Code No: 07A4BS04 **R07** **Set No. 3**

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD
II B.TECH II SEM–REGULAR/SUPPLEMENTARY EXAMINATIONS MAY – 2010
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) A random variable X has the following distribution.

X=x:	-2	-1	0	1	2	3
p(X=x):	0.1	k	0.2	2k	0.3	k

Find the value of k, and calculate mean and variance.

(b) The mean and standard deviation of intelligence quotient (I Q) of group of 500 children is 90 and 20 respectively. If the IQ is normally distributed, find the number children with IQ

i. greater than 100
ii. less than 60 and
iii. between 80 and 110. [8+8]

2. (a) 500 people were asked about their morning vitamin intake. It was found that 150 Take vitamin B, 200 take vitamin C, 165 take vitamin E, 57 take both B and C, 125 take both B and E, 82 take all three vitamins. What is the probability that a person takes none of the vitamins?

(b) A bag contains 5 red, 3 blue and 4 black balls. If three balls are drawn at random, what is the probability that

i. the three balls are of different colours
ii. two balls are of the same colour
iii. all balls are of same colour. [8+8]

3. (a) Expand $\frac{1}{(z^2+1)(z^2+2)(z^2+3)}$ in Positive and negative power of z if $1 < |z| < \sqrt{2}$

(b) Expand f(z) = sin z in Taylor's series about $z = \frac{\pi}{4}$ and find the region of convergence. [8+8]

4. (a) write down the the law of transformation for the tensors

i. A_i^{kj}
ii. C_{mn}

(b) Define Christoffel symbol of 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 [1 ,22] and [3,13] [8+8]

5. (a) Find a and b if $f(z) = (x^2 - 2xy + ay^2) + i\,(bx^2 - y^2 + 2xy)$ is analytic. Hence find f(z) in terms of z.

(b) Find the general and principal values of

i. $\log(1+i)+\log(1-i)$

ii. $(1+i)^i$ [8+8]

6. (a) Evaluate $\int_c \frac{e^{-2z}z^2}{(z-1)^3(z+2)}dz$ where c is $|z+2|=1$ using cauchy's integral formula.

   (b) Evaluate $\int_c \frac{\left(z^3+z^2+2z-1\right)}{(z-1)^3}dz$ where c is $|z|=3$ using Cauchy's integral formula.

   (c) Evaluate $\int_c (y^2+2xy)dx+(x^2-2xy)\,dy$ where c is the boundary of region bounded by y=x^2 and x=y^2. [5+5+6]

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 $nP_n(x)=x\,P_n'(x)-P_{n-1}'(x)$ [8+8]

8. (a) Show that the transformation w =z + a /z maps the circle in |z| = (a + b)/2 z -plane into an ellipse of the semi-axes a, b in the w - plane.

   (b) Find the bilinear transformation which maps the points 1, -1, ∞ of the z-plane into 1+i, 1- i , i of the w-plane. Find the invariant points of the transformation. [8+8]

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