MATHEMATICS 2019

SECTION "B" (SHORT – ANSWER QUESTIONS) (35)

NOTE: Attempt any Ten part question from this section, selecting at least three part questions from each question. All questions carry equal marks

COMPLEX NUMBER, ALGEBRA & MATRICES

2 (i) Solve the complex equation (x, y).(2, 3) = (–4, 7)

OR --- Find the real and imaginary parts of $\frac{2-i}{3i}$

2 (ii) Solve the equation $4.2^{2x+1} - 9.2^{x} + 1 = 0$

2 (iii) By using properties of determinants, show that: $\begin{vmatrix} 4 & a & b+c \\ 4 & b & c+a \\ 4 & c & a+b \end{vmatrix} = 0$

2 (iv) From an equation whose roots are $\frac{1}{2}$ and $-\frac{1}{6}$

2 (v) Determine the nature of roots of the following equation:

$$2x^2 + 9 = 9x$$

OR --- Solve the equation: $\sqrt{2x+7} + \sqrt{x+3} = 1$

GROUPS, SEQUENCE, SERIES & COUNTING PROGRAMS

3 (i) Let * defined in Z by m*n=m+n+2.

(a) Show that * is associative and commutative.

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

(c) Very element of Z has an inverse under*.

3 (ii) Find the value of n so that $\frac{a^{n+1} + b^{n+1}}{a^n + b^n}$ may becomes the G.M. between a & b.

OR --- Express 0.348 as a Vulgar fraction

3(iii) Prove by Mathematical Induction, the following preposition:

$$2 + 6 + 12 + \ldots\ldots \ldots n(n+1) = \frac{1}{3}(n+1)(n+2)$$

3(iv) If in a G.P., the fifth term is 9 times the third term and its second term is 6, find the G.P.

OR --- Insert 4 A.M.s between 18 & 3.

3 (v) If there are 3 children in a family, what is the probability that:
(a) The third child is a girl?
(b) The two children are boys and one child is a girl?

TRIGONOMETRY

4 (i) By using definition of Radian Function, find the remaining trigonometric functions if $\tan\theta = -\frac{1}{3}$ and $\rho(\theta)$ is in 4^{th} quadrant.

4 (ii) Draw the graph of y = sin2x, where $0 \leq x \leq \pi$.

OR --- Without using calculator, prove that:

$$\text{Sin } 90^o \cos 11^o + \sin 71^o \sin 11^o = \frac{1}{2}$$

4 (iii) Find area of the triangle when: a = 9.1cm, b = 8.2cm, c = 7.3cm.

4 (iv) Solve $\cos\theta - 2\sin\theta = 0$

4 (v) Show that $\tan^{-1}\theta = \sin^{-1}\frac{\theta}{\sqrt{1+\theta^2}}$

SECTION "C" (DETAILED ANSWER QUESTIONS)

NOTE: Attempt Two questions from this section, including Question number 5 which is compulsory.

5. (a) The sum of the firs n terms of Two A.P.s are in the ratio 3n + 31:5n – 3. Show that their 9^{th} terms are equal.

5. (b) Prove tha law of tangent $\frac{tan\left(\frac{\alpha-\beta}{2}\right)}{tan\left(\frac{\alpha+\beta}{2}\right)} = \frac{\alpha-\beta}{\alpha+\beta}$

OR --- In ΔABC, Prove that the area of triangle $\Delta = \frac{1}{2}$ absiny

6. (a) Find the coefficient of x^6 in expansion of $(a^3 + 3bx^2)^{-6}$.

6. (b) Apply Gramer's rule to solve the following system of equations:

$$x + y = 5$$
$$Y + z = 7$$
$$z + x = 6$$

7. (a) An aeroplane is flying at a height of 9000 meters. If the angle of depression to a field marker measures 23^o. Find aerial distance.

7. (b) Prove any two of the following

(i) $= \text{cosec}^2\frac{\pi}{6}$ (ii) $\frac{\sin 3\theta}{sin\theta} - \frac{\cos 3\theta}{cos\theta} = 2$

(iii) $\frac{\tan\theta+\sin\theta}{\text{cosec}\theta+\cot\theta} = \tan\theta\ \sin\theta, (\cos\theta \neq 0, -1)$

7. (c) Solve and check: $4x^2 + y^2 = 25$, $y^2 - 2x = 5$

MATHEMATICS 2018

SECTION "A" (MULTIPLE CHOICE QUESTIONS)

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

(i) The middle term in the expression of $\left(2x - \frac{1}{x^2}\right)^2$ is the:
* ninth term * tenth term * eleventh term * twelfth term

(ii) If n = 0, then $\frac{(n+1)}{n!}$ = :
* 0 * 1 * n * ∞

(iii) $\text{Sin}60^o \cos30^o - \cos36^o \sin30^o$ =:
* $\frac{1}{2}$ * $-\frac{\sqrt{3}}{2}$ * $\frac{\sqrt{3}}{2}$ * $-\frac{1}{2}$

(iv) If are length is equal to the radius r, then the central angle θ is:
* 0 radian * $\frac{1}{2}$ radian * 2 radian * 1 radian

(v) In a triangle ABC, if y = 90^o, then the law of cosine reduces to:
* $a^2 = b^2 + c^2$ * $b^2 = b^2 - c^2$ * $c^2 = a^2 + b^2$ * $c^2 = a^2 - b^2$

(vi) In an escribed triangle ABC, $\frac{\Delta}{r_3}$ =:
* (s – a) * (s – b) * (s – c) * (s – c)

(vii) If r cosθ = 4 and r sin θ = 3, then r =:
* 3 * 5 * 6 * 2

(viii) $(10.5)^o$ =:
* $\frac{\pi}{18}$ radians * $\frac{7\pi}{120}$ radians * $\frac{10.5}{\pi}$ radians * 5π radians

(ix) If A = {2,3} and B={3,4}, then (A – B) ∪ B =:
* ϕ * { ϕ } * {2} * {3}

(x) $\{(A \cup A')'$ =:

* A * A′ * ϕ * U

(xi) The imaginary part of $i(3 + 5i^2)$

* –2i * 3i * –2 * –5

(xii) If z is a complex number, then $z\bar{z}$ =:

* z^2 * $(\bar{z})^2$ * |z| * $|z|^2$

(xiii) The product of the roots of the equation $y^2 + 1 = 7y – 7$

* 4 * 8 * 7 * 1

(xiv) If ω is a complex cube root of unity, then $(2 – \omega – \omega^2)^2$ =

* –1 * 1 * 3 * 9

(xv) If A, B and C are non-singular matrices, then $(CBA)^{-1}$

* $A^{-1} B^{-1} C^{-1}$ * $C^{-1} B^{-1} A^{-1}$ * $(ABC)^{-1}$ * ABC

(xvi) If A is a square matrix, then $|A| A^{-1}$ =:

* AA^{-1} * $|A| i_3$ * adj A * A^2

(xvii) If 1, x-1, 3 are in A.P., then x =:

* 0 * 1 * 2 * 3

(xviii) The H.M. between 3 and 6 is:

* $\frac{1}{4}$ * $\frac{9}{2}$ * $\pm\sqrt{18}$ * 4

(xix) If $\frac{a-b}{b-c} = \frac{a}{b}$, then a, b, c are in:

* A.P. * G.P. * H.P * A.G.P.

(xx) The number of permutations of the letters of the word **COMMITTEE** is:

* $\binom{9}{2\ \ 2\ \ 2}$ * $\binom{6}{2\ \ 2\ \ 2}$ * $\binom{9}{2\ \ 2\ \ 1}$ * $\binom{2\ \ 2\ \ 2}{9}$

MATHEMATICS 2018

SECTION "B" (SHORT ANSWER QUESTIONS)

NOTE: Attempt any Ten part question from this section, selecting at least three part questions from each question. All questions carry equal marks

COMPLEX NUMBER, ALGEBRA & MATRICES

2 (i) Solve the complex equation for x and y; (x + 2yi) – xi

OR --- Solve the complex equation for x and y: x (1 + 2i) + y(3 + 5i) = – 3i (where = $\sqrt{-1}$)

(ii) Solve the equation: $\left(x + \frac{1}{x}\right)^2 = 4\left(x - \frac{1}{x}\right)$.

(iii) Determine the value of m in the equation that will make the roots equal: (m + 1)y2 + (m + 3)y + (2x + 3) = 0

(iv) If A = $\begin{bmatrix} sin\theta & -cos\theta \\ -cos\theta & sin\theta \end{bmatrix}$ and B = $\begin{bmatrix} sin\theta & cos\theta \\ cos\theta & sin\theta \end{bmatrix}$, then verify that AB = BA = I_2.

(v) Using properties of determinants, show that:

$$\begin{vmatrix} 1 & x & yz \\ 1 & y & zx \\ 1 & z & xy \end{vmatrix} = \begin{vmatrix} 1 & 1 & 1 \\ x & y & z \\ x^2 & y^2 & z^2 \end{vmatrix}$$

GROUPS SEQUENCE, SERIES & COUNTING PROGRAMS

3 (i) Let G = {1, ω, ω^2}, ω being a complex cube root of unity. Show that (G,*) us an abelian group, where "·" is an ordinary multiplication.

(ii) If three books are picked at random from a shelf containing 3 novels, 4 books of poems and dictionary, what is the probability that:

(a) the dictionary is selected

(b) one novel and 2 books of poems are selected

OR --- In how many ways can a party of 5 students and 2 teachers be formed out of 15 students and 5 teachers? Selected

(iii) Prove by mathematical induction that

$\frac{1}{1.2} + \frac{1}{1.3} + \frac{1}{3.4} + \ldots\ \ldots\ \ldots + \frac{1}{n(n+1)} = \frac{n}{n+1}$, ∀ natural numbers n.

OR --- Without using the calculator, find the sum of

$$21^2 + 22^2 + 23^2 + \ldots\ \ldots\ \ldots + 50^2$$

(iv) Find the sum of an A.P. of nineteen terms whose middle term is 10.

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

Find the first of a G.P. whose second term s 3 and sum of infinity is 12.

TRIGONOMETRY

4 (i) A belt 24.75 meters long. Passes around a 3.5cm diameter pulley. The belt makes three complete revolution in a minute. How many radians does the wheel turn in two seconds?

(ii) Draw the graph of $y = \cos x$, where $0 \leq x \leq \pi$.

OR Show that $\tan \theta$ is a periodic function of period π.

(iii) In ΔABC, if a=b=c, then prove that $r:R:r_1 = 1:2:3$.

(iv) Solve the equation: $\tan 2\theta \cot \theta = 3$.

(v) Prove that $\text{Tan}^{-1} \frac{1}{5} + \text{Tan}^{-1} \frac{1}{4} = \text{Tan}^{-1} \frac{9}{19}$

OR Prove that:

$\text{Sin}^{-1} A + \sin^{-1} B = \sin^{-1} (A\sqrt{1 - B^2} + B\sqrt{1 - A^2})$

SECTION "C" (DETAILED – ANSWER QUESTIONS)

NOTE: Attempt Two questions from this section, including question number 5 which is compulsory.

5. (a) Divide 600 rupees among 5 boys, so that their shares are in A.P., and the two smallest shares together make one-seventh of what the other three boys get.

5. (b) Prove the Law of cosine $a^2 = b^2 + c^2 - 2bc \cos\alpha$.

6. (a) Show that: $\sqrt{2} = 1 + \frac{1}{2^2} + \frac{1.3}{2!\ 2^4} + \frac{1.3.5}{3!\ 2^6} + \ldots\ldots\ldots$

6. (b) Apply Gramer's rule to solve the system of equations:

$$x + y + z = d$$
$$x + (1 + d)y + z = 2d$$
$$x + y + (1 + d)z = 0 \qquad (d \neq 0)$$

7. (a) By using definition of radians function, if $\sin \theta = 0.6$ and $\tan \theta$ is negative, find the remaining trigonometric functions.

7. (b) Prove any two of the following:

(i) $\sqrt{\frac{t-\sin\theta}{1-\sin\theta}} = \sec\theta - \tan\theta$ (ii) $\frac{\sin 2\theta}{\sin\theta} - \frac{\cos 2\theta}{\cos\theta} = \sec\theta$

(iii) $\frac{\sin 7\theta - \sin 5\theta}{\cos 7\theta + \cos 7\theta} = \tan\theta$ OR $\tan\frac{\theta}{2} = \frac{\sin\theta}{1+\cos\theta}$

7. (c) Solve and Check:

$$yz + 15 = 0 \qquad y^2 + z^2 - 34 = 0$$

MATHEMATICS 2017

SECTION "A" (MULTIPLE CHOICE QUESTIONS)

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

(i) A diagonal matrix in which all the diagonal elements are equal is called:
* Null matrix * Unit Matrix * zero Matrix * Scalar matrix

(ii) A coin is tossed thrice. The probability of getting three tail is:
* $\frac{1}{2}$ * $\frac{3}{2}$ * $\frac{1}{8}$ * $\frac{2}{3}$

(iii) 1 + 2x + 3x2+ ……. Is equal to:
* $(1-x)^{-1}$ * $(1-x)^{-2}$ * $(1+x)^{-1}$ * $(1+x)^{-2}$

(iv) $\sum_{n=1}^{3} n^3$ is equal to:
* 30 * 12 * 48 * 36

(v) If tanθ>0 and cosec θ <0 then $\rho(\theta)$ is in the:
* 1st quadrant * 2nd quadrant * 3rd quadrant * 4th quadrant

(vi) $1 - 2\sin^2\frac{\theta}{2}$ is equal to
* sinθ * cosθ * $\sin\frac{\theta}{2}$ * $\cos\frac{\theta}{2}$

(vii) The number of elements in the set A = {x | x ϵ Z, -1 $\leq$ x $\leq$ 5}, where Z is the set integers, is:
* 5 * 6 * 7 * 8

(viii) If the Matrix $\begin{bmatrix} \lambda & 3 \\ 2 & 4 \end{bmatrix}$ is singular, then the value of λ is:
* $\frac{4}{3}$ * $\frac{3}{4}$ * $\frac{3}{2}$ * $\frac{2}{3}$

(ix) The distance between the point (1, 1) and (2, 1) is:
* 0 unit * 1 unit * 2 unit * 3 unit

(x) The circle inscribed within a triangle so that it touches all the sides of the triangle is called:
* incircle * incentre * circum circle * circum centre

(xi) The principle value of tan (arc tan(–1)) is:

* –1   * 1   * ∞   * 0

(xii) The arc length of a unit circle with centre angle $\frac{\pi}{6}$ radian is approximately:

* 0.52   * 1.52   * 2.52   * 3.52

(xiii) The value of $(1 + \omega^2)^3$ is:

* 1   * ω * –1   * $-\omega$

(xiv) Let x + 3i = 2yi, the value of x and y respectively are:

* 0 and 0   * $\frac{3}{2}$ and 0   * $\frac{3}{2}$ and $\frac{2}{3}$ * 0 and $\frac{3}{2}$

(xv) Two Matrices A and B are confirmable for addition if both have:

* same elements   * same order   * same rows   * same columns

(xvi) The sum of infinite Geometric series $\frac{1}{2} + \frac{1}{4} + \frac{1}{8} + \ldots\ldots\ldots\ldots$ is:

* ∞   * 0   * 1   * $\frac{1}{2}$

(xvii) If a^2, b^2, c^2 are three terms of an A.P., then:

* $a^2 = \frac{b^2 + c^2}{2}$ * $b^2 = \frac{a^2 + c^2}{2}$ * $c^2 = \frac{a^2 + b^2}{2}$ * $a^2 + b^2 = c^2$

(xviii) If U is the universal set and "A" is any non-empty set, then AUA'

* A   * A' * U   * ϕ

(xix) The progression 3, 9, 27, 8 …… is a/an:

* A.P.   * G.P.   * H.P   * A.G.P

(xx) The roots of the equation $x^2 + 126 = 0$ are:

* $\pm 4i$ * ± 4 * $\pm 8i$ * $\pm 16i$

MATHEMATICS 2017

SECTION "B" (SHORT ANSWER QUESTIONS)

NOTE: Answer 10 questions from this section.

COMPLEX NUMBER, ALGEBRA & MATRICES

2 (i) Find the cube roots of –8 in terms of ω

(ii) Separate into real and imaginary parts, and fine the multiplicative inverse, of $\frac{\sqrt{2}+i}{\sqrt{2}-i}$.

OR

(ii) The area of a square in numerically less than twice its diagonal by 2.

(iii) If α and β are roots of the equation $px^2 + qx + r = 0$, $p \neq 0$, from an equation whose roots are 2α +1 and 2β+1.

(iv) Let A = $\begin{bmatrix} -2 & 1 & 0 \\ -1 & 4 & 3 \\ 0 & 8 & 5 \end{bmatrix}$ and X = $\begin{bmatrix} 2 & 1 & -1 \\ -3 & 2 & -4 \\ 0 & 4 & 5 \end{bmatrix}$ Find a matrix B if A-3B = 2X

(v) Prove that: $\begin{bmatrix} a+b+2c & c & c \\ a & b+c+2a & a \\ b & b & c+a+2b \end{bmatrix} = 2(a + b + c)^3$

GROUP, SEQUENCE, SERIES & COUNTING

3. (i) By drawing composition table, show that (S, *) is groupoid if S = (24,6,8) and * is defined S by x*y = 4 ∀x, y ϵ S

(ii) The Probability that a student passes Mathematics is $\frac{33}{60}$ and the probability that the passed Physics is $\frac{39}{60}$ if the probability of passing at least one course is $\frac{51}{60}$ what is the probability that he will pass both courses?

(ii) How many words can be formed by using 2 vowels and 3 constants out of 4 vowels and 7 consonants.

(iii) Prove that preposition of by Mathematical induction:
1+5+9+……..+(4n-3)=n(2n-1).

(iii) Prove by Mathematical Induction $11^{n+2} + 12^{2n+1}$ is divisible by 133 for all integral values of $n \geq 0$.

(iv) If u, v, x, y, z are in A.P. m prove that u+z=v+y=2x.

(iv) If n A.M.'s are inserted between 20 and 80 and the ratio of first and last mean is 1:3, find n

(v) If the roots of the equation $p(q-r)x^2 + q(r-p)x + r(p-q)=0$ are equal, prove that p, q, r are in H.P.

TRIGONOMTERY

4. (i) How far does a boy on a bicycle travel in 15 revolutions if the diameter of the wheel of his bicycle each equal to 50cm?

(ii) Draw the graph of $y = \sin(-x)$, where $-\pi \leq \theta \leq \pi$.
Show that $\sin\theta$ is a periodic function of period 2π.

(iii) Show that in a triangle of ABC: $\frac{1}{ab} + \frac{1}{bc} + \frac{1}{ca} = \frac{1}{2rR}$

(iv) Solve the trigonometric equation $\cos\theta + \cos 2\theta + 1 = 0$

(v) Prove that $\cot^{-1}\theta = \cos^{-1}\theta \frac{\theta}{\sqrt{1+\theta^2}}$

SECTION 'C' (DETAILED – ANSWER)

NOTE: Answer 2 questions from this section.

5. (a) Determine the sum of an infinite decreasing geometric series, if it is known that the sum of its first and fourth terms is equal to 54, and the sum of the second and third terms, is 36.

OR

5. (a) The 12^{th} term of H.P. is $\frac{1}{5}$ and 19^{th} term is $\frac{3}{22}$. Find the 4^{th} term.

5. (b) The measure of two sides of a triangle are 4 and 5 units. Find the third side so that the area of the triangle is 6 square units.

OR

5. (b) In ΔBC, prove that: $\frac{a}{\sin\alpha} = \frac{b}{\sin\beta} = \frac{b}{\sin\gamma}$

6. (a) Identify the series as binomial expression and find the sum

$$1 + \frac{3}{4} + \frac{3.5}{4.8} + \frac{3.5.7}{4.8.12} + \ldots\ \ldots\ \ldots$$

6. (b) Solve by Matrix method:

$x + y + z = 2$ $\quad$ $2x - y - z = 1$ $\quad$ $x - 2y - 3z = -3$

7. (a) By using definition of radian function, find the remaining trigonometric functions if $\sin\theta = \frac{-2}{3}$ and $\rho(\theta)$ is in the third quadrant.

7. (b) Prove any two of the following:

(i) $\sin 3\theta = 3\sin\theta - 4\sin^3\theta$ (ii) $(\operatorname{cosec}\theta - \cot\theta)2 = \frac{1-\cos\theta}{1+\cos\theta}$

(iii) $\cos(\theta + \varphi).\ \mathrm{Cos}\ (\theta - \varphi) = \cos^2\theta - \sin^2\varphi$

7. (c) Solve and check:

OR Prove that the roots of the equation $pqr^2 x^2 + r(3p^2 + q^2)x + 3p^2 - pq + q^2 = 0$ are rational $\forall p, q, r \in Q$ and p,q,r are non-zero.

MATHEMATICS 2016

SECTION "A" (MULTIPLE CHOICE QUESTIONS)

1. Choose the correct answer for each form 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 î =
* –i * i * 1 * –1

(vi) If ω is a complex cube roots of unit 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 head is:
* 1/3   * 1/2   * 0   * 1

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

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

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

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

(xiv) The middle term in the expansion of $\left[x^2 + \frac{1}{x}\right]^{2th}$ 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^o * 90^o * 120^o * 150^o

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

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

(xviii) $\sum n^2 =$:
* $\frac{n(n-1)}{2}$ * $\frac{n(n+1)^2}{2}$ * $\frac{n(n+1)}{2}$ * $\frac{n(n-1)(2x+1)}{2}$

(xix) $\text{Sin}\left[\frac{\pi}{2} - \theta\right]$ =:
* cosθ   * –sinθ   * sinθ   * –cosθ

(xx) [1 2 5] is:
* Diagonal Matrix   * Scalar Matrix
* Column Matrix   * Raw Matrix

MATHEMATICS 2016

SECTION "B" (SHORT ANSWER QUESTIONS)
ALGEBRA

NOTE: Answer 7 questions from this section.

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

2 (i) **OR** Solve the question: $\frac{y-2}{y+2}+\frac{y+2}{y-2}=\frac{34}{15}$

(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 = 3b + 5, vanish?

(iv) Let* be *defined in Z by p * q = p +q + 3 for all p,q,ϵz 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) = 1/3n (n+1)(n+2)

(v) **OR** Find the sum of the series: $11^2 + 12^2 + 13^2 + \ldots\ldots 20^2$

(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 conins are tossed simultaneously, what is the probability of obtaining at least one head?

(vii) **OR** Find n if ${}^nP_4 = 24\,{}^nC_5$

(viii) Show that $5^{1/2}.5^{1/4}.5^{1/8}$ …….. = 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 $\left[2x+\frac{1}{3x^2}\right]^9$

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

TRIGONOMETRY

Note: Attempt 3 questions from this section.

3. (i) If tanθ = 3/4 and sinθ is positive, find the remaining trigonometric functions, using the definition of radian function.

(ii) Prove any Two:

(a) $\frac{cot\theta+cos\theta}{sec\theta+tan\theta} = cot\theta cos\theta$ (b) $\sin^6\theta+\cos^6\theta=1-3\sin^2\theta\cos^2\theta$

(c) $\frac{sin2\theta}{sin\theta} - \frac{cos2\theta}{cos\theta} = sec\theta$

(iii) Draw the graph of $\sin\theta$, where $0 \leq \theta \leq 2\pi$ **OR**

(iii) Find the period of the function tan 4x

(iv) Without using the calculator, prove that:

$\tan^{-1}\frac{1}{3} + \tan^{-1}\frac{1}{7}$

OR (iv) Solve: $\text{Sin}2\theta - \cos\theta = 0$

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

SECTION "C" (DETAILED ANSWER QUESTIONS)

NOTE: Answer 2 question from this section.

4. (a) Solve the system of equations by Matrix method:

$X + 2y + z = 8$

$2x - y + z = 3$

$X + y - z = 0$

4. (b) The base of a right angled triangle is 8cm 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) $r^1.r^2.r^3 = rs^2$

5. (b) Derive the Law of Cosines. **OR**

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

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

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

MATHEMATICS 2015

SECTION "A" (MULTIPLE CHOICE QUESTIONS)

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

(i) $\sum n =$

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

(ii) The angle 135^o in radians is:

* $\frac{5\pi}{4}$ * $\frac{3\pi}{4}$ * $\frac{2\pi}{3}$ * 135π

(iii) If sinθ<0 and cosθ>0 then p(θ) is in:
* 1^{st} Quadrant * 2^{nd} Quadrant * 3^{rd} Quadrant * 4^{th} Quadrant

(iv) The distance between (a, 0) and (0, b) is:
* a+b * $a^2 + b^2$ * $\sqrt{a+b}$ * $\sqrt{a^2+b^2}$

(v) The period of sin x is:
* π/2 * π * –π * 2π

(vi) If the sides of a triangle are a, b and c then $\frac{a+b+c}{2} =$
* s * s-a * s-b * s-c

(vii) The matrix $[1 \quad 2 \quad 3]^t$ is a:
* Row Matrix * column matrix
* singular matrix * non-singular matrix

(viii) If a, c are the sides of triangle ABC then R=:
* $\frac{abc}{4}$ * $\frac{\Delta}{4}$ * $\frac{\Delta}{s}$ * $\frac{abc}{4\Delta}$

(ix) $\sin(180^o + \theta) =$:
* cos θ * –cos θ * sin θ * –sin

(x) If roots of the equation $ax^2 + bx + c = 0$ are real then $b^2 - 4ac$ is:
* Positive * Negative * Zero * Perfect square

(xi) If angle a in ΔABC is in standard position, the law of cosine is:
* $a^2 + b^2 + c^2 + 2bc\cos\alpha$ * $a^2 = b^2 + c^2 + bc\cos\alpha$
* $a^2 = b^2 + c^2 - 2bc\cos\alpha$ * $a^2 = b^2 + c^2 - bc\cos\alpha$

(xii) $\sum_{n=3}^{20} n^o$
* 1 * 18 * 19 * 20

(xiii) If ω is a complex cube roots of unity then $\omega^3 + \omega^4 + \omega^5 =$
* 1 * ω * ω^2 * 0

(xiv) A square matrix A is said to be singular if:
* |A| = 1 * A = 0 * |A| = 0 * A = 1

(xv) The real and imaginary parts of i(3-2i) are respectively

* -2 and 3   * 2 and -3   * 2 and 3   * -2 and -3

(xvi) If Z = –4 + 3i then $\bar{z}$ is equal to:
* 4+3i   * –4   * 4–3i   * –4+3i

(xvii) The product of the roots of the equation 2x2 – 6x – 15 = 0 is:
* –15   * 15   * 15/2   * 15/2

(xviii) If i=$\sqrt{-1}$ then value of $(-i^3)^2$ is:
* 1   * i   * –i   * –1

(xix) The G.M. between 2 and 8 is:
* 5   * 16   * ± 8 * ± 4

(xx) ^nP_r is equal to:
* $\frac{n!}{r!(n-r)!}$ * $\frac{n!}{r!}$ * $\frac{n!}{n!-r!}$ * $\frac{n!}{(n-r)!}$

MATHEMATICS 2015

SECTION "B" (SHORT ANSWER QUESTIONS)
ALGEBRA

NOTE: Answer 7 questions from this section.

2 (i) Prove that the roots of the equation
$y^2 - 2\left(m + \frac{1}{m}\right) y + 3 = 0$ are real; $\forall m \in \Re$ **OR**

(i) Solve the complex equation (x, y) (2, 3) = (–4, 7)

(ii) Prove that the cube roots of –125 are –5, –ω, –5 ω^2 & their sum is zero (where ω is the complex cube root of unity) **OR**

(ii) Solve the equation $\left(t + \frac{1}{t}\right)^2 = 4\left(t + \frac{1}{t}\right)$

(iii) Solve the system of equation: $4x^2 + y^2 = 25$
$y^2 - 2x = 5$

(iv) Find the values of x, y, z and v so that:

$$\begin{bmatrix} 4 & x+y \\ z+v & 3 \end{bmatrix} = \begin{bmatrix} z & y \\ z & v \end{bmatrix} + \begin{bmatrix} x & 6 \\ -1 & 2v \end{bmatrix}$$

(v) Using the properties of determinants, evaluate:

$$\begin{vmatrix} a+x & a & a \\ a & a+x & a \\ a & a & a+x \end{vmatrix}$$

(vi) Prove by mathematical induction:

$2^3 + 4^3 + 6^3 + \ldots\ldots\ldots + (2n)^3 = 2\,[n\,(+1)]^2$

(vii) Find the simplified from the term independent of x in the binary expansion of: $\left(\frac{4x^2}{3} - \frac{3}{2x}\right)^9$

(viii) The pth term of an A.P. is q and qth term is P. Find $(P+Q)^{th}$ term.

(ix) A = {1, –1, i, –i}, construct the multiplication table for complex numbers multiplication (*) in A, also show that (*) is commutative in A.

(x) Find n, If ${}^nP_4 = 24\,{}^nC_5$.

(x) In how many ways can 3 English, 2 Urdu and 2 Sindhi books be arranged on a shelf so as to keep all the books in a language together?

TRIGONOMETRY

NOTE: Attempt 3 questions from this section.

3. (i) Using th definition of radian function, find the remaining trigonometric functions of cosθ = 𝕀/2 and tanθ is positive. **OR**

(i) If $\sin\alpha = \frac{\sqrt{3}}{2}$ and $\cos\beta = \frac{1}{\sqrt{2}}$, both P(α) and P(β) lie in the first quadrant, find the value of tan(α + β).

(ii) How far does a boy on a bicycle travel in 10 revolutions if the diameter of the wheel of his bicycle each equal to 56cm?

(iii) Prove any two of the following:

(i) $\frac{\cot\theta+\mathrm{cosec}\theta}{\sin\theta+\tan\theta} = \mathrm{cosec}\theta\cot\theta$ (ii) $\frac{\sin(\theta+\emptyset)}{\cos\theta\cos\emptyset} = \tan\theta + \tan\%$

(iii) $cos(\alpha + \beta = \frac{cot\alpha\ cot\ \beta-1}{cot\alpha+cot\beta})$

(iv) Prove that Δ = 1/2ab sin γ, where Δdenotes the area of ΔABC.

(v) Draw the graph of sin θ, where $0 \leq \theta \leq 2\pi$.

(v) OR Solve the triangle ABC when a = 10cm, $\alpha = 30^o$, $\beta = 40^o$

SECTION 'C' (DETAILED ANSWER QUESTIONS)

NOTE: Answer 2 questions from this section.

4. (a) Solve the following system of equations using matrix method:

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

4. (b) If α, β are roots of the equation $px^2 + qx + r = 0$, $p \neq 0$, then find the equation whose roots are $\frac{-1}{a^2}, \frac{-1}{\beta^3}$

5. (a) If c be a quantity so small that c^3 may be neglected in comparison with 1^3, prove that:

$$\sqrt{\frac{l}{l+c}} + \sqrt{\frac{l+c}{l}} = 2 + \frac{3c^2}{4l^2}$$

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

(ii) Find the 17^{th} term of an H.P. whose first two term are 6 and 8.

6. (a) Without using the calculator, prove that: $\tan^{-1}\frac{1}{13} + \tan^{-1}\frac{1}{4} = \tan^{-1}\frac{1}{3}$

6. (b) Prove that: $4R \sin\frac{\alpha}{2} \cos\frac{\beta}{2} \cos\frac{\gamma}{2} = r_1$

6. (c) A man observes that the angle of elevation of the top of a mountain measures 45^o from a point on the ground. On walking 100 meters away from the point, the angle of elevation measures 43.45^o. Find the height of the mountain.

6. (c) OR Solve $4\sin^2\theta \tan\theta - 3 = 0$.

MATHEMATICS 2014

SECTION "A" (MULTIPLE CHOICE QUESTIONS)

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

(i) The real part of $(2i - 3)^t$ is:
* 2 * –2 * –3 * 3

(ii) $\tan(180^o - \theta) =$
* $\tan\theta$ * $-\tan\theta$ * $\cos\theta$ * $-\cot\theta$

(iii) The value of ${}_8P_2$ is:
* 66 * 76 * 56 * 86

(iv) The multiplication inverse of (–3, 8) is:
* (3, –8) * $\left(-\frac{1}{3}, \frac{1}{8}\right)$ * $\left(\frac{1}{3}, \frac{1}{8}\right)$ * $\left(\frac{-3}{73}, \frac{-8}{73}\right)$

(v) $\cos(90 - \alpha)$ is equal to:
* $\sin\alpha$ * $\cos\alpha$ * $-\cos\alpha$ * $-\sin\alpha$

(vi) If $|x| < 1$, then $1+2x+3x^2+4x^3+\ldots\ldots$ is equal to
* $(1-x)^{-2}$ * $(1+x)^{-2}$ * $(1-x)^{-1}$ * $(1+x)^{-1}$

(vii) $\binom{5}{3,2} = 1$

* 8 * 9 * 10 * 20

(viii) If ω is a complex cube root of unity the $(1 + \omega + \omega^2)^2$ will be equal to:

* 0 * 1 * ω^2 * 4

(ix) If order to matrices A and B respectively are 2x3 and 3x4 than order of AB:

* 2x2 * 3x3 * 2x4 * 4x2

(x) If $\begin{bmatrix} 4 & 2 \\ 3 & \lambda \end{bmatrix}$ is a singular matrix, then λ =:

* 6 * ± 5 * $\frac{3}{2}$ * $\frac{2}{3}$

(xi) $\frac{n!}{(n+1)!}$ is equal to:

* n * n+1 * $\frac{1}{\pi}$ * $\frac{1}{\pi+1}$

(xii) The period of tan x is:

* π * $\frac{\pi}{2}$ * 2π * none of these

(xiii) $\sum n^3 =$:

* $\frac{n^2(n+1)^2}{4}$ * $\frac{n^3(n+1)^3}{28}$ * $\frac{n(n+1)}{2}$ * none of tehse

(xiv) The middle term in the expansion of $\left(x - \frac{1}{x}\right)^{20}$ is:

* 9th * 10th * 11th * 12th

(xv) If a balanced dies is rolled, then the probability of getting 3 is

* $\frac{2}{3}$ * $\frac{3}{2}$ * $\frac{1}{3}$ * $\frac{1}{6}$

(xvi) $\frac{1}{1+tan^2\theta}$ =:

* $Sec^2\theta$ * $\cos^2\theta$ * $\sin^2\theta$ * $\cot^2\theta$

(xvii) If sinθ>0 and secθ<0, then ρ(θ) lies in this quadrat:

* First * second * Third * Four

(xviii) The total number of terms in the binomial expansion of $\left(y^2 + \frac{b^2}{y^2}\right)^2$ is:

* n * n – 1 * n +1 * 2n

(xix) The roots of a quadratic equation are equal if:

* $b^2 - 4ac>0$ * $b^2 - 4ac<0$
* $b^2 - 4ac = 0$ * $b^2 - 4ac$is a perfect square

(xx) The H.M of 2 and 5 is

* $\frac{7}{2}$ * $\pm\sqrt{10}$ * 0 * $\frac{20}{7}$

MATHEMATICS 2014

SECTION "B" (SHORT ANSWER QUESTIONS) ALGEBRA

NOTE: Answer 7 questions from this section.

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 $x^4 + x^3 - 4x^2 + x + 1 = 0$

(ii) **OR** Solve the system of equations:

$x^2 + y2 = 34$

$xy + 15 = 0$

(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**

(iii) Find the value of 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: $\frac{\sqrt{1+x}+(1-x)^{2/3}}{(1+x)+\sqrt{1+x}} = 1 - \frac{5}{6}x$ 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 $\forall n \in \Re$.

(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**

(xi) If $\frac{1+3+5+\cdots n\ term}{2+4+6+\cdots.n\ term} = 0.95$, find ‘n’.

TRIGONOMETRY

NOTE: Attempt 3 questions from this section.

3. (i) If cosecθ = $-\frac{3}{2}$ 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 21cm diameter flywheel travels 5040 meters in a minute, through how many 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) $\cos^3\theta = 4\cos^3\theta - 3\cos\theta$

(iv) Draw the graph of sin θ, when $-\pi \leq \theta \leq \pi$.

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

(v) 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)

NOTE: Answer 2 questions from this section.

4. (a) Solve the following system of equations by Gramer’s rule:

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

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

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

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

5. (b) (i) The sum of four term of an A.P. is 4. The sum of the products of the first and the last term and of the two middle term is -38. Find the numbers.

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

6. (a) Without using calculator, verify $tan^{-1}\frac{1}{13} + tan^{-1}\frac{1}{4} = tan^{-1}\frac{1}{3}$.

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

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

MATHEMATICS 2013

SECTION "A" (MULTIPLE CHOICE QUESTIONS)

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

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

(ii) Area of a triangle ABC is:
* $\frac{1}{2}bc\ sin\beta$ * $\frac{1}{2}bc\ sin\alpha$ * $\frac{1}{2}ac\ sin\gamma$ * $\frac{1}{2}bc\ sin\beta$

(iii) $\frac{(n+1)!}{n!}$ is equal to:
* $\frac{n+1}{1}$ * $n+1$ * $n(n+1)$ * $(n+1)!$

(iv) If the roots of the equation $ax^2 + bx + c = 0$ are equal then $b^2 - 4ac$ is
* Positive * Negative * Perfect square * zero

(v) If A and B are any two sets, then $(AUB)^{/}$=:
* $A^{/} \cup B^{/}$ * $A^{/} \cap B^{/}$ * $A \cup B$ * none of these

(vi) The multiplicative inverse of (a, b) is:
* $\left[\frac{1}{a},\frac{1}{b}\right]$ * $\left[\frac{-1}{a},\frac{-1}{b}\right]$ * $\left[\frac{a}{a^2+b^2},\frac{-b}{a^2+b^2}\right]$ * $\left[\frac{a}{a^2+b^2},\frac{b}{a^2+b^2}\right]$

(vii) If an equation, has roots ½ & -1/6, then the equation is:
* $12x^2–4x–1=0$ * $x^2-6x+2=0$ * $x^2+6x-2=0$ * $12x^2+4x11=0$

(viii) A matrix, in which the number of rows is equal to the number of columns, is called:
* identity matrix * diagonal matrix * square matrix * scalar matrix

(ix) If z = -3i + 4 than $\overline{z}$ =:
* -3i-4 * -3i+4 * 3i+4 * $\frac{1}{-3i+4}$

(x) If A = $\begin{bmatrix} 1 & 0 & 0 \\ 0 & \omega & 0 \\ 0 & 0 & \omega^2 \end{bmatrix}$ then |A|:

* 1   * ω   * ω^2 * –1

(xi) If H is the Harmonic mean between a and b, then H=:

* $\frac{a+b}{2}$ * $\sqrt{ab}$ * $\frac{ab}{a+b}$ * $\frac{a}{-3i+4}$

(xii) A die is rolled once, the probability of getting a number 4 is:

* 1/6   * 1/3   * 1/2   * 2/3

(xiii) If cosθ > 0 and sin θ < 0 then ρ(θ) lies in:

* 1^{st} quadrant   * 2^{nd} quadrant   * 3^{rd} quadrant   * 4^{th} quadrant

(xiv) tanθ.cosθ=:

* cosθ   * sinθ   * secθ   * cosecθ

(xv) tan(180° – θ)=:

* tan θ   * –cot θ   * cot θ   * -tan θ

(xvi) cosu-cosv=:

* $2\sin\frac{u+v}{2}\cos\frac{u-v}{2}$ * $2\cos\frac{u+v}{2}\cos\frac{u-v}{2}$

* $2\cos\frac{u+v}{2}\cos\frac{u-v}{2}$ * $-2\sin\frac{u+v}{2}\sin\frac{u-v}{2}$

(xvii) Magnitude of 3 – 4 is:

* 25   * 1   * 9   * 5

(xviii) The real and imaginary parts of $\frac{2-i}{3}$ are respectively:

* $\frac{-2}{3}$ *and* $\frac{1}{3}$ * $\frac{2}{3}$ *and* $\frac{-1}{3}$ * $\frac{-1}{3}$ *and* $\frac{-2}{3}$ * $\frac{-1}{3}$ *and* $\frac{2}{3}$

(xix) The middle term in the expansion of $\left(x-\frac{1}{x}\right)^{2\pi}$ is:

* $(2n+1)^{th}$ term   * $(n+1)^{th}$ term   * $(2n+2)^{th}$ term   * $(n+2)^{th}$ term

(xx) The period of cos θ is:

* π   * 2π   * 4π   * π/2

MATHEMATICS 2013

SECTION "B" (SHORT ANSWER QUESTIONS)
ALGEBRA

NOTE: Answer 7 questions from this section.

2 (i) Prove that the roots of the equation

$$y^2 - 2\left(m + \frac{1}{m}\right)y + 3 = 0 \text{ are real; } \forall m \in \Re$$

(ii) If α, β are the roots of the equation $2x^2 + 3x + 4 = 0$. Find the equation whose roots are α^2 and β^2

(iii) Solve the following: $x^2 + y^2 = 25$

$(4x - 3y)(x - y - 5) = 0$ **OR**

(iii) Solve: $\sqrt{\frac{x+16}{x}} + \sqrt{\frac{x}{x+16}} = \frac{25}{12}$

(iv) Let S = {A, B, C, D} where A = {a}, B = {a, b}, C = {a, b, c} and D = φ, Construct composition table to show that ∪ and ∩ are binary operations on S.

(v) IN how many ways can 3 books of Mathematics, 2 books of physics and 2 books of chemistry be placed on a shelf so that the book on the same subject always remain together?

(vi) Identify the series as binomial expansion and find its sum

$1 + \frac{2}{3}.\frac{1}{2} + \frac{2.5}{3.6}.\frac{1}{2^2} + \frac{2.5.8}{3.69}.\frac{1}{2^3} + \cdots \ldots \ldots ..$

(vii) Prove the given proportion by the principle of mathematical induction: 12+22+32+ ………+n=$\frac{n(n+1)(2n+1)}{6}$ $\forall n \in \Re$

(viii) Find x, y, z and v so that:

$\begin{bmatrix} 4 & x+y \\ z+v & 3 \end{bmatrix} = 3\begin{bmatrix} z & y \\ z & v \end{bmatrix} + \begin{bmatrix} x & 6 \\ -1 & 2v \end{bmatrix}$

(ix) If c be a quantity so small that c^3 may be neglected in comparison with l^3, prove that:

$$\sqrt{\frac{l}{l+c}} + \sqrt{\frac{l+c}{l}} = 2 + \frac{3c^2}{4l^2}$$

(x) Let S = (1, ω, ω^2) where ω, being complex cube root of unity, construct multiplication table with respect to (.) and show that: (a)(.) is binary operation is S.

(b) t is the identity element is S.

TRIGONOMETRY

NOTE: Attempt 3 questions from this section.

3. (i) Express all the trigonometric function in terms of cosθ

(i) OR if cotθ=3 and sinθ is positive, find the remaining trigonometric functions using the definition of Radian function with $x^2 + y^2 = 1$.

(ii) Prove any Two of the following:

(a) $\frac{1+sec\theta}{1-sec\theta} = \frac{tan\theta+sin\theta}{sin\theta-tan\theta}$, $(\cos\theta \neq 0)$ (b) $\cos 30 = 4\cos^3\theta - 3\cos\theta$

(c) $\sin 5\theta - \sin 3\theta + \sin 2\theta = 4\sin\theta\cos\frac{3\theta}{2}\cos\frac{5\theta}{2}$

(iii) A piece of plastic strip 1 meter long is bent to form an isosceles triangle with 95^o as its larges angle. Find the length of sides

(iv) A belt 24.75 meters long passes around a 3.5cm diameter pulley. As the belt makes three complete revolutions in a minute, how many radians does the wheel turn in one second?

(v) Prove that: $\tan^{-1}\frac{1}{13} + \tan^{-1}\frac{1}{4} = \tan^{-1}\frac{1}{3}$.

SECTION 'C' (DETAILED ANSWER QUESTIONS)

NOTE: Answer 2 questions from this section.

4. (a) Find the inverse of A = $\begin{bmatrix} 2 & 1 & -1 \\ 0 & 2 & 1 \\ 5 & 2 & -3 \end{bmatrix}$ by adjoint method. OR

4. (a) By using the properties of determinants express the following determinants in factorized form

$$A = \begin{vmatrix} 1 & 1 & 1 \\ a & b & c \\ bc & ac & ab \end{vmatrix}$$

4. (b) If α and β are the roots of pt + qt + q = 0, q ≠ 0 prove that:

$$\sqrt{\frac{q}{p}} + \sqrt{\frac{\alpha}{\beta}} + \sqrt{\frac{\beta}{\alpha}} = 0$$

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

5. (b) Prove that a, b, c are in A.P., G.P., or H.P. according as

$$\frac{a-b}{a-c} = \frac{a}{a} or \frac{a}{b} or \frac{a}{c}$$ **OR**

5. (b) Inset four Harmonic means between 12 and 48/5.

5. (c) Write in simplified form the term involving x^{10} in the expansion of $\left(x^2 - \frac{1}{x^3}\right)^{10}$

6. (a) Prove that in any triangle ABC r1 r2 r3 = rs2

6. (b) Prove that in any triangle ABC, r = $\Delta/_{s}$

6. (b) **OR** Draw the graph of cos 2θ where $-180^o \leq 0 \leq 180^o$.

6. (c) Find the general solution of sinθ + cosθ = 1

MATHEMATICS 2012

SECTION "A" (MULTIPLE CHOICE QUESTIONS)

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

(i) A square matix A is said to be singular if:
* $\lfloor A \rfloor = 0$ * A=0 * $\lfloor A \rfloor = 1$ * none of these

(ii) The probability of getting a head in single toss of a coin is:
* 0 * I * 1 * -1/2

(iii) $\left(\frac{5}{3,2}\right) =$
* 9 * 10 * 20 * 8

(iv) If R is the circum-radius of a circum-circle then R=
* $\frac{\Delta}{s}$ * $\frac{\Delta}{s-c}$ * $\frac{abc}{4\Delta}$ * $\frac{4\Delta}{abc}$

(v) The period of tan θ is:
* $\pi/_2$ * 2π * $3\pi/_2$ * π

(vi) $\frac{1}{1+tan^2\theta} =$
* $-sec^2\theta$ * $cos^2\theta$ * $sin^2\theta$ * $cot^2\theta$

(vii) If (x + 3,3)=(-5,3), then value of x is:
* -7 * -2 * -8 * -5

(viii) If A = {2,3} and B ={1,2} then A–B is equal to:
* {1,1} * {0,3} * {3} * {2}

(ix) If the roots of the equation $ax^2+bx+c=0$ are equal then b^2-4ac is:
* greater than zero * less than zero
* equal to zero * equal to one

(x) The matrix $\begin{bmatrix} \sqrt{3} & 0 & 0 \\ 0 & \sqrt{3} & 0 \\ 0 & 0 & \sqrt{3} \end{bmatrix}$ is a:

* Diagonal matrix * Scalar Matrix
* Unit Matrix * Null Matrix

(xi) if matrix $\begin{bmatrix} \lambda & 3 \\ 2 & 4 \end{bmatrix}$ is a singular matrix, then the value of λ is:

* $\frac{2}{3}$ * $\frac{4}{3}$ * $\frac{3}{2}$ * $-\frac{3}{2}$

(xii) The value of 5_{P_3} is:

* 120 * 60 * 20 * 80

(xiii) $\frac{(n+1)!}{(n-1)!}$ =:

* n * (n-1) * (n+1) * n(n+1)

(xiv) If n is a natural number, the middle term is the expansion of $(a+b)^{2n}$ is:

* $[\frac{n}{2}]^{th}$ * $[\frac{n+2}{2}]^{th}$ * $(n+1)^{th}$ term * $\left[\frac{2n+1}{2}\right]^{th}$ term

(xv) If the sides of a triangle are 3,4 and 5 units, then s is:

* 4 * 12 * 5 * 6

(xvi) Cot ($-\theta$) =:

- -cot θ * -tan θ * $\frac{1}{cot\theta}$ * $\frac{1}{tan\theta}$

(xvii) The multiplicative inverse of (c,d) is equal to:

* $\left[\frac{1}{C^2}, \frac{1}{d^2}\right]$ * $\left[\frac{1}{C^2+d^2}, \frac{-d}{C^2+d^2}\right]$ * $\left[\frac{c}{d,}, \frac{d}{c}\right]$ * $\left[\frac{1}{c}\ \frac{1}{d}\right]$

(xviii) If -4 and 8 are the roots of quadratic equation then the equation is:

* $x^2-4x-32 = 0$ * $x^2+4x-32 = 0$ * $x^2-4x+32 = 0$ * $x^2+4x+32 = 0$

(xix) $\omega + \omega^2$ =:

* ω * 1 * -1 * ω

(xx) The sum of the roots of $12x^2-16x+4 = 0$ is:

* $\frac{-4}{3}$ * $\frac{1}{3}$ * $\frac{4}{3}$ * $\frac{-1}{3}$

MATHEMATICS 2012

SECTION "B" (SHORT ANSWER QUESTIONS)

NOTE: Answer 7 questions from this section.

ALGEBRA

2 (i) solve: (x+6)(x+1)(x+3)(x-2)+56 = 0

(ii) Solve the following system of equations:

$2x+3y = 7$

$2x^2-3y^2 = -25$

(iii) By using the properties of determinants, prove that:

$$\begin{bmatrix} a+x & a & a \\ a & a+x & a \\ a & a & a+x \end{bmatrix} = x^2(3a+x)$$

(v) Let S = $(1, \omega, \omega^2)$ where ω, being complex cube root of unity, construct a composition table with respect to multiplication on C and Show that

(a) Associative law holds in 'S'

(b) 1 is the identity element in 'S'

(c) Each element of 'S' has its inverse in 'S'

(d) Insert four Harmonic means between 12 and $48/_5$

(vi) Two cards are drawn at random from a deck of well shuffled cards, find the probability that the cards drawn are:

(a) Both aces (b) a king and a queen

(vii) Prove by mathematical induction that:

$1^2+2^2+3^2+\ldots\ldots\ldots+n^2 = \frac{n(n+1)(2n+1)}{6} \ \forall n \in N$

(vii) $2^{n+2}-28n-4$ is divisible by 49, $\forall n \in N$

(viii) Determine the value of k for which the roots of the following equation are equal:

$x^2-2(1+3k)x+7(3+2k) = 0$

(ix) if [x] <1, prove that $\frac{\sqrt{1+x}+{}^3\sqrt{2n+1^2}}{1+x+\sqrt{1}+x} = \left[1-\frac{5}{6}x\right]$ nearly.

(ix) OR Find the first negative term in the expansion of $(1+2x)^{3,2}$

TRIGONOMETRY

Note: Attempt 3 question from this Section.

3. (i) if $\tan\theta = \frac{-1}{3}$ and $\sin\theta$ is negative, find the remaining trigonometric functions using definition of radian function.

(ii) if a point on the rim of a 21 cm diameter fly wheel travels 5040 meters in a minute, through how many radians does they the fly wheel turn in one second.

(iii) Prove any Two of the following:

(a) $\frac{\tan\theta+\sin\theta}{\operatorname{cosec}\theta+\cot\theta}$ = tanθ. Sinθ (b) sin3θ = 3sinθ – 4sin$^3\theta$

(c) $\frac{\sin(\theta+\emptyset)}{\cos\theta\cos\emptyset}$ = tanθ + tan$\emptyset$ OR $\frac{\sin 2\theta}{\sin\theta} - \frac{\cos 2\theta}{\cos\theta} = \sec\theta$

(iv) Draw the graph of cos 2θ, when -180$^o \leq \theta \leq$ 180^o.

(v) Prove: $\tan^{-1}\frac{1}{3} + \frac{1}{2} + \tan^{-1}\frac{1}{7} = \frac{\pi}{8}$

SECTION 'C' (DETAILED – ANSWER)

NOTE: Answer 2 questions from this section.

4. (a) Solve the following system of equations by using the matrix method:

x + y = 5
x + z = 7
z + x = 6

4. (b) If a, β are the roots of the equation px^2+qx+r=0, from the equation whose roots are $-1/_{a^3}$ and $-1/_{\beta^3}$

5. (a) Find the sum of 20 terms of an AP.. whose 4th term is 7 and 7th term is 13.

5. (b) In the Pth term of an H.P. is q the qth term is p, prove that the (p+q)th term is $\frac{pq}{p+q}$ **OR**

5. (b) if y = $\frac{3}{4} + \frac{3.5}{4.8} + \frac{3.5.7}{4.8.12} +$ ___ prove that; y^2+2y-7=0

6. (a) Derive the Law of Tangents. **OR**

6. (a) Solve the equation tan2θ cotθ = 3

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

MATHEMATICS 2011

SECTION "A" (MULTIPLE CHOICE QUESTIONS)

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

(i) if 2^{2x+3} = 32 then x=:

* 2   * 3   * 1   * 4

(ii) if A is a non-singular matrix then A^{-1}=:

* $\frac{Adj\ A}{A}$ * $\frac{Adj\ A}{[A]}$ * $\frac{[Adj\ A]}{A}$ * $[A]\ Adj\ A$

(iii) If H is the Harmonic Means between a & b then H=?

* $\frac{2(a+b)}{ab}$ * $\frac{a+b}{2ab}$ * $\frac{2ab}{a+b}$ * $\frac{ab}{a+b}$

(iv) 2_{C_1} =:

* $\frac{n!}{r!(n-r)!}$ * $\frac{n!}{(n-r)!}$ * $\frac{n!}{r!}$ * $\frac{(n-r)!r!}{n!}$

(v) The value of $\frac{(n+r)!}{(n-r)!}$ is equal to:

* $n(n+1)$ * (n+1)! * $n!$ * $\frac{n+1}{n-1}$

(vi) The middle term in expansion of $(a+b)^{2n}$ is:

* nth term * (n+1)th term * (2n-1)th term * (2n+1)th term

(vii) If tanθ=$\frac{-3}{4}$is sinθ is –v then p(θ) lies in:

* 1st quadrant * 2nd quadrant * 3rd quadrant * 4th quadrant

(viii) If the sides of the triangle are 3,4,5 units then s=:

* 15 * 6 * 12 * 30

(ix) $\frac{n\pi}{3}$ radius in degrees is equal to:

* 90^o * 120^o * 60^o * 150^o

(x) Cas u+cos v=:

* cos $\frac{u+v}{2}$ cos $\frac{u-v}{2}$ * 2cos $\frac{u+v}{2}$ sin $\frac{u-v}{2}$

* 2cos $\frac{u+v}{2}$ cos $\frac{u-v}{2}$ * 2sin $\frac{u+v}{2}$ cos $\frac{u-v}{2}$

(xi) If a balnced die is rolled then the probability of getting 2 or 5 is:

* $\frac{1}{2}$ * $\frac{1}{3}$ * $\frac{1}{6}$ * $\frac{2}{5}$

(xii) If sinθ=0, then θ is equal to:

* 2nπ , n ∈ Z * (2n+1) π, n ∈ * nπ, n π Z * $\frac{n\pi}{2}$ $n \in Z$

(xiii) If A = {0,1}, B = {1,2} and C = {2,3} then A x (B∩C):

* φ * {(1,3)(0,1)} * {(0,2)(1,2)} * {(2,3)(1,1)}

(xiv) (a,b).(c,d)=:

* (ac-bd, ad+bc) * (ac,bd) * (ac+bd, ad-bc) * (cd, bc)

(xv) The real and imaginary parts respectively of i(2-3i) are:

* –3&2 * 3&2 * 2&3 * –2&–3

(xvi) The roots of the equation $ax^2 + bx + c = 0$ are rael and distinct, if $b^2 - 4ac$ is:

* 0 * +ve * –ve * non zero

(xvii) The product of the roots of the equation $3x^2 - 5x + 2 - 0$ is:

* $\frac{3}{5}$ * $\frac{2}{3}$ * $\frac{3}{2}$ * $\frac{5}{3}$

(xviii) If ω is a complex cube root of unity then $\omega^{16} =$:

* 0 * ω^2 * ω * 1

(xix) If z = a + ib then |z| = :

* $\sqrt{a-b}$ * $\sqrt{a^2+b^2}$ *$\sqrt{a^2-b^2}$ * $\sqrt{a+b}$

(xx) If $\begin{bmatrix} 2\lambda & 3 \\ 4 & 2 \end{bmatrix}$ is a singular matrix then value of λ is:

* 3 * 2 * $\frac{1}{2}$ * 4

MATHEMATICS 2011

SECTION "B" (SHORT ANSWER QUESTIONS)
ALGEBRA

NOTE: Answer 7 questions from this section.

2 (i) Solve the complex equation $(x+3i)^2 = 2yi$

(ii) Solve the equation $\sqrt{\frac{1-x}{x}} + \sqrt{\frac{x}{1-x}} = \frac{13}{6}$

(iii) Solve the following system of equation $x^2 + y^2 = 169$
$X - y = 13$

(iv) Solve x, $\begin{bmatrix} -2 & 3 \\ 4 & -1 \end{bmatrix} \begin{bmatrix} 1 & x & 5 \\ 2 & 4 & x \end{bmatrix} \begin{bmatrix} -3 \\ 1 \\ 0 \end{bmatrix} = [2 \quad -14]^t$

(v) Using the properties of determinant show that:

$$\begin{vmatrix} 1 & 1 & 1 \\ \alpha & \beta & \gamma \\ \beta\gamma & \gamma\alpha & \alpha\beta \end{vmatrix} = (\alpha-\beta)(\beta-\gamma)(\gamma-\alpha).$$

(vi) Using the multiplication table show that multiplication (.) is a binary operation on S = {1, –1, i, –i}. Also show that (.) is commutative.

(vii) If ${}^nP_3$ = 12, 2P3, find n:

(viii) A word consists of 5 consonants and 4 vowels, three letters are chosen at random. What is the probability that more than one vowel will be selected?

(ix) Prove my mathematical Induction:

2+6+12+……..+n(n+1)–$\frac{1}{3}$n(n+1)(n+2) $\forall n \in N$

(x) Find the term independent of x in the binomial expansion of $\left(x - \frac{1}{x^2}\right)^{15}$

OR

(x) Show that $\sqrt{3} = 1 + \frac{1}{3} + \frac{1.3}{3^2.2!} + \frac{1.3.5}{3^3.3!} + \cdots$ … … ..

TRIGONOMETRY

NOTE: Answer 3 questions from this section.

3. (i) If a point on the rim of 21cm diameter fly wheel travels 5040 meters in a minute, through how many radians does the wheel turn in one second?

(ii) If tanθ = $\frac{3}{4}$ and ρ(θ) is in the 3rd quadrant. Find the remaining trigonometric functions by using the definition of radian function.

(iii) Prove any Two of the following:

(a) $\frac{cot\theta + cosec\theta}{sin\theta + tan\theta} = cosec\theta cot\theta$ (b) cos = 8cos^4 $\theta - 8cos^2\theta = 1$

(c) $\frac{sin7\theta - sin5\theta}{cos7\theta + cos5\theta} = tan\theta$

(iv) Draw the graph of sinx when – 180° $\leq \theta \leq$ 180°.

SECTION 'C' (DETAILED – ANSWER)

NOTE: Answer 2 questions from this section.

4. (a) Using Gramer's rule, solve the following system of equations:

x + y – z = 2
z + 2y + z = 7
3x + y + 2z = 12

OR

4. (a) Find A–1 by adjoint method if A = $\begin{bmatrix} 1 & 3 & 5 \\ 2 & 4 & 7 \\ 9 & 8 & 6 \end{bmatrix}$.

4. (b) If α, βare the roosts of the equation x2 – 3x + 2 = 0, from an equation whose roots are (α + β)2 and $(\alpha - \beta)^2$.

5. (a) Find the sum of 20 terms of an A.P. whose 4th term is 7 and 7th term is 13.

5. (b) (i) Which term of the sequence 27, 18, 12 ……. is $\frac{512}{729}$?.

5. (b) (ii) the 12th term of an H.P. is $\frac{1}{5}$ and 19th term is $\frac{3}{22}$ find the 4th term

6. (a) (i) Solve the triangle in which a = 5, b = 10, c = 13

6. (a) (ii) Prove that Δ = 4R$\cos\frac{\alpha}{2} cos\frac{\beta}{2} cos\frac{\gamma}{2}$.

6. (b) Derive the Law of Sines

MATHEMATICS 2010

SECTION "A" (MULTIPLE CHOICE QUESTIONS)

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

(i) If the sides of a triangle are 2, 3 and 5 units, then s =

* 30   * 25   * 5   * 10

(ii) If a, b, c are the sides of a triangle ABC, then 'r' is:

* $\frac{abc}{4}$ * $\frac{4\Delta}{abc}$ * $\frac{\Delta}{s}$ * $\frac{abc}{4\Delta}$

(iii) The law of cosine when <B is in the standard position is:

* $a^2 = b^2 + c^2 - 2c\cos\alpha$ * $b^2 = c^2 + a^2 - 2ac\cos\beta$
* $c^2 = a^2 + b^2 - 2ac\cos\gamma$ * $\cos\beta = a^2 + c^2 - b + 2ac$

(iv) The value of $\frac{(n+1)!}{(n-1)!}$ is:

* n(n+1)   * (n+1)!   * (n(n+1)!   * $\frac{(n+1)}{(n-1)}$

(v) The real and imaginary parts of I(3-2i) are respectively:

* -2 & 3   * 2 & -3   * 2 & 3   * -3 & -2

(vi) The roots of the equation $ax^2+bx+c=0$ are complex if b^2-4ac is:

* -ve   * +ve   * 0   * perfect square

(vii) If ω is the cube root of unit, then ω^{64}:

* ω * 0   * ω^2 * 1

(viii) For the equation $px^2+qx+r=0$, the sum of the root is:

* $-q_{/p}$ * $q_{/p}$ * $p_{/q}$ * $-p_{/q}$

(ix) If the matrix $\begin{bmatrix} 1 & 2 \\ 3 & \lambda \end{bmatrix}$ is singular, then the value of λ :

* 1/6 * 6 * -6 * 5

(x) If 4 and 16 are in G.P. the value of 'a' is:

* 64 * $\underline{+}8$ * $\sqrt{8}$ * $\underline{+}\sqrt{8}$

(xi) The H.M. between p & q is:

* $\frac{p+q}{2}$ * $\frac{p+q}{pq}$ * $\frac{2pq}{p+q}$ * $\frac{q}{p+q}$

(xii) The value of $\left(\frac{5}{3,2}\right)$ is:

* 10 * 5/6 * 1 * 20

(xiii) The probability of getting the tail in a single toss of a coin is:

* 1/3 * 1/2 * 2/3 * 3

(xiv) The value of $^{13}C_{11}$ is:

*77 * 11! * !3! * 78

(xv) $|I_3|$ equal to:

* -1 * 0 * 1 * 3

(xvi) The number of term in the binomial expansion of $(3x+2y)^9$ is:

* 9 * 10 * 11 * 8

(xvii) If tanθ = $-1/_3$ and sin θ is negative, p(θ) lies in this quadrant:

* 3^{rd} quadrant * 1^{st} quadrant * 4^{th} quadrant * 2^{nd} quadrant

(xviii) tan(θ)=:

* $\frac{1}{tan\theta}$ * $-tan\theta$ * $-cot\theta$ * $\frac{1}{cot\theta}$

(xix) The period of θ is:

* $\frac{3\pi}{2}$ * $\frac{\pi}{2}$ * 2π * π

(xx) The distance between (1,1) and (4,5) is:

* 4 * 3 * 5 * 2

MATHEMATICS 2010

SECTION "B" (SHORT ANSWER QUESTIONS)

NOTE: Answer 7 questions from this section.

2 (i) Solve: the complex equation (x,y).(2,3) = (-4,7)

(ii) If α, β are the roots of the equation $px^2+qx+r=0$, ($p\neq 0$) find the value of $a^3+\beta^3$.

(iii) if $\{1,\omega,\omega^2\}$ are the cube roots of unity, prove that $(2+\omega^2)=\frac{3}{(2+\omega)}$

(iv) Solve:

$$x+y=5$$
$$\frac{3}{x}+\frac{2}{x}=2$$

(v) Using the properties of determinants, show that:

$$\begin{vmatrix} 1 & 1 & 1 \\ a & b & c \\ a^2 & b^2 & c^2 \end{vmatrix} = (a-b)(b-c)(c-a)$$

(vi) verify that:

$$\begin{bmatrix} \frac{sin\theta - cos\theta}{cos\theta \ \ sin\theta} \end{bmatrix} \begin{bmatrix} \frac{sin\theta \ \ cos\theta}{-cos\theta \ \ sin\theta} \end{bmatrix} = \begin{bmatrix} \frac{1 \ \ 0}{0 \ \ 1} \end{bmatrix}$$

(vii) Using the multiplication table show that multiplication is a binary operation on S={1,-1,i.-i}. Also show that (.) is commutative.

(viii) find the sum of 8 terms of an A.P. is 64 and the sum of its 19 terms is 361, find the sum of 31 terms of the A.P.

(ix) Prove by mathematical induction that 10n+3.4n+2+5 is divisible by 9 for all $n \in N$

(x) Show that: $3_{\sqrt{4}} = 1 + \frac{1}{4} + \frac{1.3}{4.6} + \frac{1.3.5}{4.6.8} + \ldots\ldots\ldots\ldots$ OR

(x) Find the first negative terms in the expansion of $\left[1+\frac{3}{2}x\right]^{9/2}$

TRIGONOMETRY

Note: Attempt 3 question from this Section.

3. (i) if $\tan\theta = \frac{1}{2}$, find the remaining trigonometric functions when 'θ' lies in the 3rd quadrant.

(ii) A belt 24.75 meters long passes around a 3.5 cm diameter pulley. As the belt makes three complete revolutions in a minute, how many radians does the wheel turn in one second?

(iii) Prove any Two of the following:

(i) Cos3θ=4cos^{3}θ-cosθ (ii) $\frac{sin3\theta}{sin\theta} - \frac{cos3\theta}{cos\theta} = 2$ (iii) tan $\frac{\theta}{2}$ =$\frac{1-cos\theta}{sin\theta}$

(iv) Draw the graph of cos2x, where $-\pi \leq \theta \leq \pi$

(iv) OR Show that the point, (2,1)(5,1)(2,6) are the vertices of right angle triangle

(v) Without using a calculator and table verify that:

tan^{-1} $\frac{1}{13} + \; tan^{-1} = tan^{-1}\frac{1}{3}$

SECTION 'C' (DETAILED – ANSWER)

NOTE: Answer 2 questions from this section.

4. (a) Insert 4 harmonic means between 12 and 48/5.

4. (b) Use the Adjoint method to solve the given equations"

2x-y+2y = 4
X+10y-3z = 10
x-7-z = 6

5. (a) In how many distinct ways can the latters of the word INTELLIGENCE be arranged?

5. (b) A father has 8 children. He take them, three at a time, to a zoo without taking the same 3 children more than once, how often will he go and how often does each child get the chance to go?

6. (a) Derive the Law of Cosine. OR

6. (a) Prove that $r_2 = \frac{\Delta}{s-b}$ where all the letters have their usual meanings.

6. (b) (i) Show that in any ΔABC in $\frac{1}{r_1} + \frac{1}{r_2} + \frac{1}{r_3} = \frac{1}{r}$ the letter have their usual meanings.

6. (b) (ii) solve the ΔABC in which a=5cm, b=10cm, c=13cm. OR

6. (b) solve the equation for all values of 2sin2θ-3sin θ-2=0