BVN

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FIRST TERMINAL EXAMINATION–2014-2015

Class–XI

Subject–Maths

Time Allowed : 3 Hrs. **M.M. : 100**

Please Check the Total Marks

Do not write any answers on the questions paper. Check the total marks.

Instructions :

Attempt all the questions.

Section A consists of 6 questions carrying 1 mark each.

Section B consists of 13 questions carrying 4 marks each.

Section C consists of 7 question carrying 6 marks each.

Internal choice has been given in a few questions.

Section A

1. For any two sets A and B, $[B' \cup (B' - A)]' =$_____

2. Find the domain of the function $f(x) = \frac{1}{\sqrt{x + [x]}}$

3. The minute hand of a watch is 1.5cm long. How far does its tip move in 40min ?

4. In a triangle ABC, if $a = 2$, $b = 3$ and $\sin A = \frac{2}{3}$, find $\angle B$

5. Find the smallest positive integer 'n' for which $\frac{(1+i)^n}{(1-i)^{n-2}}$ is a real number.

6. If 10 parallel lines in a plane are intersected by a family of 9 parallel lines, find the number of parallelograms formed.

Section B

7. In a class of 35 students, 17 have taken mathematics, 10 have taken mathematics but not economics. Find the number of students who have taken both Mathematics and Economics and the number of students who have taken Economics but not Mathematics, if it is given that each student has taken either Mathematics or Economics or both.

8. Let R be the relation on the set Z of all initegers defined by $(x, y) \in R \Rightarrow x-y$ is divisible by n. Prove that.

   (i) $(x, x) \in R$ for all $x \in z$

   (ii) $(x, y) \in R \Rightarrow (y, x) \in R$ for all $x, y \in z$

   (iii) $(x, y) \in R$ and $(y, z) \in R \Rightarrow (x \in z) \in R$ for all $x, y, z \in z$

9. If $\frac{\sin(\theta+\alpha)}{\cos(\theta-\alpha)} = \frac{1-m}{1+m}$, prove that

$$\tan\left(\frac{\pi}{4}-\theta\right)\tan\left(\frac{\pi}{4}-\alpha\right) = m$$

10. Solve the equation and find the general solution :

$\sin 2\theta + \sin 4\theta + \sin 6\theta = 0$

OR

In ΔABC, prove that;

$a \cos A + b \cos B + c \cos C = 2a \sin B \sin C$

11. Prove that

$\sin 3A \sin^3 A + \cos 3A \cos^3 A = \cos^3 2A$

12. Using the principle of mathematical induction, prove that

$$\frac{1}{1.2.3}+\frac{1}{2.3.4}+\frac{1}{3.4.5}+\ldots+\frac{1}{n(n+1)(n+2)} = \frac{n(n+3)}{4(n+1)(n+2)}$$

13. If $\left(\frac{1+i}{1-i}\right)^3 - \left(\frac{1-i}{1+i}\right)^3 = x+iy$, find (x, y)

14. Write the polar form of $\frac{1+3i}{1-2i}$

15. A manufacturer has 600 litres of a 12% solution of acid. How many litres of 30% acid solution must be added to it so that the acid content in the resulting mixture will be more than 15% but less than 18%.

16. Solve the following inequality.

$$\frac{x+3}{x-2} \leq 2$$

17. If ${}^{n+2}C_8 : {}^{n-2}P_4 = 57 : 16$, find n.

OR

A box contains 5 different red and 6 different white balls. In how many ways can 6 balls be selected so that there are at least two balls of each colour ?

18. How many even numbers are there with three digits such that if 5 is one of the digits then 7 is the next digit ?

19. If $2 \tan \alpha = 3 \tan \beta$, prove that

$$\tan(\alpha - \beta) = \frac{\sin 2\beta}{5 - \cos 2\beta}$$

Section C

20. Find the range of the following functions.

(a) $f(x) = \frac{x^2}{1+x^2}$ (b) $f(x) = 1 - |x - 3|$

21. Show that

$$\cot \frac{\pi}{24} = \sqrt{2} + \sqrt{3} + \sqrt{4} + \sqrt{6}$$

22. If $\sin(\theta + \alpha) = a$ and $\sin(\theta + \beta) = b$, prove that,

$$\cos 2(\alpha - \beta) - 4ab \cos(\alpha - \beta) = 1 - 2a^2 - 2b^2$$

23. Prove that $2.7^n + 3.5^n - 5$ is divisible by 24, for all $n \in N$ using PMI

OR

Prove by the principle of Mathematical induction that for all $n \in N$.

$$\sin\theta + \sin 2\theta + \sin 3\theta + \ldots + \sin n\theta = \frac{\sin\left(\frac{n+1}{2}\right)\theta \sin\frac{n\theta}{2}}{\sin\frac{\theta}{2}}$$

24. How many words can be formed by taking 4 letters at a time out of the letters of the word 'MATHEMATICS' ?

25. Solve the quaddratic equation.

$2x^2 - (3 + 7i)\,x - (3 - 9i) = 0$

26. Exhibit graphically the solution set of linear inequations.

$x + y \leq 5,\ 4x + y \geq 4,\ x + 5y \geq 5,\ x \leq 4,\ y \leq 3$