Std. 11 Time : 3 hrs.

11-9-2015 Half Yearly Examination in MATHEMATICS M. Marks : 100

GENERAL INSTRUCTIONS:

1. Attempt all the questions.
2. Section - A consists of 6 questions of 1 mark each.
3. Section - B consists of 13 questions of 4 marks each.
4. Section - C consists of 7 questions of 6 marks each.

SECTION - A

1. Evaluate $i^9 + i^{19}$.

2. Which term of the following sequence: 2, $2\sqrt{2}$, 4,.....is 128?

3. Find the solution set for $2 \leq 3x - 4 \leq 5$, $\forall\, x \in R$.

4. If $\frac{1}{6!} + \frac{1}{7!} = \frac{x}{8!}$, find x.

5. Evaluate: $\sin\frac{8\pi}{3}\cos\frac{23\pi}{6} + \sin\frac{35\pi}{6}\cos\frac{13\pi}{3}$.

6. If the statement $p(n) = 1.3 + 2.3^2 + 3.3^3 ..... + n.3^n = \frac{3+(2n-1)3^{n+1}}{4}$ is true $\forall\, x \in N$, then find p(3).

SECTION - B

7. The ratio of the sums of m and n terms of an A.P is $m^2 : n^2$. Show that the ratio of m^{th} and n^{th} terms is $(2m-1) : (2n-1)$.

8. Find three numbers in G.P whose sum is 21 and sum of their squares is 189.

9. If A.M and G.M of two positive numbers a and b are 10 and 8, respectively, find the numbers.

10. Find the square root of complex number i.

11. If $(x + iy)^3 = u + iv$, then show that $\frac{u}{x} + \frac{v}{y} = 4(x^2 - y^2)$.

12. Solve : $\frac{2x+1}{x-2} \geq 1$, for real values of x.

13. Prove the following by principle of mathematical induction $\frac{1}{2}+\frac{1}{4}+\frac{1}{8}+.....\frac{1}{2^n}=1-\frac{1}{2^n}$.

14. Using the principle of mathematical induction prove that $3^{2n+2} - 8n - 9$ is divisible by 8.

15. Find the number of different 8-letter words that can be formed from the letters of the word DAUGHTER so that (i) all vowels occur together. (ii) all vowels do not occur together.

16. Prove that: $\sin20^o \sin40^o \sin60^o \sin80^o = \frac{3}{16}$.

17. Solve : $2\cos^2x + 3\sin x = 0$.

18. Prove that : $\frac{\sin5x - 2\sin3x + \sin x}{\cos5x - \cos x} = \tan x$.

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

SECTION C

20. Show that $\frac{1x2^2+2x3+.....+nx(n+1)^2}{1^2x2+2^2x3+.....n^2x(n+1)}=\frac{3n+5}{3n+1}$.

21. The sum of three numbers in G.P. is 56. If we subtract 1, 7, 21 from these numbers in that order, we obtain an arithmetic progression. Find the numbers.

22. Find the modulus and argument of the complex number $Z=\frac{1+i}{1-i}-\frac{1-i}{1+i}$, and hence change it to the polar form.

23. A group consists of 4 girls and 7 boys. In how many ways can a team of 5 members be selected if the team has (i) no girl? (ii) at least one boy and one girl? (iii) at least 3 girls?

24. Solve the following system of linear inequations graphically.
$4x + 3y \leq 60$, $y \geq 2x$, $x \geq 3$, $x, y \geq 0$.

25. If $\tan\frac{\theta}{2} = \sqrt{\frac{1-e}{1+e}}\tan\frac{\alpha}{2}$, prove that $\cos\alpha = \frac{\cos\theta - e}{1 - e\cos\theta}$.

26. i) Prove $(1 + \cos\frac{\pi}{8})(1 + \cos\frac{3\pi}{8})(1 + \cos\frac{5\pi}{8})(1 + \cos\frac{7\pi}{8}) = \frac{1}{8}$.

ii) Evaluate : $\sin(22\frac{1}{2})^\circ$

-x-x-x-x-x-x-x-