

C.U.SHAH UNIVERSITY

Winter Examination-2015

Subject Name : Advance Mathematics

Subject Code : 2TE02AMT1

Branch : Diploma (All)

Semester : 02

Date : 19/11/2015

Time : 10:30 am To 1:30 pm

Marks : 70

Instructions:

- (1) Use of Programmable calculator & any other electronic instrument is prohibited.
 - (2) Instructions written on main answer book are strictly to be obeyed.
 - (3) Draw neat diagrams and figures (if necessary) at right places.
 - (4) Assume suitable data if needed.
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Q-1

Attempt the following questions:

(14)

- a) Centre of the circle $x^2 + y^2 = 25$ is _____.
(a) (0, 5) (b) (5, 0) (c) (5, 5) (d) (0, 0)
- b) If A(-3, 5) and B(2, -4) are two points then slope of AB is _____.
(a) $\frac{5}{9}$ (b) $\frac{-5}{9}$ (c) $\frac{-9}{5}$ (d) $\frac{9}{5}$
- c) x – intercept of line $3x + 2y - 7 = 0$ is _____.
(a) $\frac{7}{2}$ (b) $\frac{7}{3}$ (c) $\frac{3}{2}$ (d) $\frac{-3}{2}$
- d) Midpoint of A(5, 6) and B(5, 8) is _____.
(a) (5, 7) (b) (7, 5) (c) (0, -1) (d) (-1, 0)
- e) Distance between the points (5, 7) and (7, 5) is _____.
(a) 2 (b) 4 (c) $\sqrt{2}$ (d) $2\sqrt{2}$
- f) $\lim_{x \rightarrow 0} \frac{\tan x}{x} =$ _____.
(a) 0 (b) e (c) 1 (d) none of these
- g) $\lim_{x \rightarrow 0} (1+x)^{\frac{1}{x}} =$ _____.
(a) 1 (b) e (c) e^{-1} (d) none of these
- h) $\frac{d(e^{7x})}{dx} =$ _____.
(a) $7e^{7x}$ (b) e^{7x} (c) $\frac{e^{7x}}{7}$ (d) none of these



- i) $\frac{d(x^b)}{dx} = \underline{\hspace{2cm}}$
 (a) bx (b) x^{b-1} (c) bx^b (d) bx^{b-1}
- j) $\frac{d(b^x)}{dx} = \underline{\hspace{2cm}}$
 (a) xb^{x-1} (b) xb^x (c) $b^x \log_e b$ (d) $x^b \log_e b$
- k) $\int \frac{1}{x} dx = \underline{\hspace{2cm}}$
 (a) $\frac{-1}{x^2} + c$ (b) $\log x + c$ (c) $e^x + c$ (d) none of these
- l) $\int \frac{1}{\sqrt{x^2 + a^2}} dx = \underline{\hspace{2cm}}$
 (a) $\log|x + \sqrt{x^2 + a^2}| + c$ (b) $\cot^{-1} \frac{x}{a} + c$ (c) $\tan^{-1} \frac{x}{a} + c$ (d) none of these
- m) $\int \frac{1}{x^2 + 1} dx = \underline{\hspace{2cm}}$
 (a) $\sin^{-1} x + c$ (b) $\cos^{-1} x + c$ (c) $\cot^{-1} x + c$ (d) $\tan^{-1} x + c$
- n) $\int_0^1 e^x dx = \underline{\hspace{2cm}}$
 (a) e^x (b) e (c) $e-1$ (d) $1-e$

Attempt any four questions from Q-2 to Q-8

- Q-2 Attempt all questions (14)**
- a) $A(-1, 3)$, $B(-1, x)$ and $C(4, 3)$ are vertices of a triangle. If $m\angle B = 90^\circ$ then find value of x . (5)
- b) Find the equation of line perpendicular to line $4x - y + 5 = 0$ and passing through $(1, -2)$. (5)
- c) If two straight lines $A_1x + B_1y + C_1 = 0$ and $A_2x + B_2y + C_2 = 0$ are parallel to each other, prove that $A_1B_2 - A_2B_1 = 0$. (4)
- Q-3 Attempt all questions (14)**
- a) Find centre and radius of circle $4x^2 + 4y^2 + 8x - 12y - 3 = 0$. (5)
- b) Find equation of a circle passing through points $(0, 0)$, $(1, 0)$ and $(0, 1)$. (5)
- c) If $A(3, 4)$ and $B(-3, -4)$ are the given points, find the locus of point $P(x, y)$, so that $PA^2 + PB^2 = 100$. (4)
- Q-4 Attempt all questions (14)**
- a) Prove that $\lim_{n \rightarrow \infty} \sqrt{n^2 + n + 1} - n = \frac{1}{2}$ (5)
- b) Evaluate: $\lim_{x \rightarrow 3} \frac{x^2 - x - 6}{x^3 - 3x^2 + x - 3}$ (5)



c) If $f(x) = \frac{ax+b}{bx+a}$ then prove that $f(x) \cdot f\left(\frac{1}{x}\right) = 1$ (4)

Q-5 Attempt all questions (14)

a) Find $\frac{dy}{dx}$ if $y = \log\left(\frac{\sin x}{1+\cos x}\right)$. (5)

b) Find derivative of $f(x) = \sqrt{x}$ using definition. (5)

c) Find $\frac{dy}{dx}$ if $y = e^x \sin x \cos x$ (4)

Q-6 Attempt all questions (14)

a) The equation of motion of a particle is $S = 2t^3 - 3t^2 - 12t + 5$. Find velocity and acceleration at $t = 1$. (5)

b) Find $\frac{dy}{dx}$ if $x = \frac{a}{2}\left(t + \frac{1}{t}\right)$ and $y = \frac{b}{2}\left(t - \frac{1}{t}\right)$. (5)

c) Find $\frac{dy}{dx}$ if $y = x^{\sin x}$. (4)

Q-7 Attempt all questions (14)

a) Evaluate: $\int x \sin x \, dx$ (5)

b) Evaluate: $\int \frac{e^x(1+x)}{\cos^2(xe^x)} \, dx$ (5)

c) Evaluate: $\int \left(\sqrt{x} + \frac{1}{\sqrt{x}}\right)^2 \, dx$ (4)

Q-8 Attempt all questions (14)

a) Prove that $\int_0^{\frac{\pi}{2}} \frac{\sin x}{\sin x + \cos x} \, dx = \frac{\pi}{4}$ (7)

b) Find the volume of sphere of radius r . (7)

