

12-11-13-DTP28-NK-7

Con. 8012-13.

S.E. (Sem III) CBS GS (B.T.)  
AM-III(3 Hours) Applied Mathematics  
29/11/13

GX-12092

[Total Marks : 30]

19

- 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.

1. (a) Find the Laplace Transform of  $\sin t \sin 2t \sin 3t$ . 5  
 (b) Find  $2A^3 - 3A^4 + A^2 - 2I$  where  $A = \begin{bmatrix} 3 & 1 \\ -1 & 2 \end{bmatrix}$ . 5  
 (c) Evaluate  $\int |z| dz$  along the left half of  $|z|=1$  from  $Z = -i$  to  $Z = i$ . 5  
 (d) The proofs of a 500 page book contain 500 misprints. Find the probability that there are atleast 4 misprints in a randomly chosen page. 5
2. (a) Find an analytic function whose imaginary part is  $\cosh x \cos y + \frac{x}{x^2+y^2}$ . 6  
 (b) Evaluate  $\int_0^\infty t e^{-st} dt$  if  $L(f(t)) = \frac{1}{\sqrt{s^2+1}}$ . 6  
 (c) Using Kuhn-Tucker conditions solve the following :-  
 NLPP Maximize  $Z = 2x_1 + 3x_2 - x_1^2 - x_2^2$   
 Subject to  $x_1 + x_2 \leq 1$ ,  $2x_1 + 3x_2 \leq 6$ ;  $x_1, x_2 \geq 0$ . 8
3. (a) Find minimal polynomial of  $A = \begin{bmatrix} 1 & 2 & 3 \\ 2 & 3 & 4 \\ 3 & 4 & 5 \end{bmatrix}$   
 Is it derogatory matrix ? 6  
 (b) The life of Army Shoes normally distributed with mean 8 months and standard deviation 2 months. If 5000 pairs are issued how many pairs would be expected to need replacement after 12 months ? 6  
 (c) Find the bilinear transformation which maps the points  $Z = 1, i, -1$  onto the points  $W = i, 0, -i$ . Hence find the image of  $|Z| < 1$  onto the W-plane. 8

[ TURN OVER ]

12-11-13-DTP28-NK-8

S.E. (Sem III) CBSGS (B.T)  
Con. 8012-GX-12092-13. 2 AM - III

4. (a) Find the inverse Laplace Transform using convolution theorem  $\frac{1}{(S-4)^2(S+3)}$  6  
 (b) Find the orthogonal Trajectory of the family of curves  $e^x \cos y + x^2$  6  
 (c) Using Lagrange's Method solve the following NLPP  
 Optimise  $Z = 3x_1^2 + x_2^2 + x_3^2$   
 Subject to  $x_1 + x_2 + x_3 = 2, x_1, x_2, x_3 \geq 0$  8

5. (a) Find Eigen values and Eigen vectors of  $A^2$  if :-

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

~~6~~

- (b) Evaluate  $\int \frac{\sin \pi z + \cos \pi z}{z^2 + z} dz; \text{cis}|Z|=4$  using Cauchy's integral formula. 6

- (c) Find inverse Laplace Transform of :-

8

$$(i) \quad \frac{1}{S} \operatorname{Log}(1 + \frac{1}{S^2})$$

$$(ii) \quad \frac{(S+1)\bar{e}^s}{S^2 + S + 1}$$

6. (a) Evaluate  $\int_0^{2\pi} \frac{d\theta}{2 + \cos \theta}$  using Residue theorem. 6

- (b) Find the coefficient of correlation between X and Y. 6

X	14	8	10	11	9	13	5
Y	14	9	11	13	11	12	4

- (c) Find the rank, Signature and class of the following Quadratic form by reducing it to its canonical form using congruent transformations 8

$$x_1^2 + 2x_2^2 + 3x_3^2 + 2x_2x_3 - 2x_1x_3 + 2x_1x_2.$$