Code No: 07A4BS04 | R07 | SET-1

B.Tech II Year II Semester Examinations, April/May-2012
MATHEMATICS FOR AEROSPACE ENGINEERS
(AERONAUTICAL ENGINEERING)

Time: 3 hours **Max. Marks: 80**

Answer any FIVE questions
All Questions carry equal marks

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1.a) Prove that $e^{\frac{x}{2}\left(t-\frac{1}{t}\right)} = \sum_{n=-\infty}^{\infty} t^n J_n(x)$

b) Prove that $nP_n(x) = xP_n'(x) - P_{n-1}'(x)$ [8+8]

2.a) Find Laurent's series for the function

$f(z) = \dfrac{z^2 - 6z - 1}{(z-1)(z-3)(z+2)}$ in the region $3 < |z+2| < 5$.

b) Expand $f(z) = \dfrac{z+3}{z(z^2 - z - 2)}$ in powers of z if $|z| < 1$. [8+8]

3.a) Prove that $f(x,y) = \begin{cases} \dfrac{x^2 y(y-x)}{(x^6 + y^2)(x+y)}, & if\ (x,y) \neq (0,0) \\ 0 \quad , & if\ (x,y) = (0,0) \end{cases}$ is discontinuous at (0,0).

b) Find the analytic function f(z) = u+iv given that

$u + v = \dfrac{\sin 2x}{\cosh 2y - 2\cos 2x}$. [8+8]

4.a) Data given below gives the number of seeds that germinate out of 10 for 80 sets of seeds.

x:	0	1	2	3	4	5	6	7	8	9	10
P(x=X)	6	20	28	12	8	6	0	0	0	0	0

Fit a binomial distribution for this data.

b) Define auto correlation of a random process. Find the mean and variance of the random process whose auto correlation function is given by $R_{XX}(\tau) = (25\tau^2 + 36)/[6.25\tau^2 + 4]$ [8+8]

5.a) Find the image and sketch the mapping of the region $2 \le x \le 3$ and $3 \le y \le 4$ under the transformation $w = e^z$.

b) Show that a bilinear transformation preserves the cross ratio of four points. [8+8]

6.a) Evaluate $\int_{(0,0)}^{(1,1)}(3x^2+4xy+ix^2)dz$ along $y = x^2$.

b) Evaluate $\int_c \frac{dx}{z^8(z+4)}$ where c is the circle $|z|=2$.

c) Using Cauchy's integral formula, evaluate $\int_c \frac{2z+1}{z^2+z}dz$ where c is the circle $|z|=\frac{1}{2}$

[6+5+5]

7.a) What is summation convention in tensor analysis? Explain. Write the following in using summation convention

i) $(x^1)^1 + (x^1)^2 + (x^1)^3 + \ldots (x^1)^n$

ii) $(x^1)^2 + (x^2)^2 + (x^3)^2 + \ldots (x^n)^2$

b) Define Christoffel symbol of first and second kind. If $(ds)^2 = (dr)^2 + r^2(d\theta)^2 + r^2\sin^2\theta(d\varphi)^2$, then find the value of [13, 3] and $\begin{bmatrix} 3 \\ 13 \end{bmatrix}$

[8+8]

8.a) A box contains 6 red, 5 black balls. A man draws 4 balls from the box at random. Find the probability that among the balls drawn there is at least one ball of each colour.

b) The chances of three candidates A, B, C to become the manager are in the ratio 3 : 4 : 5. The probabilities of introducing a special bonus scheme by them if selected as managers are 0.6, 0.4 and 0.5 respectively. If the bonus scheme is introduced, what is the probability that B has become the manager? [8+8]

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(AERONAUTICAL ENGINEERING)

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$u+v=\dfrac{\sin 2x}{\cosh 2y-2\cos 2x}$. [8+8]

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Fit a binomial distribution for this data.

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7.a) Prove that $e^{\frac{x}{2}\left(t-\frac{1}{t}\right)} = \sum_{n=-\infty}^{\infty} t^n J_n(x)$

b) Prove that $nP_n(x) = xP_n'(x) - P_{n-1}'(x)$ [8+8]

8.a) Find Laurent's series for the function

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