Code: DE01 / DC01 Time: 3 Hours

DECEMBER 2010

Student Bounty Com **Subject: MATHEMATICS** -

Max. Marks: 100

NOTE: There are 9 Questions in all.

- Question 1 is compulsory and carries 20 marks. Answer to Q.1 must be written in the space provided for it in the answer book supplied and nowhere else.
- The answer sheet for the Q.1 will be collected by the invigilator after half an hour of the commencement of the examination.
- Out of the remaining EIGHT Questions answer any FIVE Questions. Each question carries 16 marks.
- Any required data not explicitly given, may be suitably assumed and stated.

Choose the correct or the best alternative in the following: **Q.1**

(2x10)

a. The equation whose roots are double the roots of $x^2 - bx + c = 0$ is

(A)
$$4x^2 - 2bx + c = 0$$

(B)
$$x^2 - 2bx + 4c = 0$$

(C)
$$x^2 - 2bx + 2c = 0$$

(D)
$$x^2 - 4bx + 2c = 0$$

b.
$$\lim_{x\to 0} \frac{\tan x - \sin x}{x^3}$$
 is

(C)
$$\frac{1}{2}$$

(D)
$$\frac{1}{4}$$

- c. If A(2, 1), B(4, 5) and C(K, -1) lie on a straight line, then value of k is
 - **(A)** 1

(B) 2

(C) 3

- **(D)** 0
- d. The equation of the straight line with slope 3 and x-intercept 2 is

(A)
$$y=3x+2$$

(B)
$$y=3x-2$$

(C)
$$y=3x+6$$

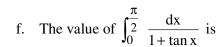
(D)
$$y=3x-6$$

e. If $y = \log (\sec x + \tan x)$, the value of $\frac{dy}{dx}$ is

(A)
$$\frac{1}{\sec x + \tan x}$$

(B)
$$\sec x + \tan x$$

$$(\mathbf{D})_{tan x}$$



(A) 0

(B) π

(C) $\frac{\pi}{2}$

(D) $\frac{\pi}{4}$

THE THEOLINE COM g. The area bounded by $y = \sin x$, the x - axis between x = 0 and $x = \pi$ is

(A) 1

(B) 2

(C) 3

(D) 4

h. The solution of the differential equation $\frac{dy}{dx} + \frac{y}{x} = 0$ is

 $(\mathbf{A}) \mathbf{x} + \mathbf{y} = \mathbf{c}$

(B) $x^2 + y^2 = c$

(C) xy = c

(D) $\frac{x}{v} = c$

i. The value of $\tan^{-1} \left[\sqrt{\frac{1 - \cos x}{1 + \cos x}} \right]$ is

(A) x

(B) $\frac{x}{2}$

(C) $\frac{x}{4}$

(D) 0

The value of $\frac{\sin 5A - \sin 3A}{\cos 5A + \cos 3A}$ is

(A) tan 5A

(B) tan 3A

(C) tan 2A

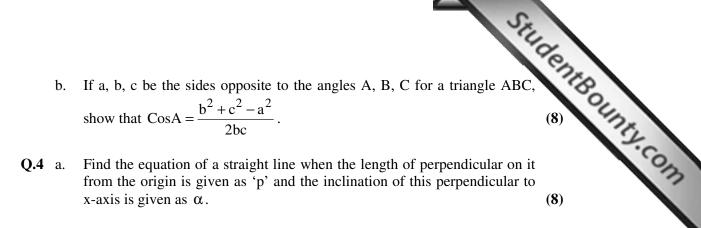
(D) tan A

Answer any FIVE Questions out of EIGHT Questions. Each question carries 16 marks.

a. The sum of an infinite number of terms of a G.P. is 9 and sum of the **Q.2** squares of these terms is $\frac{81}{5}$. Find the G.P. **(8)**

If the rth term to the expansion of $(1+x)^{20}$ has its coefficient equal to that of $(r+4)^{th}$ term. Find r. **(8)**

If $A + B + C = \pi$, show that $\tan 2A + \tan 2B + \tan 2C = \tan 2A \cdot \tan 2B \cdot \tan 2A = \tan 2A = \tan 2A \cdot \tan 2A = \tan 2A$ **(8)** If a, b, c be the sides opposite to the angles A, B, C for a triangle ABC, show that $CosA = \frac{b^2 + c^2 - a^2}{2bc}$.



- b. Find the angle between the straight lines $y \sqrt{3}x 5 = 0$ and $\sqrt{3}y - x + 6 = 0.$ **(8)**
- Q.5 a. Find the equation of the circle circumscribing the triangle formed by the lines x + y = 2, x - y = 0 and 3x - 4y = 6. **(8)**
 - b. Find the focus, vertex, latus rectum and directrix of the parabola $(y+3)^2 = 2(x+2)$ $(4 \times 2 = 8)$

Q.6 a. If
$$\sin y = x \sin (a+y)$$
, show that $\frac{dy}{dx} = \frac{\sin^2(a+y)}{\sin a}$ (8)

- b. Show that the sum of the intercepts on axes of any tangent to the curve $\sqrt{x} + \sqrt{y} = \sqrt{a}$ is constant. **(8)**
- **Q.7** a. Find the local maximum and minimum values of the function f(x) = (x-1)(x-2)(x-3)(4+4)

b. Evaluate
$$\int \sqrt{\left(\frac{2+x}{2-x}\right)} dx$$
 (8)

Find the area bounded by the axis of x and the curve $y = 1 - x^2$ **Q.8** a. **(8)**

b. Evaluate
$$\int_{0}^{\pi/4} \log(1 + \tan x) dx$$
 (8)

- **Q.9** Solve any **TWO** of the following differential equations:-
 - (i) $\sec^2 x \tan y dx + \sec^2 y \tan x dy = 0$
 - (ii) $x \frac{dy}{dx} + y = \log x$

(iii)
$$xdy - ydx = \sqrt{x^2 + y^2}dx$$
 (8 + 8)