A. G. High School and G. & D. Parikh Higher Secondary School

Navrangpura, Ahmedabad - 380 009.

Semester - II Exam - 2014

Date	: 15-02-2014	Std. : 11		Marks	: 100
Day	: Saturday	Subject : Maths		Time	: 3:00 Hrs.

PART - A

Instructions :

1. **This section contains 50 questions and all are compulsory.**
2. **All Question carry one mark.**
3. **Select proper alternatives and answer in the OMR Sheet.**

1. $p(n): 11^{n+2} + 12^{2n+1}$ is divisible by _____; $n \in N$.
   (A) 123 (B) 113
   (C) 133 (D) 103
2. Let Z and W be two non-zero complex numbers such that $|Z|=|W|$ and $arg(z)+arg(w)=\pi$ then z equal to _____.
   (A) w (B) $-w$
   (C) $\overline{w}$ (D) $-\overline{w}$
3. How many terms in the expansion of $(a+b+c)^{19}$
   (A) *20* (B) *190*
   (C) *210* (D) None of these
4. Construct term of expansion $\left(\frac{3}{x^2}+\frac{\sqrt{x}}{3}\right)^{10}$ is _____
   (A) $\frac{5}{81}$ (B) $\frac{9}{181}$
   (C) $-\frac{5}{81}$ (D) $-\frac{9}{181}$
5. If $\left(2+\sqrt{3}\right)^4+\left(2-\sqrt{3}\right)^4 = x+y\sqrt{3}$ then $y =$ _____.
   (A) *0* (B) *56*
   (C) *112* (D) *97*
6. The middle term in expansion of $\left(x+\frac{1}{x}\right)^{11}$ is _____. $(x \neq 0)$
   (A) $\binom{11}{5}$ (B) $\binom{11}{6}x$
   (C) $\binom{11}{4}\frac{1}{x}$ (D) $\binom{11}{7}x^4$
7. $arg(z) < 0$, then $arg(-z) - arg(z) =$ _____
   (A) π (B) $-\pi$
   (C) $-\frac{\pi}{2}$ (D) $\frac{\pi}{2}$

8. If Z_1, Z_2, Z_3 are complex number such that $|Z_1| = |Z_2| = |Z_3| = \left|\frac{1}{Z_1} + \frac{1}{Z_2} + \frac{1}{Z_3}\right| = 1$ then $|Z_1| + |Z_2| + |Z_3| =$ _____.
   (A) $=1$ (B) <1
   (C) >3 (D) $=3$

9. If Z_1 and Z_2 are complex numbers such that $|Z_1| = |Z_2| = 2$ and $|Z_1 + Z_2| = \sqrt{3}$, then $|Z_1 - Z_2| =$ _____.
   (A) $2\sqrt{3}$ (B) $\sqrt{5}$
   (C) 3 (D) $2 - \sqrt{2}$

10. $sin110^\circ + cos\ 117^\circ =$ _____
   (A) Positive (B) Negative
   (C) 0 (D) None of these

11. $tan20^\circ + tan40^\circ + \sqrt{3}\ tan20^\circ\ tan40^\circ =$ _____
   (A) 1 (B) $1/\sqrt{3}$
   (C) $\sqrt{3}$ (D) $1/\sqrt{2}$

12. The minimum value of $27\,tan^2\theta + 3\,cot^2\theta$ is _____
   (A) 9 (B) 18
   (C) 27 (D) 30

13. The value of $\frac{cos10^\circ + sin10^\circ}{cos10^\circ - sin10^\circ}$ is _____
   (A) $tan\ 25^\circ$ (B) $tan\ 35^\circ$
   (C) $tan\ 55^\circ$ (D) $tan\ 80^\circ$

14. The range of $cos^4\theta - sin^4\theta$ is _____
   (A) $[0, 1)$ (B) $[-1, 1]$
   (C) $(0, 1)$ (D) $(-1, 1)$

15. If $sin\theta = -7/25$, $\pi < \theta < 3\pi/2$, then $cos2\theta =$ _____.
   (A) $\frac{-527}{625}$ (B) $\frac{-625}{527}$
   (C) $\frac{527}{625}$ (D) $\frac{625}{527}$

16. The value of $cos\,2\pi/7 + cos\,4\pi/7 + cos\,6\pi/7 + cos\,7\pi/7$ is _____
   (A) 1 (B) -1
   (C) $1/2$ (D) $-3/2$

17. $tan75^o - cat75^o =$ _____

(A) $1+2\sqrt{3}$ (B) 4

(C) $2+\sqrt{3}$ (D) $2\sqrt{3}$

18. $A+B+C=\pi$ and $\cos B+\cos C=4\sin^2 A/2$ then $\tan B/2 \tan C/2 =$ _____

(A) $1/2$ (B) $1/3$

(C) $2/3$ (D) $3/2$

19. Solution set of $\tan 2\theta - \sqrt{3}=0$ is _____

(A) $\{k\pi+\pi/3 / k \in z\}$ (B) $\{k\pi+\pi/6 / k \in z\}$

(C) $\{2k\pi+\pi/3 / k \in z\}$ (D) $\{k\pi+\pi/6 / k \in z\}$

20. The least postivie root of the function $\sin x - \pi/2 + 1 = 0$ lies in the interval _____.

(A) $[0, \pi/2]$ (B) $[\pi/2, \pi]$

(C) $[\pi/2, 3\pi/2]$ (D) None of these

21. In ΔABC, $A=\pi/4$, $C=\pi/3$ then $a+C\sqrt{2} =$ _____

(A) b (B) $\sqrt{3}b$

(C) $\sqrt{2}b$ (D) $2b$

22. The general solution of $\sin^{10}x - \cos^{10}x = 1$ is _____.

(A) $2k\pi+\pi/2; k \in z$ (B) $2k\pi+\pi/3; k \in z$

(C) $k\pi+\pi/3; k \in z$ (D) $k\pi+\pi/2; k \in z$

23. In ΔABC, $a=2$, $b=\sqrt{6}$, $C=\sqrt{3}+1$ then $\cos C =$ _____.

(A) $\frac{\sqrt{6}+\sqrt{2}}{4}$ (B) $\frac{\sqrt{6}-\sqrt{2}}{4}$

(C) $\frac{\sqrt{3}+1}{4}$ (D) $\frac{\sqrt{3}-1}{4}$

24. The third term of G.P. is 3 then the product of first five terms is _____.

(A) 3^5 (B) 5^3

(C) 3^3 (D) 5^5

25. $\sum_{r=1}^{m}\left(\sum_{n=1}^{r} n\right) =$ _____

(A) $\frac{m(m+1)(2m+1)}{6}$ (B) $\frac{m(m+1)(m+2)}{6}$

(C) $\frac{m^2(m+1)^2}{4}$ (D) $\frac{n(n+1)(n+2)}{6}$

26. For A.P. $a=2$, $t_5=14$ then common difference $d=$
(A) 6 (B) -3
(C) -6 (D) 3

27. The arithmetic and geometric mean of two positive numbers a and b are respectively A and G then the numbers a and b are .....
(A) $A \pm \left(A^2 - G^2\right)$ (B) $\sqrt{A} \pm \sqrt{A^2 - G^2}$
(C) $A \pm \sqrt{A^2 - G^2}$ (D) $\frac{A \pm \sqrt{A^2 - G^2}}{2}$

28. Three Geometric means between 4 and $4/81$, are _____
(A) $4/3, 4/9, 4/27$ (B) $4/9, 4/27, 4/81$
(C) $1, 12, 36$ (D) $4/9, 1, 81/4$

29. In G.P. if $r = 1/3$ and $S_4 = 80/29$, then $a =$ _____.
(A) $2/3$ (B) 3
(C) 2 (D) $3/2$

30. Parametric equation of $x^2=8y$ are .....
(A) $x = 2t^2, y = 2t^2$ (B) $x=4t, y=4t$
(C) $x=4t, y=4t^2$ (D) $x=4t, y=2t^2$

31. For the circle $x^2 + y^2 - 2x\tan\alpha + 2y\sec\alpha + 2\tan^2\alpha = 0$, center and radius are _____
(A) $(\tan\alpha, -\sec), 1$ (B) $(-\tan\alpha, \sec\alpha), 1$
(C) $(\tan\alpha, \sec\alpha), 1$ (D) $(-\tan\alpha, -\sec\alpha), 1$

32. The eccentricity of the ellips whose minor axis is equal to the distance between *foci* is _____.
(A) $1/\sqrt{2}$ (B) $\sqrt{2}/3$
(C) $\sqrt{3}/2$ (D) $2/\sqrt{3}$

33. Vertex of parabola $y^2 - 6y = 2x - 7$ is _____
(A) $(3, -1)$ (B) $(1, -3)$
(C) $(1, 3)$ (D) $(-1, 3)$

34. The centre of elipse $\left(\frac{x+y-2}{3}\right)^2 + \left(\frac{x-y}{4}\right)^2 = 1$ is _____.
(A) $(0, 0)$ (B) $(1, 0)$
(C) $(0, 1)$ (D) $(1, 1)$

35. The direction of $(1, 1, 2)$ and $(2, 1, 0)$ is _____
(A) equal (B) opposite
(C) different (D) none of these

36. If the centroid of ΔABC is $(0, 0, 0)$ where $A\ (1, 1, 1)$, $B\ (2, 1, 2)$ and $C\ (x, y, z)$ then $(x, y, z) =$ _____.
(A) $(3, 2, 3)$ (B) $(0, 0, 0)$
(C) $(-3, -2, -3)$ (D) $(1, -1, 1)$

37. Find point on z-axis, whose distance from $(-2, 1, 3)$ is $\sqrt{14}$
(A) $(0, 0, 6)$ (B) $(0, 0, -6)$
(C) $(0, 0, 3)$ (D) $(0, 0, -3)$

38. If xz-plane divide the line segment joining by $(1, -1, 5)$ and $(2, 3, 4)$ in the ratio λ:1, find λ.
(A) 3 (B) -3
(C) $1/3$ (D) $-1/3$

39. Find vector in direction of $(3,6, 2)$ having magnitude 4.
(A) $\left(3/7, 6/7, 2/7\right)$ (B) $(12, 24, 8)$
(C) $\left(12/7, 24/7, 8/7\right)$ (D) $(-12, -24, -8)$

40. $\lim\limits_{x \to \infty} x\left\{\sin 1/x + \sin 1/x^2\right\} =$ _____
(A) 0 (B) $-1/2$
(C) 1 (D) Does not exists.

41. $\lim\limits_{x \to a-} \left(\dfrac{|x|^3}{a} - \left[\dfrac{x}{a}\right]^3 \right) =$ _____; where $a>0$ and $[x]$= greast integer less than or equal to x.
(A) a^2-3 (B) a^2-1
(C) a^2 (D) None of these

42. $\lim\limits_{x \to -a} \dfrac{x^9 + a^9}{x + a} = 9$, then $a =$ _____
(A) -1 (B) -7
(C) 7 (D) None of these

43. $\lim\limits_{x \to 1} \dfrac{\sqrt{1-\cos(2x-2)}}{(x-1)} =$ _____
(A) $\sqrt{2}$ (B) $-\sqrt{2}$
(C) 0 (D) Does not exist

44. $\lim\limits_{x \to 27-} \left[\sqrt{x}\right] =$ _____
(A) $3\sqrt{3}$ (B) 5
(C) 4 (D) Does not exist

45. $\lim_{x \to 2} \left(\frac{1}{x-2} - \frac{4}{x^2-4} \right) =$ _____

(A) $1/4$ (B) $1/2$
(C) 1 (D) Does not exist

46. $f'(1)=4$, then $\lim_{h \to 0} \frac{f(1+h^2)-f(1-h^2)}{4h^2} =$ _____

(A) 2 (B) $1/2$
(C) $1/4$ (D) 4

47. $f(x)=(x^2-1)|x^2-3x+2|$ is not differentiable at $x=$ _____.

(A) 1 (B) 2
(C) -1 (D) None of these

48. $y=x\log x$ then $\frac{dy}{dx} =$ _____.

(A) $x+\log x$ (B) 1
(C) $1+\log x$ (D) $x\log x$

49. $d/dx(3\cos x - 4\cos^3 x) =$ _____

(A) $-3\sin 3x$ (B) $3\sin 3x$
(C) $2\cos 3x$ (D) $\sin 3x$

50. If $y = \frac{2-3\cos x}{\sin x}$, then $\left(\frac{dy}{dx}\right)$ at $x = \pi/4$ is _____.,

(A) $6+2\sqrt{2}$ (B) $6-2\sqrt{2}$
(C) $2\sqrt{2}-6$ (D) $6-\sqrt{2}$

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Part - B **Marks : 50**

Instructions :-

1. **This section contains 18 questions and all are compulsory.**
2. **New section will be write on new page.**

Section - A

Given the following 1 to 8 questions as directed in the question. **(16)**
(Each carrying 2 marks)

1. By using P.M.I. prove that $1+5+9+.....+(4n-3)=n(2n-1); n \in N$.

2. By using P.M.I. prove that $\left(3+\sqrt{5}\right)^n+\left(3-\sqrt{5}\right)^n; n\in N$ is even

3. Find the square of -1.

4. For $z=3-2i$. Find the value of $z^4-4x^3+6z^2-4z+17$.

5. Find the range of $sin\theta+cos\left(\theta+\pi/3\right)$

OR

Prove that $\frac{\sqrt{3}}{sin20^o}-\frac{1}{cos20^o}=4$

6. For ΔABC prove that $a(cos\,c-cos\,B)=2(b-c)cos^2\,A/2$

7. Find equation of hyperbola whose focii $(0, \pm 3)$ and eccentricity is 2.

OR

Find quation of circle which is co-centric to the circle $x^2+y^2-4x-6y-5=0$ and touches to x-axis.

8. Find $\frac{d}{dx}\left(\frac{a+b\,sinx}{c+d\,sinx}\right)$.

Section - B

Answer the following 9 to 14 questions as directed in the question. (18)
Each carrying 3 marks.

9. If $a_1=1; a_2=1$ and $a_n=a_{n-1}+a_{n-2}; n\geq 3$ then prove that $a_2+a_4+.....+a_{2n}=a_{2n+1}-1; n\in N$.

OR

By using P.M.I. prove that

$$\binom{n}{0}+\binom{n}{1}+\binom{n}{2}+....+\binom{n}{n}=2^n;\ \forall n\in N$$

10. If $cos\alpha=-5/13, \pi/2<\alpha<\pi$ and $tan\beta=4/3, \pi<B<3\pi/2$, then find quadrant of $p(\alpha+\beta)$

11. Solve : $\sqrt{3}\,cos\,x+sinx=\sqrt{2}$

OR

Solve : $2cos^2\,\theta+\sqrt{3}\,cos\,\theta=0$

12. Prove that $A\,(1, 2, 3)$, $B\,(-1, -2, -1)$, $C\,(2, 3, 2)$ and $D\,(4, 7, 6)$ are vertices of paralldogram.

13. By definition find derivative of $f(x)=cosecx$ at $x=\pi/6$

14. One end point of a focal chord of the parabola $y^2=4ax$, is $(at^2, 2ati)$. Find its other end-point and show the length of the focal-chord is $|a|\left(t_i+1/t_i\right)^2$.

Section - C

Answer the following 15 to 18 questions as directed in the question. Each carrying 4 marks. **(16)**

15. Find the coefficient of x^3 in expansion of $(1-x)^{15} \cdot (1+3x)^4$

16. If α and β are roots of $a\cos\theta + b\sin\theta = c$, then prove that

(i) $\tan\alpha + \tan\beta = \dfrac{-2ac}{b^2 - c^2}$ and

(ii) $\tan\alpha \cdot \tan\beta = \dfrac{a^2 - c^2}{b^2 - c^2}$

OR

Prove that $\sin^4\theta \cos^2\theta = \dfrac{1}{32}[10 - 15\cos 2\theta + 6\cos 4\theta - \cos 6\theta]$

17. Find the sum of the integers from 100 to 200 which is divisible by 2 but not 5.

18. Find $\lim\limits_{x \to \pi/4} \dfrac{\sin 3x + \cos 3x}{x - \pi/4}$.

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