Code: 9A21501 **R9**

B.Tech III Year I Semester (R09) Supplementary Examinations, May 2013

**MATHEMATICS FOR AEROSPACE ENGINEERS**

**(Aeronautical Engineering)**

Time: 3 hours Max Marks: 70

Answer any FIVE questions
All questions carry equal marks
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1 (a) Prove that $X J'_n(x) = -nJ_n(x) + xJ_{n-1}(x)$.

(b) Prove that $\frac{1+z}{z\sqrt{1-2xz+z^2}} - \frac{1}{2} = \sum_{n-0}^{\infty}[P_n(x) + P_{n+1}(x)]z^n$.

2 (a) Show that $f(z) = \frac{xy^2(x+iy)}{x^2+y^4}, z \neq 0$

$0 \qquad if\ z = 0.$

Is not analytic at z = 0 although C-R equations are satisfied at the origin.

(b) Find the imaginary part whose real part is $e^X(x\,cosy - y\,siny)$.

3 (a) Using Cauchy's integral formula evaluate $\int_c \frac{z^4}{(z+1)(z-i)^2}dz$.

Where C is the ellipse $9x^2 + 4y^2 = 36$

(b) Evaluate $\int_0^{1+i} z^2 dz\ along\ y = x^2$.

4 (a) Find the Laurent series expansion of the function $f(z) = \frac{z^2-6z-1}{(z-1)(z-3)(z+2)}$ in the region $3 < |z+2| < 5$.

(b) Find the residue of $f(z) = \frac{ze^z}{(z+2)^4(z-1)}$ at each pole.

5 (a) Show that the function W = $\frac{4}{z}$ transforms the straight line x = c in the z plane into a circle in w-plane.

(b) Find the bilinear transformation which maps the points (-1, 0, 1) into the points (0, I, 3i)?

6 (a) Prove that metric tensor is a covariant symmetric tensor of order two and conjugate tensor is a contravariant symmetric tensor of order two.

(b) Prove the transformation law of Christoffel symbol of second kind.

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7 (a) A problem in statistics is given to 3 students A, B, C whose chances of solving it are $\frac{1}{2}, \frac{3}{4}$ and $\frac{1}{4}$ respectively. What is the probability that the problem is solved?

(b) In a factory A produces 40% of the output and machine B produces 60%. On the average 9 items in 1000 produced by A are defective and 1 item in 250 produced by B is defective. An item drawn at random from a day's output is defective. What is the probability that it was produced by A or B?

8 (a) For the discrete probability distribution:

| X | 0 | 1 | 2 | 3 | 4 | 5 | 6 |
|---|---|---|---|---|---|---|---|
| F | 0 | 2k | 2k | 3k | $K^2$ | $2k^2$ | $7k^2 + k$ |

Find: (i) K (ii) mean (iii) variance.

(b) If the masses of 300 students are normally distributed with mean 68 kgs and standard deviation 3 kgs how many students have masses:

(i) Greater than 72 Kg.

(ii) Less than or equal to 64 Kg.

(iii) Between 65 and 71 Kg.

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