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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 \leq x \leq 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 K f(x) dx = $ _____.
   (a) $K f(x)$ (b) $f(x) \int K dx$
   (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 1 \, dx = $ _____.
   (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 $\dfrac{d^2 y}{dx^2} + 3y = 0$ is _____.
   (a) 3   (b) 2
   (c) 1   (d) 0

(10) Degree of $\dfrac{d^2 y}{dx^2} + \left(\dfrac{dy}{dx}\right)^3 + xy = 0$ 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 $y = e^{x}$, $x\in R$ 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]

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 $\dfrac{d^2 y}{dx^2} + y = 0$. [05]

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

OR

Q.6

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

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

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