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INTERNATIONAL INDIAN SCHOOL – DAMMAM
MODEL EXAMINATION JANUARY - 2018

GRADE XI

Subject : Mathematics **Max marks : 100**
Time : 3 hours

SET A

General Instructions:

1. *All questions are compulsory.*
2. *The question paper consists of 29 questions divided into three sections A, B, C and D*
3. *Section A contains 4 questions of 1 mark each, Section B contains 8 questions of 2 marks each, Section C contains 11 questions of 4 marks each and Section D contains 6 questions of 6 marks*
4. *There is no overall choice in the paper. However, internal choice is provided in three questions of 4 marks each and 2 questions of 6 marks each.*
5. *Use of calculators is not permitted.*

SECTION A

1. Evaluate $\lim_{x\to 5}\frac{e^x-e^5}{x-5}$
2. Find the component statements of the compound statement
   "All rational numbers are real and all real numbers are complex."
3. If P = {1, 2}, Find $P \times P \times P$
4. Find the multiplicative inverse of 4 – 3i

SECTION B

5. Evaluate $\lim_{x\to 0}(cosecx - cotx)$
6. In how many ways can a football team of 11 players be selected from 16 players so that 2 particular players are always excluded.
7. State the converse and contrapositive of the statement
   p : If a number is divisible by 10, it is divisible by 5.
8. How many different words can be formed by using the letters of the word **ALLAHABAD**, so that both L's do not come together.

9. Given that P(3, 2, -4), Q(5, 4, -6) and R(9, 8, -10) are collinear. Find the ratio in which Q divides PR.

10. 100 students appeared for two examinations. 60 passed the first, 50 passed the second and 30 passed both. Find the probability that a student selected at random has passed at least one examination.

11. If the origin is the centroid of the triangle PQR with vertices P(2a, 2, 6), Q(-4, 3b, -10) and R(8, 14, 2c), then find the values of a, b and c.

12. In how many ways can the letters of the word **INDEPENDENCE** be arranged if all the words start with **N** and end with **P.**

SECTION C

13. Find the general solutions of
$2cos^2x = 3(1 - sinx)$

14. If $U = \{x : x \in N,\ x \leq 12\}$, $A = \{x :$ xis an odd natural number$\}$, $B = \{x : x \in N, x \leq 8\}$ and $C = \{x : x \in N,$ x is a multiple of 3$\}$
Verify that $A - (B \cap C) = (A \cap B') \cup (A \cap C')$

15. Prove by using the principle of mathematical induction for all n$\in N$

$$\frac{1}{2.5}+\frac{1}{5.8}+\frac{1}{8.11}+...+\frac{1}{(3n-1)(3n+2)}=\frac{n}{6n+4}$$

OR

Prove by using the principle of mathematical induction for all n$\in N$

$$10^{2n-1}+1 \text{ is divisible by } 11.$$

16. Find the coordinates of the foci, the vertices, the length of major axis, the minor axis, the eccentricity and the length of the latus rectum of the ellipse $4x^2 + 36y^2 = 144$

17. Find the derivative of $\frac{x\ tanx}{secx+tanx}$

OR

Find the derivative of $f(x) = secx$ from the first principle.

18. The sum of two numbers is 6 times their geometric mean, show that the numbers are in the ratio $(3 + 2\sqrt{2}):(3 - 2\sqrt{2})$

19. In the triangle ABC with vertices A(2, 3), B(4,-1) and C(1, 2), find the equation and length of altitude from the vertex A.

20. If $(x+iy)^{\frac{1}{3}}$ = a + ib, then show that $\frac{x}{a}+\frac{y}{b}=4(a^2-b^2)$

OR

Find the square root of $-5-8i$

21. Prove that $2cos\frac{\pi}{13}cos\frac{9\pi}{13}+cos\frac{3\pi}{13}+cos\frac{5\pi}{13}=0$

22. A college awarded 38 medals in football, 15 in basket ball and 20 in cricket. If these medals went to a total of 58 men and only three men got medals in all the three sports, how many received medals in exactly two of the three sports? What is the importance of sports in education?

23. Five marbles are drawn from a bag which contains 7 blue marbles and 4 black marbles. What is the probability that (i) all will be blue (ii) 3 will be blue and 2 black.

SECTION D

24. Solve the following system of inequalities graphically
$2x+y\geq 4,\ \ x+y\leq 3,\ \ 2x-3y\leq 6$

25. Find a, b and c in the expansion of $(a+b)^n$ if the first three terms of the expansion are 729, 7290 and 30375 respectively.

26. Find the sum of the following series up to n terms:
$\frac{1^3}{1}+\frac{1^3+2^3}{1+3}+\frac{1^3+2^3+3^3}{1+3+5}+\ ...$

OR

Show that $\frac{1\times2^2+2\times3^2+...\ n\times(n+1)^2}{1^2\times2+2^2\times3+...\ n^2\times(n+1)}=\frac{3n+5}{3n+1}$

27. Calculate the mean, variance and standard deviation for the following distribution

Classes	30 – 40	40 – 50	50 – 60	60 – 70	70 - 80	80 - 90	90 – 100
Frequency	3	7	12	15	8	3	2

28. Prove that $cos^2x+cos^2\left(x+\frac{\pi}{3}\right)+cos^2(x-\frac{\pi}{3})=\frac{3}{2}$

OR

Find $sin\frac{x}{2},\ cos\frac{x}{2},\ tan\frac{x}{2}\ if\ \ tanx=-\frac{4}{3}\ ,\ x\ is\ in\ quadrant\ III$

29. a) Draw the graph of the function $f(x)=x^2-2$. Also find its domain and range.
b) Find the range of the greatest integer function $f(x)=[x], x\in R$.