SE. Comp.
Sem IV.
A.M. IV

21/11/2014

(OLD COURSE) **QP Code :14312**

(3 Hours) [Total Marks : 100

N.B.: (1) Question No. **1** is **compulsory**.
(2) Attempt any **four** questions out of the remaining **six** questions.
(3) **Figures** to the **right** indicate **full** marks.

1. (a) Prove that the eigen values of $\begin{bmatrix} \frac{(1+i)}{2} & \frac{-(1-i)}{2} \\ \frac{(1+i)}{2} & \frac{(1-i)}{2} \end{bmatrix}$ are of unit moduls. 5

(b) If $u = -r^3 \sin 3\theta$ find the analytic function f(z) in terms of z where u is the real part of f(z). 5

(c) Evaluate $\int_C \frac{2z+3}{z} dz$ where C is the lower half of the circle $|z| = 2$. 5

(d) Determine all basic feasible solutions of the equation 5

$$2x_1 + 6x_2 + 2x_3 + x_4 = 3$$
$$6x_1 + 4x_2 + 4x_3 + 6x_4 = 2$$

2. (a) Find the characteristics equation of the matrix $\begin{bmatrix} 2 & -1 & 1 \\ -1 & 2 & -1 \\ 1 & -1 & 2 \end{bmatrix}$ and verify that it is satisfied by A and hence obtain A^{-1}. 6

(b) Find the analytic function and (z) = u + iv if $3u + 2v = y^2 - x^2 + 16xy$. 6

(c) Using Duality solve the L.P.P. 8

Minimise $z = 4x_1 + 3x_2 + 6x_3$
Subject to $x_1 + x_3 \geq 2$
$x_2 + x_3 \geq 5$
$x_1, x_2, x_3 \geq 0$

* Corrections Attached

LM-Con.:6796-14. [TURN OVER

3. (a) If $A=\begin{bmatrix}\alpha & \alpha\\ \alpha & \alpha\end{bmatrix}$ prove that $e^A = e^{\alpha}\begin{bmatrix}\cosh\alpha & \sinh\alpha\\ \sinh\alpha & \cosh\alpha\end{bmatrix}$ 6

(b) Solve the LPP by simplex method. 6

Minimise $z = 6x_1 - 2x_2 + 3x_3$

Subject to $2x_1 - x_2 + 2x_3 \leq 2$

$x_1 + 4x_3 \leq 4$

$x_1, x_2, x_3 \geq 0$

(c) Evaluate $\int_0^{2\pi} \frac{d\theta}{25-16\cos^2\theta}$. 8

4. (a) If $w = f(z)$ prove that $\frac{dw}{dz} = (\cos\theta - i\sin\theta)\frac{\partial w}{\partial r}$. 6

(b) Obtain two distinct Laurent's series for $f(z) = \frac{2z-3}{z^2-4z-3}$ 6

(c) Find eigen values and eigen vectors of the matrix $A=\begin{bmatrix}8 & -6 & 2\\ -6 & 7 & -4\\ 2 & -4 & 3\end{bmatrix}$ 8

5. (a) Show that $A=\begin{bmatrix}7 & 4 & -1\\ 4 & 7 & -1\\ -4 & -4 & 4\end{bmatrix}$ is derogatory. 6

(b) Find the image of the circle $|z| = 2$ under the transformation $w = z+3+2i$ 8

(c) Solve the NLPP using the method of Lagrangian multipliers.

Optimise $z = 4x_1^2 + 2x_2^2 + 4x_3^2 - 4x_1x_2$

Subject to $x_1 + x_2 + x_3 = 15$

$2x_1 - x_2 + 2x_3 = 20$

$x_1, x_2, x_3 \geq 0$

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

(b) Solve the NLPP using Kuhn-Tucker conditions 6

Maximise $z = 2x_1^2 - 7x_2^2 + 12x_1x_2$

Subject to $2x_1 + 5x_2 \leq 98$

$x_1, x_2 \geq 0$

(c) Evaluate $\int_C \frac{z+1}{z^3 - 2z^2} dz$ where C is 8

(a) the circle $|z| = 1$

(b) the circle $|z-2-i| = 2$

(c) the circle $|z-1-2i| = 2$

7. (a) Find the bilinear transformation which maps the points 2, i, –2 onto the pointe 1, i, –1. 6

(b) Using residue theorem evaluate $\oint_C \frac{e^{2z}}{(z-\pi i)^3} dz$ where C is $|z-2i| = 2$ 6

(c) Use the dual simplex method solve the LPP 8

Minimise $z = 6x_1 + x_2$

Subject to $2x_1 + x_2 \geq 3$

$x_1 - x_2 \geq 0$

$x_1, x_2, \geq 0$

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Course : Prog. 652 to 666 S.E. (ALL BRANCH) (SEM IV) (OLD)

Q.P Code : 14312

Correction :

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4 (b) Obtain two laurent's series for $f(z) = \dfrac{2z-3}{z^2-4z+3}$

5. (c)Solve the NLPP using the method of Lagrangian multipliers

Optimize $z = 4x_1^2 + 2x_2^2 + x_3^2 - 4x_1x_2$

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