Comp

COMP 3 – 1(RC)

S.E. (Computer Engg.) (Semester – III) Examination, Nov./Dec. 2012
(Revised Course 2007-08)
APPLIED MATHEMATICS – III

Duration : 3 Hours — Total Marks : 100

Instructions: 1) *Answer **five** questions and atleast **one** from **each** Module.*
2) *Figures to the **right** indicate **full** marks.*
3) *Make suitable assumptions **wherever** required.*
4) ***Use** statistical tables **wherever** required.*

MODULE – 1

I. a) i) Define adjoint of a square matrix. 7

ii) If A is a n×n matrix then show that adj (adj A) = $|A|^{n-2}A$, if $|A| \neq 0$.

b) Reduce the following matrix to its normal form and hence find its rank. 6

$$A = \begin{bmatrix} 1 & 1 & 2 \\ 1 & 2 & 3 \\ 0 & -1 & -1 \end{bmatrix}$$

c) Test the linear system of equation given below for consistency and solve it. 7

$x + y + z = 4$

$2x + 5y - 2z = 3$

$x + 7y - 7z = 5$

II. a) Find the eigen values and the associated eigen vectors of the matrix. 8

$$A = \begin{bmatrix} 2 & 2 & 1 \\ 1 & 3 & 1 \\ 1 & 2 & 2 \end{bmatrix}$$

P.T.O.

b) Find the characteristic equation of the matrix given below and hence find its inverse by analog the Cayley Hamilton theorem. 6

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

c) For the real symmetric matrix A given below find the orthogonal matrix P such that $P^{-1}AP$ is a diagonal matrix. 6

$$A = \begin{bmatrix} 7 & -2 & 1 \\ -2 & 10 & -2 \\ 1 & -2 & 7 \end{bmatrix}$$

MODULE – 2

III. a) Let X be a discrete random variable with the following probability distribution : 8

X = n :	1	2	3	4	5	6	7
P (X = n) :	C	2C	2C	3C	C^2	$2C^2$	$(7C^2 + C)$

i) Find the value of C

ii) Compute $P(1 < X < 4)$

iii) Find the mean of X.

b) Compute the moment generating function for the exponential distribution with density function $f(x) = 2e^{-2x}$, $x > 0$ 6

$= 0 , x \leq 0.$

c) Let $P(A) = \frac{1}{3}$, $P(B) = \frac{3}{4}$ and $P(A \cup B) = \frac{11}{12}$. Find $P(A \mid B)$ and $P(B \mid A)$. 6

IV. a) The life of a certain type of electrical lamps is normally distributed with mean 2040 hours and standard deviation 60 hours. In a consignment of 3000 lamps, how many would be expected to burn for : 6

i) More than 2150 hours, and

ii) Less than 1950 hours.

b) The breaking strengths of cables produced by a manufacturer have a mean of 1800 pounds and a standard deviation of 100 pounds by introducing a new technique in the manufacturing process, it is claimed that the breaking strength can be increased. To test this claim a sample of 50 cables is tested and it is found that the mean breaking strength is 1850 lb. Can we support the claim at the 5% level of significance. 8

c) The equation of the two lines of regression one, $x = 19.13 - 0.87\,y$ and $y = 11.4 - 0.50\,x$. Find : 6

i) Mean of x values

ii) Mean of y values and

iii) The correlation coefficient between x and y.

MODULE – 3

V. a) Find the Laplace transform of the following : 9

i) $f(t) = e^{3t} \sin 2t \sin t$,

ii) $g(t) = te^{-4t} \sin 3t$,

iii) $h(t) = \int_0^t \frac{e^{-u} \sin u}{u} du$

b) Find the inverse Laplace transform of the following : 6

i) $\bar{f}(s) = \tan^{-1}\left(\frac{1}{s}\right)$,

ii) $\bar{g}(s) = \frac{1}{s^2 - 2s - 3}$

c) Let f(t) be periodic with period "p". Prove that, 5

$$L(f(t)) = \frac{1}{1-e^{-sp}} \int_0^P e^{-st} f(t)\,dt.$$

VI. a) Use the Laplace transform to evaluate $\int_0^{\infty} te^{-3t} \cos 2t \, dt$. 6

b) Use the convolution theorem to find the inverse Laplace transform of,

$\bar{f}(s) = \dfrac{1}{(s+1)(s+2)}$. 6

c) Use the Laplace transform to solve the differential equation

$y''(t) - 4y'(t) + 8y(t) = e^{2t}$, $y(0) = 2$, $y'(0) = -2$. 8

MODULE – 4

VII. a) Find the Fourier transform of $f(x) = 1 - x^2$, $|x| \le 1$ 8

$= 0$, $|x| > 1$

Hence evaluate $\int_0^{\infty} \left(\dfrac{\sin x - x\cos x}{x}\right) \cos \dfrac{x}{2} \, dx$

b) Find the inverse Fourier transform of, $\hat{f}(s) = 4 - |s|, |s| \le 4$
$= 0, \ |s| > 4$ 6

c) Solve for f(n) the integral equation, $\int_0^{\infty} f(x) \cos \lambda x \, dx = e^{-\lambda}$. 6

VIII. a) Find the Z-transform of the following : 8

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

b) Find the inverse Z-transform of the following : 6

$f(z) = \dfrac{z^2}{(z+4)^2}$

c) Use the Z-transform to solve the difference equation, 6

$y(n + 3) - 3y(n + 1) + 2y(n) = 0, \ n \ge 0$

and $y(0) = 4$, $y(1) = 0$ and $y(2) = 8$
