MATHEMATICS 2014

Time: 20 Minutes Max. Marks: 20

SECTION "A" (MULTIPLE CHOICE QUESTIONS)

1. Choose the correct answer for each from the given options:

(i) The real part of $(2i-3)i$ is:
- ♦ 2 ♦ <u>−2</u> ♦ −3 ♦ 3

(ii) $\tan(180^o-\theta)=$
- ♦ $\tan\theta$ ♦ <u>$-\tan\theta$</u> ♦ $\cot\theta$ ♦ $-\cot\theta$

(iii) The value of ${}^8P_2$ is :
- ♦ 66 ♦ 76 ♦ <u>56</u> ♦ 86

(iv) The multiplication inverse of (− 3, 8) is:
- ♦ $(3,-8)$ ♦ $\left(-\frac{1}{3},\frac{1}{8}\right)$ ♦ $\left(\frac{1}{3},\frac{-1}{8}\right)$ ♦ <u>$\left(\frac{-3}{73},\frac{-8}{73}\right)$</u>

(v) cos (90-α) is equal to:
- ♦ <u>sinα</u> ♦ cosα ♦ -cosα ♦ -sinα

(vi) if $|x|<1$, then $1+2x+3x^2+4x^3+\ldots$ is equal to:
- ♦ <u>$(1-x)^{-2}$</u> ♦ $(1+x)^{-2}$ ♦ $(1-x)^{-1}$ ♦ $(1+x)^{-1}$

(vii) $\binom{5}{3,2}=$
- ♦ 8 ♦ 9 ♦ <u>10</u> ♦ 20

(viii) if ω is a complex cube root of unity then $(1+\omega+\omega^2)^2$ will be equal to:
- ♦ <u>0</u> ♦ 1 ♦ ω^2 ♦ 4

(ix) If order of matrices A and B respectively are 2×3 and 3×4 than order of AB:
- ♦ 2×2 ♦ 3×3 ♦ <u>2×4</u> ♦ 4×2

(x) If $\begin{bmatrix}4 & 2\\ 3 & \lambda\end{bmatrix}$ is a singular matrix, then λ=:
- ♦ 6 ♦ ±5 ♦ <u>$\frac{3}{2}$</u> ♦ $\frac{2}{3}$

(xi) $\frac{n!}{(n+1)!}$ is equal to:
- ♦ n ♦ n+1 ♦ $\frac{1}{n}$ ♦ <u>$\frac{1}{n+1}$</u>

(xii) The period of tanx is:
- ♦ <u>π</u> ♦ $\frac{\pi}{2}$ ♦ 2π ♦ none of these

(xiii) $\sum n^3=$:
- ♦ <u>$\frac{n^2(n+1)^2}{4}$</u> ♦ $\frac{n^3(n+1)^3}{8}$ ♦ $\frac{n(n+1)}{2}$ ♦ none of these

(xiv) The middle term in the expansion of $\left(x-\frac{1}{x}\right)^{20}$ is:
- ♦ 9^{th} ♦ 10^{th} ♦ <u>11^{th}</u> ♦ 12^{th}

(xv) If a balanced die is rolled, then the probability of getting 3 is:
- ♦ $\frac{2}{3}$ ♦ $\frac{3}{2}$ ♦ $\frac{1}{3}$ ♦ <u>$\frac{1}{6}$</u>

(xvi) $\frac{1}{1+\tan^2\theta}=$:
- ♦ $\sec^2\theta$ ♦ <u>$\cos^2\theta$</u> ♦ $\sin^2\theta$ ♦ $\cot^2\theta$

(xvii) If sinθ > 0 and secθ < 0, then ρ(θ) lies in this quadrant:
- ♦ First ♦ <u>Second</u> ♦ Third ♦ Fourth

(xviii) The total number of terms in the binomial expansion of $\left(y^2+\frac{b^2}{y^2}\right)^n$ is:
- ♦ n ♦ n − 1 ♦ <u>n + 1</u> ♦ 2n

(xix) The roots of a quadratic equation are equal if:
- ♦ $b^2-4ac>0$ ♦ $b^2-4ac<0$
- ♦ <u>$b^2-4ac=0$</u> ♦ b^2-4ac is a perfect square

(xx) The H.M. of 2 and 5 is:
- ♦ <u>$\frac{7}{2}$</u> ♦ $\pm\sqrt{10}$ ♦ 0 ♦ $\frac{20}{7}$

MATHEMATICS 2014

Time: 2 Hours 40 Minutes Marks: 80

SECTION 'B' (SHORT-ANSWER QUESTIONS)

ALGEBRA (35 MARKS)

NOTE: Answer 7 questions from this section.

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Q.2(i) Determine the value of 'k' for which the root of the equation $(k+1)x^2+2(k+3)x+(2k+3)=0$ are equal.

(ii) Solve the equation $x^4+x^3-4x^2+x+1=0$

OR Solve the system of equations:

$$x^2+y^2=34$$
$$xy+15=0$$

(iii) Using the properties of determinants, prove that:

$$\begin{vmatrix}a+y & a & a\\ a & a+y & a\\ a & a & a+y\end{vmatrix}=y^2(3a+y)$$

OR Find the value λ if $\begin{bmatrix}5 & 8 & 2\\ 0 & \lambda & 2\\ 9 & -8 & 4\end{bmatrix}$ is a singular matrix.

(iv) If |x| < 1, prove that: $\frac{\sqrt{1+x}+(1-x)^{2/3}}{(1+x)+\sqrt{1+x}}=11-\frac{5}{6}x$ nearly.

(v) Which term of the sequence 18, 12, 8, …….. is $\frac{512}{729}$?

(vi) Prove by Mathematical induction:
$10^n+3.4^{n+2}+5$ is completely divisible by 9, $\forall n\varepsilon\mathbb{N}$.

(vii) Write the term independent of x is the expansion of $\left(2x+\frac{1}{3x^2}\right)^9$.

(viii) $A=\{1,-1,i,-i\}$, construct the multiplication table for (•) in A, also show that (•) is commutative in A.

(ix) Into how many distinct ways can the letters of the word PAKPATTAN be arranged?

(x) Find the value of 'n' so that $\frac{a^{n+1}+b^{n+1}}{a^n+b^n}$ may become the H.M. between 'a' and 'b'.

OR If $\frac{1+3+5+\ldots\ldots n\ term}{2+4+6+\ldots\ldots n\ term}=0.95$, find 'n'.

TRIGONOMETRY (15)

Note: Attempt 3 questions from this Section.

Q.3(i) if $\operatorname{cosec}\theta=-\frac{3}{2}$ and $\rho(\theta)$ is in fourth quadrant, then find the remaining trigonometric functions using the definition of radius function with $x^2+y^2=1$.

(ii) If a point on the rim of a 21 cm diameter flywheel travels 5040 meters in a minute, through how may radians does the wheel turn in one second?

(iii) Prove any Two of the following:

(a) $\frac{1}{1-\sin\theta}+\frac{1}{1+\sin\theta}=2\sec^2\theta$

(b) $\tan57^o=\frac{\sqrt{3}\cos3^o-\sin3^o}{\cos3^o+\sqrt{3}\sin3^o}$

(c) $\cos3\theta=4\cos^3\theta-3\cos\theta$

(iv) Draw the graph of sinθ, when $-\pi\le\theta\le\pi$.

(v) Find the general solution of tan 2θ . cotθ = 3.

OR The three sides of a triangular have lengths 10m, 11m and 13m respectively. Find the measure of the largest angle and area of the building.

SECTION C (DETAILED- ANSWER QUESTIONS)(30)

NOTE: Answer 2 questions from this section.

Q.4(a) Solve the following system of equations by Cramer's rule:

$$x+y=5 \quad y+z=7 \quad z+x=6$$

(b) If α, β are the roots of $y^2-2y+3=0$, then find the equation whose roots are $\frac{1}{\alpha^2}$ and $\frac{1}{\beta^2}$.

Q.5(a) Show that $\sqrt[3]{4}=1+\frac{1}{4}+\frac{1.3}{4.6}+\frac{1.3.5}{4.6.8}+\ldots\ldots$

(b) If sum of 8 terms of an A.P. is 64 and sum of 19 terms is 361, find the 9^{th} term of A.P.

<u>OR</u> (i) The sum of four term of an A.P. is 4. The sum of the products of the first and the last terms and of the two middle terms is −38. Find the numbers.

(ii) Find the G.Ms. between 2 and −16.

Q.6(a) Without using calculator, verify

$$Tan^{-1}\frac{1}{13}+Tan^{-1}\frac{1}{4}=Tan^{-1}\frac{1}{3}.$$

(b) Prove that $R=\frac{abc}{4\Delta}$. OR Drive Law of cosine.

(c) Prove that $\frac{1}{r^2}+\frac{1}{r_1^2}+\frac{1}{r_2^2}+\frac{1}{r_3^2}=\frac{a^2+b^2+c^2}{\Delta^2}$.