PRACTICE GURU ACADEMY

SECOND TERMINAL EXAMINATION, 2014
MATHEMATICS

Time : 3 hrs.   **Class XI**   **M.M. : 100**

Date – 01.03.2014

General Instructions :

- All the questions are compulsory.
- The question paper consists of 29 questions divided into section A, B and C. Section A comprises of 10 questions of one mark each, Section B comprises of 12 questions of four marks each and Section C comprises of 7 questions of six marks each.
- There is no overall choice. However, internal choice has been provided. You have to attempt only one of the alternatives in all such questions.
- Use of calculator is not permitted.
- You may ask for logarithmic table if required.

SECTION – A

Q.1   If A = {a, b, {a, b}} write power set of A.

Q.2   If A = { x : x is an even natural number less than 10}.

       B = {x : x is a root of $x^2 - 6x + 8 = 0$}

       find A Δ B.

Q.3   If $\left(\dfrac{1+i}{1-i}\right)^n$ is 1 find the least value of n where n $\in$ N.

Q.4   If $\dfrac{a+ib}{a-ib} = \dfrac{2+3i}{3-2i}$ prove that a = b.

Q.5   A = {1, 1}, find A × A × A.

Q.6   Evaluate $\displaystyle\sum_{k=1}^{10} 4 + 3^k$.

Q.7   Find the sum of multiple of 7 lies between 200 to 500.

Q.8   Find the ratio in which the line joining (-2, 1, 3) and (4, -2, 5) is divided by xz-plane.

Q.9   Evaluate : $\displaystyle\lim_{x \to 0} \dfrac{(1+x)^{2/3} - 1}{x}$.

Q.10   If f(x) = 1 + $\dfrac{x}{1!} + \dfrac{x^2}{2!} + \dfrac{x^3}{3!} + \dfrac{x^4}{4!}$ .... find f'(x).

SECTION – B

Q.11   Prove that $\cos^2 x + \cos^2\left(x+\dfrac{\pi}{3}\right) + \cos^2\left(x-\dfrac{\pi}{3}\right) = \dfrac{3}{2}$.

Q.12   Prove that : $\cos 5A = 16\cos^5 A - 20\cos^3 A + 5\cos A$.

Q.13   Prove by using the principle of mathematical induction :

       $\dfrac{1}{2.5} + \dfrac{1}{5.8} + \dfrac{1}{8.11} + \ldots\ldots\ldots\ldots + \dfrac{1}{(3n-1)(3n+2)} = \dfrac{n}{6n+4}$

Q.14   If $(x + iy)^3 = u + iv$, then show that $\dfrac{u}{x} + \dfrac{v}{y} = 4(x^2 - y^2)$

                                  OR

       Solve the quadratic equation using formulae $2x^2 + 3ix + 2 = 0$.

Q.15   Determine the number of 5-Cards combinations out of a deck of 52 cards if each selection of 5 Cards has –

       i)   exactly one king   ii)   no king   iii)   at least two kings

(1/2)

Q.16 Find the number of words with or without meaning which can be made using all the letters of the word AGAIN. If these words are written as in dictionary. What will be the 50th word?

Q.17 The coefficient of $(r-1)^{th}$, r^{th}, and $(r+1)^{th}$ terms in the expansion of $(x+1)^n$ are in the ratio 1:3:5. Find 'n' and 'r'.

Q.18 Sum of two numbers is 6 times their geometric mean, show that numbers are in the ratio $\left(3+2\sqrt{2}\right):\left(3-2\sqrt{2}\right)$.

Q.19 Find the sum of 1st n terms of the series $\dfrac{1^3}{1}+\dfrac{1^3+2^3}{1+3}+\dfrac{1^3+2^3+3^3}{1+3+5}+\ldots\ldots\ldots$ n terms.

<div align="center">**OR**</div>

$\dfrac{1}{1\times2}+\dfrac{1}{2\times3}+\dfrac{1}{3\times4}+\ldots\ldots$ n terms.

Q.20 Find the distance of the line 4x+7y+5=0 from the point (1, 2) measured parallel to 4x–2y+5=0.

Q.21 Find the equation of the circle passing through the points (2, 3) and (-1, 1) and whose centre lies on the line x – 3y – 11 = 0.

Q.22 Find the derivative of x.sinx from 1st principles.

<div align="center">**OR**</div>

Let f(x) = $\begin{cases} a+bx, & x<1 \\ 4, & x=1 \\ b-ax, & x>a \end{cases}$

if $\lim\limits_{x\to1}$ f(x) = f(1). What are the possible values of 'a' and 'b'.

<div align="center">**SECTION – C**</div>

Q.23 In a survey of 100 students, the number of students studying the various languages were found to be : English only 18, English but not Hindi 23, English and Sanskrit 8, English 26, Sanskrit 48, Sanskrit and Hindi 8, No language 24. Find –
  - i) How many students were studying Hindi?
  - ii) How many students were studying English and Hindi?

Q.24 Find the domain and range of the function

$\left\{\left(x,\dfrac{1}{1-x^2}\right):x\in R,\ x\neq\pm1\right\}$

Q.25 Solve : $\tan^2\theta + \sec2\theta = 1$

<div align="center">**OR**</div>

Solve : $\tan\theta + \sec\theta = 2\cos\theta$

Q.26 Solve the following system of inequations graphically.

x+2y ≤ 8, x – y ≤ 1, 2x + y ≥ 2, x ≥ 0, y ≥ 0.

Q.27 An arch is in the form of parabola with its axis vertical. The arch is 10m high and 5m wide. How high is it 2m from the centre?

<div align="center">**OR**</div>

Find the equation of hyperbola whose foci are $\left(0,\pm\sqrt{10}\right)$ and passes through the point (2, 3). Also find its eccentricity and length of latus rectum.

Q.28 Find the mean and standard deviation of 1st n natural numbers.

Q.29 Two students Ram and Shyam appeared in an interview. The probability of Ram will selected in 0.05 and Shyam will selected is 0.10 and both with selected is 0.02. Find the probability that –
  - i) both Ram and Shyam will not be selected
  - ii) at least one of them will not be selected
  - iii) only one of them will be selected.