B - 854 (Pages : 03) **COMP 3-1 (RC)**

[Total No. of Questions : 8]

S.E. (Computer) (Semester - III) (Revised 2007-08 Course) Examination, Nov./Dec. - 2011

APPLIED MATHEMATICS - III

Duration : 3 Hours **Total Marks : 100**

Instructions : 1) *Attempt any five questions. Atleast one from each module.*

2) *Assume suitable data, if necessary.*

MODULE - I

Q1) a) Define the adjoint of a matrix and prove the following. **[6]**

i) (adj A)' = adj (A') ii) (AB)' = B' A'.

b) Find non - singular matrices P and Q such that PAQ is in the normal form and hence find the rank of the matrix. **[8]**

$$A = \begin{bmatrix} 1 & 4 & 3 & 2 \\ 1 & 2 & 3 & 4 \\ 2 & 6 & 7 & 5 \end{bmatrix}.$$

c) Test the following system of linear equations for consistency and solve. **[6]**

$$5x_1 + 3x_2 + 7x_3 = 4$$
$$7x_1 + 2x_2 + 10x_3 = 5$$
$$3x_1 + 26x_2 + 2x_3 = 9$$

Q2) a) Test for linear dependence, the column vectors. **[7]**

$X_1 = [3, 7, 8, 14]'$, $X_2 = [1, 5, 1, 8]'$

$X_3 = [0, 1, -1, 2]'$, $X_4 = [1, 2, 3, 4]'$

b) Prove that similar matrices have same eigen values. **[5]**

c) Find the eigen values and eigen vectors of the following matrix. **[8]**

$$A = \begin{bmatrix} 4 & 6 & 6 \\ 1 & 3 & 2 \\ -1 & -4 & -3 \end{bmatrix}.$$

P.T.O.

MODULE - II

Q3) a) If $P(A) = 1/3$, $P(B) = 3/4$, $P(A \cup B) = 11/12$, find $P(A/B)$ and $P(B/A)$. [4]

b) Players A and B roll a pair of dice alternately. The player who rolls 10 first wins. If A starts, find his chance of winning. [6]

c) A picnic is arranged to be held on particular day. The weather forcast says that there is 80% chance of rain on that day. If it rains the probability of good picnic is 0.3 and if it does not the probability is 0.9. What is the probability that picnic will be good? [5]

d) Define Poisson distribution. Find the mean and variance of poisson distribution. [5]

Q4) a) A machine produces 12 defective products in a sample of 500. After the machine is overhanded it puts out 2 defective articles in a sample of 100. Has the machine improved? [6]

b) The following marks have been obtained by a class of students in statistics. [8]

Paper I	80	45	55	56	58	60	65	68	70	75	85
Paper II	81	56	50	48	60	62	64	65	70	74	90

Compute the coefficient of correlation for the above data. Find the lines of regression.

c) In a game of taking a chance, a contestant has to give correct answer to 4 out of 5 questions to win the contest. Question are given with 3 answers each, out of which one is a correct answer. If a contistant answers the questions by selecting the answers at random, what is the probability that he will win the contest? [6]

MODULE - III

Q5) a) Find the Laplace transform of [9]

i) $e^{t}\ t^{2} \sin 4t$ ii) $t^{2}\, u\,(t-3)$

iii) $\int_{0}^{t} e^{-2u} \sin^{3} u \ du$

b) Find the inverse transform of [6]

i) $\log\left(1+\dfrac{a^{2}}{s^{2}}\right)$ ii) $\dfrac{s^{2}}{s^{4}-a^{4}}$

c) If $L(f(t)) = F(s)$ prove that $L(u_a(t)\ f(t-a)) = e^{-as}\,F(s)$ where $u_a(t)$ is a unit step function. [5]

Q6) a) If L (f(t)) = F(s), prove that $L\left(\frac{f(t)}{t}\right)=\int_s^\infty F(u)du$ **[7]**

Use this to prove that the Laplace transform of the function f(t) = $\frac{\cos t}{t}$ does not exist.

b) Using Laplace transform solve the differential equation **[9]**
y" + 2y' + 5y = e^t t, y(0) = 1, y'(0) = −1.

c) Using convolution theorem find the inverse of $\frac{s}{(s^2+a^2)^2}$. **[4]**

MODULE - IV

Q7) a) State and prove convolution theorem for fourier transform and evaluate. **[10]**

$$\int_0^\infty \frac{x^2}{(x^2+a^2)(x^2+b^2)}dx$$

b) Solve the differential equation **[7]**
y" + 3y' + 2y = e^{-x} , $x > 0$.
using fourier transform given that
y(0) = 0, y'(0) = 0.

c) Find the fourier cosine transform of e^{-ax}. **[3]**

Q8) a) Prove that **[6]**

i) $z(n)=\frac{z}{(z-1)^2}$ ii) $z\left[a^n\right]=\frac{z}{z-a}$

b) Find z - transform of the following **[7]**

i) $f(n)=\frac{1}{n(n-1)}$ ii) $\frac{2n+3}{(n+1)\,(n+2)}$

c) Find z^{-1} of $\frac{8z^2}{(2z-1)\,(4z+1)}$. **[7]**

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