S.E - III Sem - Biotech / Chem
Applied maths - III CBGS
(16) SE/III/CHEM/BIOTECH/
AM-III

18/5/2016

QP Code : 30622

(3 hours) **Total Marks:80**

N.B: (1) Question no.1 is compulsory.

(2)Attempt any three questions from remaining five questions.

(3)Figures to the right indicate full marks.

(4)Assume suitable data if necessary.

1. (a) Find the Laplace Transform of $\cos t \cos 2t \cos 3t$. (5)

(b)If $A=\begin{bmatrix}1 & 4\\ 1 & 1\end{bmatrix}$, find A^7-9A^2+I . (5)

(c)Show that $\oint_c \log z\,dz = 2\pi i$,where C is the unit circle $|z|=1$. (5)

(d)The incidence of an occupational disease in an industry is such that workers have 20% chance of suffering from it. What is the probability that out of 6 workers 4 or more will catch the disease? (5)

2. (a)Find an analytic function whose real part is $e^{2x}(x\cos 2y - y\sin 2y)$. (6)

(b)Evaluate $\int_0^{\infty} e^{-t}\left(t\int_0^{t} e^{-4u}\cos u\,du\right)dt$. (6)

(c) Show that the matrix A is diagonisable. Also find the transforming matrix and the diagonal matrix where $A=\begin{bmatrix}8 & -8 & -2\\ 4 & -3 & -2\\ 3 & -4 & 1\end{bmatrix}$. (8)

3. (a)Find the inverse Laplace Transform of $\frac{s+4}{(s^2-1)(s+1)}$. (6)

(b)Verify the Cayley-Hamilton Theorem for matrix A and hence find A^{-1} and A^4 where $A=\begin{bmatrix}1 & 2 & 3\\ 2 & -1 & 4\\ 3 & 1 & -1\end{bmatrix}$. (6)

(c)Using Kuhn-Tucker conditions solve the following NLPP
Minimise $Z=2x_1+3x_2-x_1^2-2x_2^2$
subject to $2x_1+3x_2\le 6; 5x_1+2x_2\le 10; x_1,x_2\ge 0$. (8)

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APM-II

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4.(a)Find the bilinear transformation which maps the points $z = -2, i, 2$ onto the points $w = 0, i, -i$. (6)

(b)Find the orthogonal trajectory of the family of curves given by $2x - x^3 + 3xy^2 = a$ (6)

(c)Solve the following NLPP using Lagrange's multipliers method (8)

Optimise $Z = -10x_1 - 6x_2 - 4x_3 + x_1^2 + x_2^2 + x_3^2$

subject to $x_1 + x_2 + x_3 = 7; x_1, x_2, x_3 \geq 0.$

5.(a)Find the Eigen values and Eigen vectors of $A = \begin{bmatrix} 3 & -1 & 1 \\ -1 & 5 & -1 \\ 1 & -1 & 3 \end{bmatrix}$. (6)

(b)Evaluate $\oint_C \frac{e^{2z}}{(z+1)^4} dz$ where C is the circle $|z-1| = 3$. (6)

(c)Find the inverse Laplace Transform of (i) $\frac{(s+2)^2}{(s^2+4s+8)^2}$

(ii) $\frac{(s+1)e^{-s}}{(s^2+s+1)}$ (8)

6. (a)Using the residue theorem evaluate $\int_0^{2\pi} \frac{d\theta}{5-3\cos\theta}$. (6)

(b)From the following data calculate Spearman's rank correlation coefficient between X and Y

X: 36 56 20 42 33 44 50 15 60

Y: 50 35 70 58 75 60 45 80 38. (6)

(c)Reduce the following quadratic form to canonical form. Also find it's rank and signature

$2x^2 + y^2 - 3z^2 + 12xy - 8yz - 4zx.$ (8)