Exam Seat No:_____ Enrollment No:_____

C.U.SHAH UNIVERSITY

WADHWAN CITY

University (Winter) Examination -2013

Course Name Diploma(Engineering) Sem-I **Subject Name: -Basic Mathematics** **Marks :70**

Duration :- 3:00 Hours **Date : 31/12/2013**

Instructions:-

(1) Attempt all Questions of both sections in same answer book / Supplementary.
(2) Use of Programmable calculator & any other electronic instrument is 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.

SECTION-I

Q-1 a) Prove that $\log(1+2+3) = \log 1 + \log 2 + \log 3$. (01)

b) State Binomial theorem for $(x + y)^n$. (01)

c) Evaluate :- $\begin{vmatrix} 2 & -5 & 3 \\ -4 & 6 & 2 \\ 1 & 7 & -3 \end{vmatrix}$ (01)

d) If $A = \begin{bmatrix} 3 & 7 \\ 2 & 5 \end{bmatrix}$ then find $A + A^T$. (02)

e) Compute (i) ${}^{7}c_{3}$ (ii) ${}^{8}p_{7}$ (02)

Q-2 a) Prove that $\frac{1}{\log_a bc+1} + \frac{1}{\log_b ca+1} + \frac{1}{\log_c ab+1} = 1$ (05)

b) Find 6^{th} and 8^{th} term in the expansion of $\left(3-x^2\right)^{10}$. (05)

c) If term independent of x in the expansion of $(x-\frac{a}{x^3})^8$ is 112 then find a. (04)

OR

Q-2 a) Prove that $\log_{\sqrt{q}} p^2 \ \log_{\sqrt{r}} q^2 \ \log_{\sqrt{p}} r^2 = 64$ (05)

b) Find the middle term in the expansion of (1) $\left(x-\frac{1}{x}\right)^4$ (2) $\left(2x+3y\right)^7$ (05)

c) Find approximate value of $\sqrt[3]{1001}$ correct up to 3 decimal places by using Binomial theorem. (04)

Q-3 a) If $A = \begin{bmatrix} -1 & 3 \\ 4 & 2 \end{bmatrix}$ $B = \begin{bmatrix} 1 & 2 \\ 3 & 4 \end{bmatrix}$ and $C = \begin{bmatrix} 0 & 1 \\ -1 & 2 \end{bmatrix}$ then find X such that (05)

$2(X+A) = 3\left\{X + \frac{1}{2}(A+B)\right\} + C$.

b) Find the adjoin of $A = \begin{bmatrix} 2 & 0 & 2 \\ 0 & 1 & -3 \\ 2 & 1 & 1 \end{bmatrix}$ (05)

c) Express the matrix $\begin{bmatrix} -2 & 3 & -1 \\ 5 & 4 & -1 \\ 1 & -3 & 2 \end{bmatrix}$ as a sum of symmetric & a skew symmetric matrix. (04)

OR

Q-3 a) Find the inverse of the matrix $\begin{bmatrix} 1 & -1 & 1 \\ 2 & -1 & 0 \\ 1 & 0 & 1 \end{bmatrix}$ (05)

b) If A = $\begin{bmatrix} 3 & -2 & 0 \\ 1 & 4 & 3 \\ 2 & 1 & 2 \end{bmatrix}$ & B = $\begin{bmatrix} 1 & 0 \\ 1 & -2 \\ -2 & 1 \end{bmatrix}$ find AB, BA if exists. (05)

c) Solve the system of equations $\begin{aligned} x+y+z &= 1 \\ x+2y+3z &= 4 \\ x+3y+4z &= 6 \end{aligned}$ using matrix method. (04)

SECTION-II

Q-4 a) Show that the vector $2i - j + k$ and $i + 2j$ are orthogonal . (02)

b) If $\bar{x} = 2i - j + 3k, \bar{y} = 3i + 4j + 5k$ find $\bar{x} \cdot \bar{y}$ (02)

c) Convert 45^0, 120^0 into radians. (01)

d) Evaluate $\cos^{-1}\frac{1}{\sqrt{2}} + \tan^{-1}\sqrt{3}$. (01)

e) Write formula of $sin\, 2\alpha$ and $tan(\alpha + \beta)$. (01)

Q-5 a) Find out the angle between the vectors 3i -2 j - k and 2i + j -3k . (05)

b) If $\bar{a}$ = 3i + 2j +2k, $\bar{b}$ = i +2 j and $\bar{c}$ = i + j - 3k then find the direction cosines of $\bar{a} + 2\bar{b} + 3\bar{c}$. (05)

c) If $\bar{x}$ = (-1, 2, 1) , $\bar{y}$ = (1, 0, 3) and $\bar{z}$ = (1, 1, -1) .
Find (i) $[\bar{x}\ \bar{y}\ \bar{z}]$ (ii) $[\bar{y}\ \bar{x}\ \bar{z}]$ (04)

OR

Q-5 a) If the forces $\vec{F_1} = 3i + j + k$ and $\vec{F_2} = i + 4j + 2k$ are applied on a particle which displaces it from P(1,3,-1) and Q(2,1,1). Find (i) Resultant force and (ii) Work done. (05)

b) If $\bar{a}$ = 2i −j + k , $\bar{b}$ = 3i + j + k. Find $\bar{a} \times \bar{b}$ and $\bar{b} \times \bar{a}$. Are they equal? (05)

c) If $\bar{x}$ = 2i +j −3 k , $\bar{y}$ = −i + j + k and $\bar{z}$ = i + 2j + 3k . Verify that (04)
$\bar{x} \times (\bar{y} \times \bar{z}) = (\bar{x} \cdot \bar{z})\bar{y} - (\bar{x} \cdot \bar{y})\bar{z}$.

Q-6 a) If tan A = 3, tan B = 2 find the value of tan (2A+B) and tan (A+2B). (05)

b) Find all the angles of ΔABC if $a = 25, b = 36$ and $c = 59$. (05)

c) Prove that $\frac{\cos 11^0 + \sin 11^0}{\cos 11^0 - \sin 11^0} = \tan 56^0$ (04)

OR

Q-6 a) Prove that $\sqrt{2+\sqrt{2+\sqrt{2+2\cos 8\theta}}} = 2\cos\theta$. (05)

b) Prove that $\frac{\sin 5A + 2\sin 7A + \sin 9A}{\cos 3A + 2\cos 5A + \cos 7A} = \sin 2A + \cos 2A \tan 5A$. (05)

c) If $\tan^{-1}x + \tan^{-1}y \neq \tan^{-1}z =$, prove that x + y + z = xyz. (04)

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