BE - EE - Sem IV - OLD

EM - IV

23111115

QP Code : 1307

Time: 03 hours | Max. Marks: 100

N.B. 1. Question No.1 is compulsory and attempts 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 $\overline{F}=(x+3y)i+(y-2z)j+(az+x)k$ isSolenoidal. 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 $\overline{F}=(y^2Cosx+z^3)i+(2ySinx-4)j+(3xz^2+2)k$ 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). 06

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? 08

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 06

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

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 octant. 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

c) Verify Green's theorem for $\int_C \frac{dx}{y}+\frac{dy}{x}$ where C is the boundary of the region

given by $x=1, x=4, y=1,\quad y=\sqrt{x}$.

Q.6 a) Evaluate $\iint_S (4xi-2y^2j+z^2k)\cdot d\overline{S}$ where S is the region bounded by 06

$z=0, z=3, x=1, y^2=4x$.

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

[TURN OVER

Q.7 a) Reduce the following quadratic form to normal form using congruent transformations and find rank, signature and value class. 06

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

b) Calculate coefficient of correlation from the following data 06

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

c) Prove that every square matrix can be uniquely expressed as sum of a symmetric and a skew symmetric matrix. 08
