SARDAR PATEL UNIVERSITY
FY BSc (II SEM) (CBCS) EXAMINATION
Thursday, 19th April 2012
11 am - 1 pm
US02EMTH02 - Mathematics

Total Marks: 70

Note: Figures on the right indicate full marks of the questions.

Q.1 Choose the correct option for the following questions and write it down   [10]
     in the Answer-book.

(1) $\{x \in R / a \le x \le b\} =$_____.
    (a) [a, b]   (b) [a, b)
    (c) (a, b)   (d) (a, b]

(2) N (1, 3) = _____.
    (a) (2, 4)   (b) (4, 2)
    (c) (-2, 4)   (d) none of the these

(3) [6.8] = _____.
    (a) 6   (b) 8
    (c) 7   (d) 5

(4) $\int Kf(x)dx =$ _____.
    (a) $Kf(x)$ (b) $f(x)\int Kdx$
    (c) $K\int f(x)dx$ (d) none of the these

(5) $\int \sec x \tan x dx =$ _____.
    (a) tanx + c   (b) tan^{2}x + c
    (c) sec^{2}x + c   (d) secx + c

(6) In $\int_a^b f(x)dx$, a is called _____.
    (a) upper limit   (b) lower limit
    (c) limit   (d) none of these

(7) $\int_2^3 1dx =$ _____.
    (a) 1   (b) 3
    (c) 2   (d) 5

(8) $\int_{-1}^1 e^x \, dx =$ _____.
    (a) e^1 (b) e^{-1}
    (c) e$^{1-1}$ (d) e^1 - e^{-1}

(9) Order of $\dfrac{d^2y}{dx^2} + 3y = 0$ is _____.
    (a) 3   (b) 2
    (c) 1   (d) 0

(10) Degree of $\dfrac{d^2y}{dx^2} + \left(\dfrac{dy}{dx}\right)^3 + xy = 0$ is _____.
    (a) 2   (b) 1
    (c) 3   (d) 0

Q.2   Answer the following questions in short. **(Attempt Any Ten)**   [20]
   (1)   Define: Neighbourhood.
   (2)   Find $\dfrac{d}{dx}(x\sin x)$.
   (3)   State working rules of limit.
   (4)   Evaluate: $\int\left(x^{\frac{3}{2}}-3.5^{x}-\dfrac{1}{x}\right)dx$.
   (5)   Evaluate: $\int xe^{x}dx$.
   (6)   Evaluate: $\int\dfrac{1}{4x^{2}+9}\,dx$.
   (7)   State fundamental principle of definite integration.
   (8)   Obtain $\int\limits_{0}^{2}(x+5)dx$.
   (9)   Evaluate: $\int\limits_{0}^{\pi}\sin x\,dx$.
   (10) Define: Differential Equation.
   (11) Verify that y = e^{x}, x∈R is a solution of the differential equation $\dfrac{dy}{dx}=y$.
   (12) Obtain   the   order   and   degree   of   the   differential   equation
         $\dfrac{d^{2}y}{dx^{2}}=\left[1+\left(\dfrac{dy}{dx}\right)^{2}\right]^{\frac{3}{2}}$.

Q.3
   (a)   Evaluate $\displaystyle\lim_{x\to1}\dfrac{x^{6}-1}{x^{15}-1}, x\in R-\{1\}$.   [05]

   (b)   Evaluate $\displaystyle\lim_{x\to0}\dfrac{1-\cos x}{x^{2}}$.   [05]

OR

Q.3
   (a)   Find $\dfrac{dy}{dx}$ for $x^{3}+y^{3}=3axy$.   [05]

   (b)   If $x=\cos^{3}t,\ y=\sin^{3}t,$ then find $\dfrac{dy}{dx}$.   [05]

Q.4
   (a)   Evaluate $\int\dfrac{e^{2x}+1}{e^{2x}-1}dx$.   [05]

   (b)   Evaluate $\int x\log x\,dx$.   [05]

OR

Q.4
   (a)   Evaluate $\int\dfrac{\cos x}{\cos x-1}dx$.   [05]

   (b)   Evaluate $\int x\sqrt{x+2}\,dx,\quad x>-2$.   [05]

2

Q.5

(a) Evaluate $\int\limits_{0}^{\pi/4} \dfrac{dx}{4\sin^2 x + 5\cos^2 x}$. [05]

(b) Evaluate $\int\limits_{-\pi/4}^{\pi/4} \cos^2 x\, dx$. [05]

OR

Q.5

(a) Evaluate $\int\limits_{0}^{1} \dfrac{dx}{2e^x - 1}\, dx$. [05]

(b) Evaluate $\int\limits_{0}^{\pi/2} \dfrac{\sin^2 \theta}{(1+\cos\theta)^2}\, d\theta$. [05]

Q.6

(a) Verify that y = sinx, x ∈ R is a solution of the differential equation [05] $\dfrac{d^2 y}{dx^2} + y = 0$.

(b) Obtain the differential equation representing all lines of family [05] y = mx + c. (m and c are arbitrary constants).

OR

Q.6

(a) Verify that y = ax + a² (a is arbitrary constant) is the general solution of [05] the differential equation $\left(\dfrac{dy}{dx}\right)^2 + x\left(\dfrac{dy}{dx}\right) = y$.

(b) Obtain the differential equation of family of curves y = a sin (x + b), [05] a and b are arbitrary constants.

****

3