MATHEMATICS 2016

Time: 20 Minutes Max. Marks: 20

SECTION "A" (MULTIPLE CHOICE QUESTIONS)

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

(i) π is a/an:
* Natural number * Integer
* Rational number * Irrational number

(ii) (a,b).(c,d) =
* (ac + bd, ad + bc) * (ac – bd, ad – bc)
* (ac – bd, ad + bc) * (ac + bd, ad – bc)

(iii) If z = 3 + 4i then z + $\bar{z}$ =
* 8i * 6 * 0 * –1

(iv) If z = (a,b) is a complex number then $\bar{z}$ =
* (a, –b) * (–a, b) * (a,b) * (–a, –b)

(v) If *i* is imaginary number then i^3 = :
* –i * I * 1 * –1

(vi) If ω is a complex cube roots of unity then ω^{17} = :
* 0 * 1 * ω * ω^2

(vii) If the roots of the equation $px^2 + qx + r = 0$ are imaginary then $q^2 - 4pr$ is:
* zero * less than zero * greater than zero * perfect square

(viii) $\begin{bmatrix} 2 & 0 \\ 0 & -2 \end{bmatrix}$ is a/an:
* Rectangular Matrix * Scalar Matrix
* Diagonal Matrix * Unit Matrix

(ix) If a die and a coin are tossed simultaneously then the probability of getting two heads is:
* 1/3 * ½ * 0 * 1

(x) The number of ways in which 7 girls can be seated around a round table is:
* 6 * 6! * 7 * 7!

(xi) If $4^{x+2} = 64$ then *x* is equal to:
* 2 * 0 * 1 * 3

(xii) If the order of two matrices *A* and *B* is m x n and n x p respectively, then the order of matrix *AB* is:
* p x m * n x p * p x n * m x p

(xiii) If $\begin{bmatrix} 3 & \alpha \\ 2 & 8 \end{bmatrix}$ is a singular matrix, then the value of 'a' is:
* 10 * 12 * –12 * 1/12

(xiv) The middle term in the expansion of $\left[x^2 + \frac{1}{x}\right]^{-2n}$ is:
* $(2n + 1)^{th}$ term * $(n + 1)^{th}$ term
* $(2n + 2)^{th}$ term * $(n + 2)^{th}$ term

(xv) $\frac{2\pi}{3}$ radians in degrees is equal to:
* 60° * 90° * 120° * 150°

(xvi) If the sides of a triangle are 5, 6 and 7 units, then 2s is equal to:
* 6 units * 9 units * 18 units * 27 units

(xvii) tan-1 (tan(-1)) = :
* –1 * $\frac{\sqrt{3}}{2}$ * 1 * 1/2

(xviii) Σn^2 = :
* $\frac{n(n-1)}{2}$ * $\frac{n(n+1)^2}{4}$ * $\frac{n(n+1)}{2}$ * $\frac{n(n+1)(2n+1)}{6}$

(xix) $\sin\left[\frac{\pi}{2} - \theta\right]$ =:
* cos θ * –sin θ * sin θ * – cos θ

(xx) [1 2 5] is :
* Diagonal matrix * Scalar matrix
* Column matrix * Row matrix

MATHEMATICS 2016

Time: 2 Hours 40 Minutes Marks: 80

SECTION 'B' (SHORT-ANSWER QUESTIONS)

ALGEBRA (35 MARKS)

NOTE: Answer 7 questions from this section.

2.(i) Show that: $\frac{1+2i}{3-4i} + \frac{2}{5} = \frac{i-2}{5i}$

OR Solve the equation: $\frac{y-2}{y+2} + \frac{y+2}{y-2} = \frac{34}{15}$

(ii) Solve the following system of equations:
$y + z = 5$
$y^2 + 2z^2 = 17$

(iii) For what values of a and b will both roots of the equation $x^2 + (2a - 4)x = 3b + 5$, vanish?

(iv) Let * be defined in Z by $p*q = p + q + 3$ for all $p,q \in Z$
Show that:
(a) * is commutative in Z.

(b) Identity element w.r.t *exists in Z.

(v) Prove by Mathematical Induction that $2 + 6 + 12 + ... + n(n + 1) = 1/3\ n(n + 1)(n + 2)$.

OR Find the sum of the series: $11^2 + 12^2 + 13^2 + ... + 20^2$

(vi) Using the properties of determinants, prove that:
$$\begin{vmatrix} a+x & a & a \\ a & a+x & a \\ a & a & a+x \end{vmatrix} = x^2(3a+x)$$

(vii) If three coins are tossed simultaneously, what is the probability of obtaining at least one head?

OR Find n if ${}^nP_4 = 24\,{}^nC_5$

(viii) Show that $5^{\frac{1}{2}}.5^{\frac{1}{4}}.5^{\frac{1}{8}} - - - - - = 5$

(ix) Find the value of x if
$$\begin{bmatrix} -2 & 3 \\ 4 & -1 \end{bmatrix}\begin{bmatrix} 1 & x & 5 \\ 2 & 4 & x \end{bmatrix}\begin{bmatrix} -3 \\ 1 \\ 0 \end{bmatrix} = \begin{bmatrix} 2 \\ -14 \end{bmatrix}$$

(x) Find the term independent of x in the expansion of $\left[2x + \frac{1}{3x^2}\right]^9$.

OR Which term of the H.P. 6,2,6/5, ... is equal to 2/33 ?

TRIGONOMETRY (15)

Note: Attempt 3 questions from this Section.

3.(i) If $\tan\theta = 3/4$ and $\sin\theta$ is positive, find the remaining trigonometric functions, using the definition of radian function.

(ii) Prove any Two:
(a) $\frac{\cot\theta + \cos\theta}{\sec\theta + \tan\theta} = \cot\theta\cos\theta$ (c) $\frac{\sin 2\theta}{\sin\theta} - \frac{\cos 2\theta}{\cos\theta} = \sec\theta$
(b) $\sin^6\theta + \cos^6\theta = 1 - 3\sin^2\theta\cos^2\theta$

(iii) Draw the graph of $\sin\theta$, where $0 \le \theta \le 2\pi$.

OR Find the period of the function $\tan 4x$.

(iv) Without using the calculator, prove that
$\tan^{-1}\frac{1}{3} + \tan^{-1}\frac{1}{7} = \tan^{-1}\frac{1}{2}$

OR Solve: $\sin 2\theta - \cos\theta = 0$

(v) In ΔABC, find the largest angle if a = 5 cm, b = 10 cm and c = 14 cm.

SECTION C (DETAILED- ANSWER QUESTIONS)(30)

NOTE: Answer 2 questions from this section.

4.(a) Solve the system of equations by matrix method:
$x + 2y + z = 8$
$2x - y + z = 3$
$x + y - z = 0$

(b) The base of a right angled triangle is 8 cm and the sides of the triangle are in A.P. Find the hypotenuse.

5.(a) Prove that:
(i) $\frac{1}{ab} + \frac{1}{bc} + \frac{1}{ca} = \frac{1}{2rR}$ (ii) $r_1 . r_2 . r_3 = rs^2$

(b) Derive the Law of Cosines.

OR Prove that in triangle ABC, $\cos\frac{\alpha}{2} = \sqrt{\frac{s(s-a)}{bc}}$

6.(a) Prove that: $2\sqrt{2} = 1 + \frac{3}{4} + \frac{3.5}{4.8} + \frac{3.5.7}{4.8.12} + ...$

(b) If α, β are roots of $px^2 + qx - r = 0$, $p \neq 0$, form the equation whose roots are $\alpha + 2$, $\beta + 2$.