SE-EE.
Sem IV
A.M. IV

(OLD COURSE) 21/11/2014
QP Code :14303

Time : 03 hours Max. marks :100

N.B. 1. Question No.1 is compulsory and attempt any four questions from Q.No.2 to 7

2. Figures to the right indicate full marks.

Q.1 a) Determine value of a such that $\overline{F} = (x+3y)i + (y-2z)j + (az+x)k$ is Solenoidal. 05

b)Determine l,m,n and find inverse of matrix A if $A = \begin{bmatrix} 0 & 2m & n \\ l & m & -n \\ l & -m & n \end{bmatrix}$ is orthogonal. 05

c) X is a continuous random variable with probability distribution $f(x) = \frac{x}{6} + k$ when x belongs to [0,3] and is zero elsewhere.Find k. 05

d)Two lines of regression are given by 3x + 2y = 26 and 6x + y = 31. Find mean values of x and y and coefficient of correlation between x and y. 05

Q.2 a) Prove that $\overline{F} = (y^2 Cosx + z^3)i + (2ySinx - 4)j + (3xz^2 + 2)k$ is Irrotational.Find scalar potential of $\overline{F}$ and work done in moving an object In this field from (0,1,-1) to $(\frac{\pi}{2}, -1, 2)$. 08

b) Find Adj A if $A = \begin{bmatrix} -4 & -3 & -3 \\ 1 & 0 & 1 \\ 4 & 4 & 3 \end{bmatrix}$ 06

c) Seven dice are thrown 729 times .How many times do you expect at least four dice to show number 3 or 5? 06

Q.3 a) A car hire firm has 2 cars which it hires out day by day.The number of demands for a car on each day is distributed as a Poisson variable with mean = 1.5.Calculate proportion of days on which i) neither car is used ii) some demand is refused. 06

b) Show that $A=\begin{bmatrix}2 & -2 & 3\\ 1 & 1 & 1\\ 1 & 3 & -1\end{bmatrix}$ is nonderogatory. 06

c)If $A=\begin{bmatrix}2 & 1\\ 1 & 2\end{bmatrix}$ find A^{50}. 08

Q.4 a) If $A=\begin{bmatrix}2 & 1 & 1\\ 0 & 1 & 0\\ 1 & 1 & 2\end{bmatrix}$ find matrix represented by

$$A^8-5A^7+7A^6-3A^5+A^4-5A^3+8A^2-2A+I$$ 06

b)Verify Stroke's theorem for $\overline{F}=(x+y)i+(y+z)j-xk$ over surface S of the plane 2x + y + z = 2 in first quadrant. 06

c) Find values of a and b so that the system x + y + z = 6; x + 2y + 3z = 10 x + 2y + az = b have i) no solution ii)unique solution iii)infinite no. of solutions. 08

Q.5 a)Reduce to normal form and find rank if $A=\begin{bmatrix}1 & 3 & 5 & 7\\ 4 & 6 & 8 & 10\\ 15 & 27 & 39 & 51\\ 6 & 12 & 18 & 24\end{bmatrix}$ 06

b)Marks scored by students in a college are normally distributed with mean = 65 and variance = 25.If 3 students are selected at random what is the probability that at least one of them has scored more than 75 marks. 06

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c) Verify Green's theorem for $\int_C \frac{dx}{y} + \frac{dy}{x}$ where C is the boundary of the region given by x = 1 ,x = 4 , y = 1 , $y = \sqrt{x}$. 08

Q.6 a) Evaluate $\iint_S (4xi - 2y^2 j + z^2 k) \bullet d\overline{S}$ where S is the region bounded by Z = 0,z = 3 , x = 1 , $y^2 = 4x$. 06

b)Find eigen values and eigen vectors of $A = \begin{bmatrix} 3 & -1 & 1 \\ -1 & 5 & -1 \\ 1 & -1 & 3 \end{bmatrix}$ 06

c)Show that matrix $A = \begin{bmatrix} 8 & -6 & 2 \\ -6 & 7 & -4 \\ 2 & -4 & 3 \end{bmatrix}$ is diagonalizable

.Find the transforming matrix. 08

Q.7 a)Reduce the following quadratic form to normal form using congruent Transformations and find rank, signature and value class.

$Q = 2x^2 + y^2 - 3z^2 - 8yz - 4zx + 12xy$ 08

b)Calculate coefficient of correlation from the following data

X :	12	17	22	27	32
Y :	113	119	117	115	121

06

c) Prove that every square matrix can be uniquely expressed as sum of a symmetric and a skew symmetric matrix. 06

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