Code No. 17/2/7

PLEASURE TEST SERIES XI - 07

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Time Allowed : 180 Minutes **Max. Marks : 100**

SECTION A

Q01. Find the value of $\sin\left(-\frac{11\pi}{3}\right)$. **Q02.** Write the value of $\lim\limits_{x\to 3}\frac{e^x - e^3}{x-3}$.

Q03. Write the real and imaginary part of the zero complex number.

Q04. Write the converse of the following statements :
(i) If a number n is even, then n^2 is even.
(ii) If x is a prime number, then x is odd.

SECTION B

Q05. If $P(A) = 3/5$ and, $P(B) = 1/5$, find $P(A \text{ or } B)$, if A and B are mutually exclusive events.

Q06. If $z = 2 + \sqrt{3}\,i$, find the value of $z.\bar{z}$.

Q07. A committee of 5 is to be formed out of 6 males and 8 females. In how many ways this can be done when included females are in majority?

Q08. Write the derivative of $x^5(3 - 6x^{-9})$ with respect to x.

Q09. If $\tan x + \cot x = 2$, prove that $\tan^n x + \cot^n x = 2$, $n \in N$.

Q10. Find the distance between the lines $15x + 8y = 34$ and $15x + 8y + 31 = 0$.

Q11. Write the contrapositive of the following statements :
(i) If you are born in India, then you are a citizen of India.
(ii) If a triangle is equilateral, it is isosceles.

Q12. Evaluate : $\lim\limits_{x\to\pi/2}\frac{1+\cos 2x}{(\pi - 2x)^2}$.

SECTION C

Q13. Find the term independent of x in the binomial expansion of (a) $\left(\frac{3}{2}x^2 - \frac{1}{3x}\right)^9$ (b) $\left(\sqrt{\frac{x}{3}} + \frac{\sqrt{3}}{2x^2}\right)^{10}$.

Q14. Find the equation of the circle passing through the points (2, 3) and (–1, 1) and whose centre is on the line $x - 3y = 11$.

OR Find the equation of ellipse, with major axis along the x-axis and passing through the points P(4, 3) and Q(–1, 4)

Q15. Let $A\,A = \{x : x \in N,\ x \le 20\}$. Define a relation R from A to A by $R = \{(a, b) : a - 2b = 0;\ a, b \in N\}$. Depict the relation R using roster form. Write its domain and range also.

Q16. Find the coordinates of a point on y-axis which are at a distance of $5\sqrt{2}$ from the point (3,–2, 5).

Q17. Determine the coordinates of the foot of perpendicular drawn from the point (–1, 3) from the line $3x - 4y - 16 = 0$.

OR Find the equation of the circle which is circumscribed about the Δ whose vertices are (–2, 3), (5, 2) and (6, –1).

Q18. If the sum of n terms of an AP is $3n^2 + 5n$ and its m^{th} term is 164, find the value of m.

Q19. A girl has 3 library book passes and 8 books of his interest are there in the library. Of these 8 books she does not want to borrow Mathematicia Vol.2 unless Mathematicia Vol.1 is also borrowed. In how many ways can she choose the three books to be borrowed?

Q20. Find the domain of $f(x) = \frac{1}{\sqrt{[x]^2 - 4[x] + 3}}$.

OR Find the domain and range of the real valued function $f(x) = \frac{1}{1-x^2}$.

Q21. If $x\cos\theta = y\cos\left(\theta + \frac{2\pi}{3}\right) = z\cos\left(\theta + \frac{4\pi}{3}\right)$, then find the value of $xy + yz + zx$.

Q22. Three squares of a chess board are selected at random, find the probability of selecting two squares of one colour and the other of a different colour.

Q23. Using principle of induction, show that $\frac{1}{3.5} + \frac{1}{5.7} + ... + \frac{1}{(2n+1)(2n+3)} = \frac{n}{3(2n+3)} \quad \forall\ n \in N$.

SECTION D

Q24. Calculate mean and, variance 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

OR The mean and S.D. of a group of 100 observations were found to be 20 and 3 respectively. On rechecking, it was observed that three entries were incorrect, which were recorded as 21, 21 and, 18. Find the mean and S.D. if the incorrect entries were omitted.

Q25. In a survey of 60 people, it was found that 25 people read newspaper H, 26 read newspaper T and 26 read newspaper I, 9 read both Hand I, 11 read H and T, 8 read both T and I and 3 read all the three newspapers. Find the number of people who read (a) at least one of the newspapers (b) exactly one newspaper. Write the names of any 3 newspapers circulating in your area, also state the importance of reading newspapers.

OR In a town of 10000 families, it was found that 40% families buy fruit A, 20% families buy fruit B, 10% families buy fruit C, 5% families buy A and B, 3% buy B and C and, 4% buy A and C. If 2% families buy all the three kind of fruits, find the number of families which buy (a) fruit A only (b) none of A, B and C. Write the names of any 3 fruits of your choice, also state the importance the of eating fruits.

Q26. **(a)** Find the general solution of the equation $\tan 5x = \frac{1}{\tan 2x}$.

(b) Evaluate $\cos\frac{\pi}{7} + \cos\frac{2\pi}{7} + \cos\frac{3\pi}{7} + ... + \cos\frac{7\pi}{7}$.

OR Prove that $\sin 10^\circ \sin 30^\circ \sin 50^\circ \sin 70^\circ = \frac{1}{16}$. Hence evaluate $\cos 20^\circ \cos 40^\circ \cos 60^\circ \cos 80^\circ$.

Q27. Let $S = \frac{1}{1\times 2} + \frac{1}{2\times 3} + \frac{1}{3\times 4} + ...$ to n terms. Differentiate S w.r.t. n.

Q28. Solve the system of inequations graphically : $x + y \geq 1,\ 3x + 4y < 12,\ x - 2y \leq 2,\ x \geq 0,\ y \geq 0$

Q29. Evaluate : $\lim\limits_{x\to\frac{\pi}{4}} \frac{4\sqrt{2} - (\sin x + \cos x)^5}{1 - \sin 2x}$.

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SECTION A

Q01. $\sin\left(-\frac{11\pi}{3}\right)=\sin\left(-4\pi+\frac{\pi}{3}\right)=\sin\frac{\pi}{3}=\frac{\sqrt{3}}{2}$.

Q02. $\lim\limits_{x\to3}\frac{e^x-e^3}{x-3}=\lim\limits_{x-3\to0}\frac{e^3(e^{x-3}-1)}{x-3}=e^3\times1=e^3$.

Q03. Let $z=0+0i$ $\therefore \text{Re}(z)=0$ and $\text{Im}(z)=0$.

SECTION B

Q05. 4/5 **Q06.** 7 **Q07.** 1316 **Q08.** $15x^4+24x^{-5}$

Q09. As $\tan x+\cot x=2 \Rightarrow \tan x+\frac{1}{\tan x}=2 \Rightarrow (\tan x-1)^2=0 \Rightarrow \tan x=1=\tan(\pi/4)$

$\therefore x=n\pi+\pi/4,\ n\in Z$.

Now LHS : $\tan^n x+\cot^n x=\left(\tan\frac{\pi}{4}\right)^n+\left(\cot\frac{\pi}{4}\right)^n=1^n+1^n=2=\text{RHS}$.

Q10. 24/17 units **Q12.** 1/2.

SECTION C

Q13. (a) 7^{th} term i.e., ${}^9C_6\times\frac{1}{216}$ (b) 3^{rd} term i.e., ${}^{10}C_2\times\frac{1}{108}$.

Q16. (0, 2, 0), (0, –6, 0) **Q18.** 27

Q21. Let $x\cos\theta=\frac{1}{k}\Rightarrow k\cos\theta=\frac{1}{x}$...(i)

So, $k\cos\left(\theta+\frac{2\pi}{3}\right)=\frac{1}{y}$...(ii) and $k\cos\left(\theta+\frac{4\pi}{3}\right)=\frac{1}{z}$...(iii)

Adding these equations, we get : $\frac{1}{x}+\frac{1}{y}+\frac{1}{z}=k\cos\theta+k\cos\left(\theta+\frac{2\pi}{3}\right)+k\cos\left(\theta+\frac{4\pi}{3}\right)$

$\Rightarrow \frac{yz+zx+zy}{xyz}=k\left(\cos\theta+2\cos\left(\frac{2\theta+2\pi}{2}\right)\cos\left(\frac{\pi}{3}\right)\right)=k\left(\cos\theta-\cos\theta\right)$ $\therefore\ xy+yz+zx=0$.

Q22. $\frac{2\left({}^{32}C_2\times{}^{32}C_1\right)}{{}^{64}C_3}$

SECTION D

Q25. (a) 52 (b) 30

Q26. **(a)** $\tan5x=\cot2x=\tan\left(\frac{\pi}{2}-2x\right) \Rightarrow 5x=n\pi+\left(\frac{\pi}{2}-2x\right)$ $\therefore x=\frac{n\pi}{7}+\frac{\pi}{14},\ n\in Z$.

(b) $\cos\frac{\pi}{7}+\cos\frac{2\pi}{7}+\cos\frac{3\pi}{7}+\cos\frac{4\pi}{7}+\cos\frac{5\pi}{7}+\cos\frac{6\pi}{7}+\cos\frac{7\pi}{7}$

$\Rightarrow \quad =\cos\frac{\pi}{7}+\cos\frac{2\pi}{7}+\cos\frac{3\pi}{7}+\cos\left(\pi-\frac{3\pi}{7}\right)+\cos\left(\pi-\frac{2\pi}{7}\right)+\cos\left(\pi-\frac{\pi}{7}\right)+\cos\pi$

$\Rightarrow \quad =\cos\frac{\pi}{7}+\cos\frac{2\pi}{7}+\cos\frac{3\pi}{7}-\cos\frac{3\pi}{7}-\cos\frac{2\pi}{7}-\cos\frac{\pi}{7}+\cos\pi=-1$.

Q27. $\frac{1}{(n+1)^2}$

Q29. $\lim\limits_{x\to\frac{\pi}{4}}\frac{4\sqrt{2}-(\sin x+\cos x)^5}{1-\sin2x}=\lim\limits_{\sin x+\cos x\to\sqrt{2}}\frac{(\sin x+\cos x)^5-(\sqrt{2})^5}{(\sin x+\cos x)^2-(\sqrt{2})^2}$

$\Rightarrow \quad =\lim\limits_{\sin x+\cos x\to\sqrt{2}}\frac{(\sin x+\cos x)^5-(\sqrt{2})^5}{(\sin x+\cos x)-(\sqrt{2})}\times\frac{(\sin x+\cos x)-(\sqrt{2})}{(\sin x+\cos x)^2-(\sqrt{2})^2}=5(\sqrt{2})^4\times\frac{1}{2(\sqrt{2})}=5\sqrt{2}$.