INTERNATIONAL INDIAN SCHOOL , DAMMAM

MODEL EXAMINATION 2012 – 2013

GRADE – 11

TIME : 3 HOURS **SUBJECT : MATHEMATICS** **Max. Marks : 100**

SET – A

General Instructions

1. All questions are compulsory.

2. The question paper consists of **29** questions divided into sections **A, B** and **C**. Section **A** comprises of **10** questions of one mark each, Section **B** comprises of **12** questions of four marks each and Section C comprises of **07** questions of six marks each.

3. All questions in Section A are to be answered in one word, one sentence or as per the exact requirement of the question.

4. There is no overall choice. However, internal choice has been provided in **04** questions of four marks each and **02** questions of six marks each. You have to attempt only one of the alternatives in all such questions.

5. Use of calculator is not permitted. You may ask for logarithmic tables , if required.

SECTION – A

1. Use geometric series to express 0.555555… as a rational number.

2. Write the component statements of the statement " If a triangle ABC is equilateral , then it is isosceles ."

3. List all the elements of the set B = { x : x is an integer, $x^2 \le 9$. }

4. Express $\left(-2 - \dfrac{1}{3} i \right)^3$ in the form a + ib.

5. Find the equation of the line, which makes intercepts -3 and 2 on the x- and y- axes respectively.

6. Let A = { 1, 2, 3, 4, 6 } . Let R be the relation on A defined by { (a , b) : a, b $\in$ A , b is exactly divisible by a } . Write R in roster form.

7. Write the contrapositive of the statement " x is an even number implies that x is divisible by 4 . "

8. Write the following in the form ' if p then q '
   " It never rains when it is cold "

9. Find the derivative of (sin x + cos x) at $x = \dfrac{\pi}{4}$.

10. Evaluate $\lim_{x \to 1} \dfrac{x^{15} - 1}{x^{10} - 1}$

SECTION – B

11. Draw the graph of $f(x) = \dfrac{1}{x}$, $x \neq 0$. Also find its domain and range.

12. Prove that
$$\cos 2x \cos \frac{x}{2} - \cos 3x \cos \frac{9x}{2} = \sin 5x \sin \frac{5x}{2}.$$

13. By using the Principle of Mathematical Induction , prove that for all $n \in N$.
$$1.3 + 2.3^2 + 3.3^3 \;....\; + n.3^n = \frac{(2n-1)\,3^{n+1} + 3}{4}.$$

OR

By using the Principle of Mathematical Induction , prove that for all $n \in N$.
$3^{2n+2} - 8n - 9$ is divisible by 8.

14. Let S be the sum , P the product and R the sum of reciprocals of n terms in a GP. Prove that $P^2 R^n = S^n$.

OR

Between 1 and 31 , m numbers have been inserted in such a way that the resulting sequence is an A.P. and the ratio of 7th and $(m - 1)^{th}$ numbers is 5 : 9. Find the value of m.

15. Prove that $\cos 6x = 32 \cos^6 x - 48 \cos^4 x + 18 \cos^2 x - 1$.

16. Find the equation of the hyperbola where foci are $(0, \pm 12)$ and the length of the latus rectum is 36.

OR

The cable of a uniformly loaded suspension bridge hangs in the form of a parabola. The roadway which is horizontal and 100 m long is supported by vertical wires attached to the cable , the longest wire being 30 m and the shortest being 6 m. Find the length of a supporting wire attached to the roadway 18m from the middle.

17. Solve the following system of linear inequalities graphically
$x + 2y \leq 8$, $2x + y \geq 2$, $x - y \leq 1$, $x \geq 0$, $y \geq 0$.

18. If $x + iy = \dfrac{a + ib}{a - ib}$, prove that $x^2 + y^2 = 1$.

OR

Convert the complex number $\dfrac{-16}{1 + i\sqrt{3}}$ into polar form.

19. A committee of 5 is to be formed out of 6 gents and 4 ladies. In how many ways this can be done when

    i.   At least two ladies are included
    ii.   At most two ladies are included

20. Using section formula, prove that the three points $(-4, 6, 10)$, $(2, 4, 6)$ and $(14, 0, -2)$ are collinear.

21. Find the derivative of $\dfrac{sinx + x\ cosx}{sinx - cosx}$ with respect to x.

22. If the different permutations of all the letter of the word EXAMINATION are listed as in a dictionary, how many words are there in this list before the first word starting with E ?

SECTION – C

23. In a $\triangle$ ABC, prove that

$$\left(\frac{b^2 - c^2}{a^2}\right) \sin 2A + \left(\frac{c^2 - a^2}{b^2}\right) \sin 2B + \left(\frac{a^2 - b^2}{c^2}\right) \sin 2C = 0.$$

OR

Find the general solution of $\sin\theta + \sin2\theta + \sin3\theta + \sin4\theta = 0$.

24. A survey of 500 television viewers produced the following information ; 285 watch football, 195 watch hockey, 115 watch basketball, 45 watch football and basketball, 70 watch football and hockey, 50 watch hockey and basketball, 50 do not watch any of the three games. How many watch all the three games ? How many watch exactly one of the three games ?

25. Show that

$$\frac{1 \cdot 2^2 + 2 \cdot 3^2 + 3 \cdot 4^2 + \ldots + n\ terms}{1^2 \cdot 2 + 2^2 \cdot 3 + 3^2 \cdot 4 + \cdots + n\ terms} = \frac{3n+5}{3n+1}$$

26. A line is such that its segment between the lines $5x - y + 4 = 0$ and $3x + 4y - 4 = 0$ is bisected at the point $(1, 5)$. Obtain its equation.

27. Find n, if the ratio of the fifth term from the beginning to the fifth term from the end in

the expansion of $\left(\sqrt[4]{2} + \dfrac{1}{\sqrt[4]{3}} \right)^n$ is $\sqrt{6} : 1$.

OR

Find the coefficient of x^5 in the product $(1 + 2x)^6 (1 - x)^7$ using binomial theorem.

28. Two students Ravi and Sabha appeared in an examination. The probability that Ravi will qualify the examination is 0.05 and that Sabha will qualify the examination is 0.10 . The probability that both will qualify the examination is 0.02. Find the probability that
   a. Both Ravi and Sabha will not qualify the examination.
   b. At least one of them will not qualify the examination.
   c. Only one of them will qualify the examination.

29. The following table gives the distribution of income of 100 families in a village. Calculate the mean , variance and standard deviation :

Income(Rs)	0 - 1000	1000-2000	2000-3000	3000-4000	4000-5000	5000-6000
No. of families	18	26	30	12	10	4