such that C_2 lies to the right of C_1 and touches it externally. C_3 lies to the right of C_2 and touches it externally. Further there exists two straight lines each of which is a direct common tangent simultaneously to all three circles. **(10 marks)**

(i) Draw figure (Draw rough sketch without using compass)

(ii) Find value of $\frac{r_2 - r_1}{r_2 + r_1}$ in terms of r_2 and r_3

(iii) Prove that $r_2^2 = r_1 r_3$

<u>Solution with explanation</u> :-

Ans. (ii)

Q. 13.Find the remainder if $^{20}C_{10}$ is divided by 169. **(10 marks)**

Solution with explanation :-

Ans.

(For Rough work)

(For Rough work)

(For Rough work)