

# 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.

**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)

