

Enrollment No:- _____

Exam Seat No:- _____

C.U.SHAH UNIVERSITY

Summer-2015

Subject Code: 2TE02AMT2

Subject Name: Advanced Mathematics

Course Name: DIPLOMA

Date: 18/5/2015

Semester:II

Marks:70

Time:02:30 TO 05:30

Instructions:

- 1) Attempt all Questions of both sections in same answer book/Supplementary.
- 2) Use of Programmable calculator & any other electronic instrument prohibited.
- 3) Instructions written on main answer book are strictly to be obeyed.
- 4) Draw neat diagrams & figures (if necessary) at right places.
- 5) Assume suitable & perfect data if needed.

Q-1 Answer the following.

[14]

- 1) $|2i + j - 3k| = \underline{\hspace{2cm}}$
- 2) If θ is the angle between the vectors x and y find $\sin\theta = \underline{\hspace{2cm}}$
- 3) If the two vectors a and b are perpendicular to each other $a \cdot b = \underline{\hspace{2cm}}$
- 4) If $f(x) = \sin x$ $f(2\pi) = \underline{\hspace{2cm}}$
- 5) $\lim_{x \rightarrow 0} \frac{\tan x}{x} = \underline{\hspace{2cm}}$
- 6) $\lim_{x \rightarrow \infty} \left(1 + \frac{1}{x}\right)^x = \underline{\hspace{2cm}}$
- 7) $\lim_{x \rightarrow 0} \frac{x^2 + x + 1}{x + 1} = \underline{\hspace{2cm}}$
- 8) $\frac{d(k)}{dx} = \underline{\hspace{2cm}}$ (Where $k = \text{constant}$)
- 9) Write derivative of \sqrt{x} .
- 10) If $y = 3x^2$ find $\frac{dy}{dx}$
- 11) $\int 1 dx = \underline{\hspace{2cm}}$
- 12) $\int \cos x dx = \underline{\hspace{2cm}}$
- 13) $\int \frac{1}{1 + x^2} dx = \underline{\hspace{2cm}}$
- 14) $\int_0^1 x dx = \underline{\hspace{2cm}}$



Attempt any four from Q-2 to Q-8

Q-2 (A) If $A = 2i - j - k$, $B = 3i + 2j - 3k$ and $C = 4i + 3j - 3k$ find $|3A + 2B - 2C|$. [05]

(B) Prove that $\lim_{x \rightarrow 0} \frac{\sqrt{1-x^2} - \sqrt{1+x^2}}{x^2} = -1$ [05]

(C) Find $\frac{dy}{dx}$ if $y = (\sin x)^x$ [04]

Q-3 (A) Simplify: $(10i + 2j + 3k) \cdot [(i - 2j + 2k) \times (3i - 2j - 2k)]$. [05]

(B) Evaluate: $\int x e^x dx$ [05]

(C) Find $\frac{dy}{dx}$ if $y = \frac{x^2 - 1}{x^2 + 1}$ [04]

Q-4 (A) Find $\frac{dy}{dx}$ if $x = \frac{a}{2} \left(t + \frac{1}{t} \right)$, $y = \frac{b}{2} \left(t - \frac{1}{t} \right)$ [05]

(B) Evaluate: $\lim_{x \rightarrow \pi/4} \frac{2 - \sec^2 x}{1 - \tan x}$ [05]

(C) For what value of m , vectors $2i + mj + k$ and $2i + 4j + 5k$ are perpendicular to each other? [04]

Q-5 (A) Prove that angle between two vectors $i + j - k$ and $2i - 2j + k$ is $\sin^{-1} \left(\frac{\sqrt{26}}{3\sqrt{3}} \right)$ [05]

(B) Find derivative of $f(x) = e^x$ using definition. [05]

(C) If $f(x) = e^x$ prove that (i) $f(x+y) = f(x)f(y)$ (ii) $f(x-y) = \frac{f(x)}{f(y)}$. [04]

Q-6 (A) Constant forces $3i - j + 2k$ and $i + 3j - k$ act on a particle and the particle moves from the point $2i + 3j + k$ to the point $5i + 2j + 3k$. Find the work done by the forces. [05]

(B) Find $\frac{dy}{dx}$ if $y = \log(\sec x + \tan x)$ [05]

(C) Evaluate: $\int \frac{(\log x)^2}{x} dx$ [04]

Q-7 (A) $S = t^3 - 6t^2 + 8t - 4$ gives the distance travelled by a body in t seconds. Find velocity and acceleration at $t = 4$ seconds. [05]

(B) Evaluate: $\int \frac{2 + 3\sin x}{\cos^2 x} dx$ [05]

(C) Find unit vector which is perpendicular to $a = i + j + k$ and $b = 2i - 2j + k$ [04]

Q-8(A) Evaluate: $\int_0^{\pi/2} \frac{\tan x}{\tan x + \cot x} dx$ [05]

(B) Find the area of the region bounded by the curve $y = x^2$ and line $y = x + 2$. [05]

(C) If $f(x) = \frac{1}{1+x}$ find $f(x) + f\left(\frac{1}{x}\right)$ [04]

