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Reg. No. : ....

Name : ....

First Semester M.Tech. Degree Examination, March 2013
(2008 Scheme)
Branch : Electrical and Electronics
Stream : Power Control and Drives
EDC 1001 : ADVANCED MATHEMATICS

Time : 3 Hours Max. Marks : 100

Instructions : *Answer* ***any five*** *questions.* ***All*** *questions carry* ***equal*** *marks.*

I. a) If $b_1 = \begin{bmatrix} 1 \\ 0 \\ 0 \end{bmatrix}$, $b_2 = \begin{bmatrix} -3 \\ 4 \\ 0 \end{bmatrix}$, $b_3 = \begin{bmatrix} 3 \\ -6 \\ 3 \end{bmatrix}$ and $x = \begin{bmatrix} -8 \\ 2 \\ 3 \end{bmatrix}$. Show that the set $B = (b_1, b_2, b_3)$ is a basis for IR^3. Also find the change of co-ordinate matrix from B to the standard basis.

b) Let V = (1, –2, 2, 0). Find a unit vector u in the same direction as V.

c) Using Gram Schemidt process find an orthogonal basis for the subspace W spanned by $\begin{bmatrix} 2 \\ -5 \\ 1 \end{bmatrix}, \begin{bmatrix} 4 \\ -1 \\ 2 \end{bmatrix}$.

II. a) Find a Least square solution of AX = b for $A = \begin{bmatrix} 1 & 1 & 0 & 0 \\ 1 & 1 & 0 & 0 \\ 1 & 0 & 1 & 0 \\ 1 & 0 & 1 & 0 \\ 1 & 0 & 0 & 1 \\ 1 & 0 & 0 & 1 \end{bmatrix}$ and $b = \begin{bmatrix} -3 \\ -1 \\ 0 \\ 2 \\ 5 \\ 1 \end{bmatrix}$

P.T.O.

b) Let $Q(\dot{x}) = 5x_1^2 + 3x_2^2 + 2x_3^2 - x_1x_2 + 8x_2x_3$. Write this quadratic factor as X^TAX.

c) Find the singular value decomposition of $\begin{bmatrix} 2 & 3 \\ 0 & 2 \end{bmatrix}$

III. a) Prove that $\sum_{n=-\infty}^{\infty} t^n J_n(x) = e^{\frac{x}{2}\left(t-\frac{1}{t}\right)}$.

b) Prove that $J_n(x) = \frac{1}{\pi}\int_0^{\pi}\cos(n\theta - x\sin\theta)d\theta$.

c) Use Jacobi's series to prove that $J_0^2(x) + 2\left[J_1^2(x) + J_2^2(x) + ...\right] = 1$.

IV. a) State and prove Rodrigue's formula.

b) Prove that $P_{2n}(0) = \frac{(-1)^n(2n)!}{2^{2n}(n!)^2}$ and $P_{2n+1}(0) = 0$.

c) Show that $\frac{2}{5}P_3(x) + \frac{3}{5}\,P_1(x) = x^3$.

V. a) For a bivariate probability distribution of (X, Y) give below find $P[X \le 1], P[Y \le 3], P[X \le 1, Y \le 3]$ $P[X \le 1/Y \le 3], P[Y \le 3/X \le 1]$ and $P[X + Y \le 4]$

X \ Y	1	2	3	4	5	6
0	0	0	1/32	2/32	2/32	3/32
1	1/16	1/16	1/8	1/8	1/8	1/8
2	1/32	1/32	1/64	1/64	0	2/64

b) Find the value of k if f (x, y) = k (1 – x) (1 – y), 0 < x, y < 1 is to be a joint density function.

VI. a) The process {X (t)} whose probability distribution under certain condition is given by $P[X(t)=n]=\frac{(at)^{n-1}}{(1+at)^{n+1}}$, $n=1, 2, 3....$

$$=\frac{at}{1+at}, n=0$$

Show that it is not stationary.

b) A message transmission system is found to be Markovian with tpm is given by $P=\begin{bmatrix}0.2 & 0.3 & 0.5\\ 0.1 & 0.2 & 0.7\\ 0.6 & 0.3 & 0.1\end{bmatrix}$, $P(0)=[0.4 \quad 0.3 \quad 0.3]$.

Find the probability of the next stage.

c) If the tpm of the Markov chain is $P=\begin{bmatrix}0 & 1\\ \frac{1}{2} & \frac{1}{2}\end{bmatrix}$. Find the steady state distribution of the chain.
