

BRILLIANT EDUCATION CENTRE, DOHA, QATAR
ANNUAL EXAMINATION –FEBRUARY 2016
CLASS: XI

Subject: Mathematics.

Time Allowed: 3 hours

Maximum Marks:100

General Instructions:

- All questions are compulsory.
- This question paper consists of **29** questions.
- Question **1-4** in **Section A** are Very Short-Answer type questions carrying **1** mark each.
- Question **5-12** in **Section B** are Short-Answer type questions carrying **2** marks each.
- Question **13-23** in **Section C** are Long-answer type-I questions carrying **4** marks each.
- Question **24-29** in **Section D** are Long-answer type-II questions carrying **6** marks each.
- There is no overall choice. However, internal choice has been provided for **3** questions of **4** marks each and **2** questions of **6** mark each. You have to attempt only one of the alternatives in all such questions.
- Use of calculators is not permitted.

Section - A

1. Find the distance of (1, -2, 7) from the y-axis.
2. If $A = \{-1, 1\}$, then find $A \times A \times A$
3. The probability that a student will pass the final exam in both English and Hindi is 0.5. The probability of passing neither is 0.1. If the probability of passing the English exam is 0.75. What is the probability of passing Hindi exam?
4. Write the negation of the statement “ $\sqrt{2}$ is a complex number”.

Section - B

5. If the coefficient of the $(r-5)^{\text{th}}$, $(2r-1)^{\text{th}}$ terms in the expansion of $(1+x)^{34}$ are equal. Find r .
6. In how many ways can 5 girls and 3 boys be seated in a row so that no two boys are together?

7. Find $\lim_{x \rightarrow \frac{\pi}{2}} \frac{\tan 2x}{x - \frac{\pi}{2}}$.

8. Find the 4th term from the end in the expansion of $\left(\frac{3}{x^2} - \frac{x^3}{6}\right)^7$.
9. A rod of length 12 cm moves with its ends always touching the coordinate axes. Determine the equation of the locus of a point P on the rod, which is 3 cm from the end in contact with the x-axis
10. Find n , if ${}^{n-1}P_3 : {}^n P_4 = 1 : 9$.
11. If $a + ib = \frac{x+1}{2x+i}$, prove that: $a^2 + b^2 = \frac{(x+1)^2}{4x^2 + 1}$.
12. Using section formula, show that the points A (2, -3, 4), B (-1, 2, 1) and (0, 1/3, 2) are collinear.

Section - C

13. In a survey of 60 people, it was found that 25 people read newspaper H, 26 read newspaper T, 26 read newspaper I, 9 read both H and I, 11 read both H and T, 8 read both T and I, 3 read all three newspapers. Find: (i) the number of people who read at least one of the newspapers.
(ii) the number of people who read exactly one newspaper.

OR

In a survey of 400 students in a school, 100 were listed as taking apple juice, 150 as taking orange juice and 75 were listed as taking both apple as well as orange juice. Find how many students were taking neither apple juice nor orange juice.

14. Find the range of each of the following functions :
- (i) $f(x) = 1 - |x - 2|$ (ii) $f(x) = \frac{x^2 - 9}{x - 3}$.
15. The letters of the word WOMAN are written in all possible orders and these words are written out as in a dictionary ,then find the rank of the word 'WOMAN'.
16. Find the coordinates of the foci and the vertices, the eccentricity, the length of the latus rectum of the hyperbola: $49y^2 - 16x^2 = 784$.
17. Solve the equation: $\tan x + \tan 2x + \sqrt{3}\tan x \tan 2x = \sqrt{3}$.

18. Find the modulus and argument of the complex number $Z = \frac{1+7i}{(2-i)^2}$. Hence convert it into polar form.

19. Prove by the principle of mathematical induction that for all $n \in \mathbb{N}$:

$$\frac{1}{1.4} + \frac{1}{4.7} + \frac{1}{7.10} + \dots + \frac{1}{(3n-2)(3n+1)} = \frac{n}{3n+1}.$$

OR

Prove that: $3^{2n+2} - 8n - 9$ is divisible by 8 for all $n \in \mathbb{N}$

20. Show that: $\frac{1 \times 2^2 + 2 \times 3^2 + \dots + n \times (n+1)^2}{1^2 \times 2 + 2^2 \times 3 + \dots + n^2 \times (n+1)} = \frac{3n+5}{3n+1}$.

21. The 3rd, 4th and 5th terms in the expansion of $(x+a)^n$ are respectively 84, 280 and 560, find the values of x , a and n .

OR

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

22. Find the distance of the point (2,5) from the line $3x+y+4=0$ measured parallel to the line having slope $\frac{3}{4}$.

23. 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 (i) all 4 unit are good. (ii) exactly 3 units are good (iii) at least 2 units are good.

Section - D

24. Prove that: $\frac{\cos 8A \cos 5A - \cos 12A \cos 9A}{\sin 8A \cos 5A + \cos 12A \sin 9A} = \tan 4A$.

OR

If $\cos(\theta+2\alpha) = m \cos \theta$, prove that: $\cot \alpha = \frac{1+m}{1-m} \tan(\theta+\alpha)$.

25. Solve the following system of linear inequalities graphically: $x+2y \leq 10$, $x+y \geq 1$, $x-y \leq 0$, $x \geq 0$, $y \geq 0$.

26. If a and b are the roots of $x^2 - 3x + p = 0$ and c, d are roots of $x^2 - 12x + q = 0$, where a, b, c, d form a G.P. Prove that $(q + p) : (q - p) = 17:15$.
27. i) Differentiate with respect to x: $\sin(2x+3) \cdot \log(3x+4)$
- ii) Differentiate $f(x) = \sqrt{\cos x}$ by using first principle.
28. Find the equation of the line through the intersection of lines $x + 2y - 3 = 0$ and $4x - y + 7 = 0$ which is parallel to $5x + 4y - 20 = 0$.

OR

Find the equation of the lines through the point (3, 2) which make an angle of 45° with the line $x - 2y = 3$.

29. Find the Mean, Variance and Standard deviation for the following data:

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

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