13/05/16

S.E. (SEM - IV) old

EE - EM - IV

Q.P. Code : 543002

(Old Course)

(3 hours) **[Total Marks : 100**

N.B. 1. Question No. 1 is compulsory. Attempt any FOUR questions from Question No 2 to Question No 7.

2. Figures to the right indicate full marks.
3. Use of statistical tables is permitted.

Q.1 a) If $A=\begin{bmatrix}1 & 0\\ 2 & 4\end{bmatrix}$ find eigen values and vectors of $4A^{-1}+3A+2I$. 05

b) Find values of a,b and c if $\overline{F}=(axy+bz^3)i+(3x^2-cz)j+(3xz^2-y)k$ is irrotational. 05

c) Obtain mean and variance of Binomial distribution. 05

d) Two lines of regression are given by $6y=5x+90; 15x=8y+130$ Find $\overline{x},\overline{y}$ and coefficient of correlation. 05

Q.2 a) Reduce to normal form and find rank of $A=\begin{bmatrix}2 & 3 & -1 & -1\\ 1 & -1 & -2 & -4\\ 3 & 1 & 3 & -2\\ 6 & 3 & 0 & -7\end{bmatrix}$ 06

b) Prove that vector field $\overline{F}=(y+z)i+(z+x)j+(x+y)k$ is irrotational and find its scalar potential. 06

c) X is a continuous random variable with probability density function $f(x)=kx(1-x); 0\le x\le 1$. Find k ,mean value and variance. 08

Q.3 a) Find eigen values and eigen vectors of $A=\begin{bmatrix}2 & 1 & 1\\ 2 & 3 & 2\\ 3 & 3 & 4\end{bmatrix}$. 06

b) Using Green's theorem evaluate $\int_C \frac{1}{y}dx+\frac{1}{x}dy$ where C is the boundary of the region defined by $x=1, x=4, y=1, y=\sqrt{x}$. 06

c) In a distribution exactly normal, 7 % of the items are under 35 and 89% are under 63.Find mean and standard deviation of the distribution. 08

Q.4 a) If $A=\begin{bmatrix}-1 & 4\\ 2 & 1\end{bmatrix}$ prove that $3\tan A=A\tan 3$. 06

b) In a bombing attack,there is 50 % chance that a bomb dropped hits the target.Two direct hits are required to destroy the target completely.How many bombs must be dropped to have 99% or more chance of destroying the target? 06

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c) Using Stroke's theorem evaluate $\int_C \overline{F} \cdot \overline{dr}$ where $\overline{F} = yi + zj + xk$ where C is the boundary of the region given by $x^2 + y^2 = 1 - z$ and $z > 0$. 08

Q.5 a) Using congruent transformations reduce $Q = 3x^2 + 2y^2 + z^2 + 4xy - 2xz + 6yz$ to diagonal form.Find rank,index,signature and value class of Q. 06

b) Test whether the matrix $A = \begin{bmatrix} 2 & 3 & 4 \\ 0 & 2 & -1 \\ 0 & 0 & 1 \end{bmatrix}$ is diagonalizable.Justify your answer. 06

c) What is rank correlation?Obtainspearmann's rank correlation coefficient for the following data. 08

X :	10	12	18	18	15	40
Y :	12	18	25	25	50	25

Q.6 a) Test whether $A = \begin{bmatrix} 7 & 4 & -1 \\ 4 & 7 & -1 \\ -4 & -4 & 4 \end{bmatrix}$ is derogatory or not.Justify your answer. 06

b) Examine the following system for consistency and solve if it is consistent: 06
$2x - 3y + 7z = 5; 3x + y - 3z = 13; 2x + 19y - 47z = 32.$

c) Use Gauss-divergence theorem to evaluate $\iint_S \overline{F} \cdot \overline{N} ds$ where $\overline{F} = 4xi + 3yj - 2zk$ and S is the surface bounded by $x = 0, y = 0, z = 0, 2x + 2y + z = 4$. 08

Q.7 a) Prove that every square matrix A can be uniquely expressed as sum of a hermitian and a skew hermitian matrix. 06

b) Find work done in moving a particle from A(1,0,1) to B(2,1,2) along straight line AB in the force field $\overline{F} = x^2 i + (x - y) j + (y + z) k$. 06

c) When do we use Poisson distribution? Fit a Poisson distribution to the following data. 08

X :	0	1	2	3	4
f :	123	59	14	3	1