

**III B.Tech I Semester Supplementary Examinations, April/May 2005**  
**COMPUTATIONAL METHODS**  
**(Aeronautical Engineering)**

Time: 3 hours

Max Marks: 80

**Answer any FIVE Questions**  
**All Questions carry equal marks**

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1. Solve Laplace equation  $\frac{\partial^2 u}{\partial x^2} + \frac{\partial^2 u}{\partial y^2} = 0$  inside the square bounded by the lines  $x = 0$ ,  $x = 4$ ,  $y = 0$  and  $y = 4$ , given that  $u = x^2 y^2$  on the boundary using relaxation technique.
2. Find the solution of the parabolic equation  $\frac{\partial^2 u}{\partial x^2} - \frac{\partial u}{\partial t} = 0$ , when  $u(0, t) = 0$ ,  $u(4, t) = 0$  and  $u(x, 0) = x(4-x)$ ; Assuming  $h = 1$ , find the values up to  $t = 5$ .
3. (a) Find the components of the space Euclidean metric tensor and the expression for the line element in spherical polar coordinator.  
 (b) What is a mixed tensor and show that Kronecker delta is a mixed tensor of order two?
4. (a) The lifting weights of certain weight lifter is known to have a mean of 100 and standard deviation of 5. For a random sample of 75 weight lifter, find the probability that the sample mean lifting power will be anywhere between 109 and 111?  
 (b) An urn contains 1500 white and 2000 black balls. If  $x$  denotes the number of white balls when 300 balls are drawn without replacement, find  $P(180 < X < 120)$
5. (a) A process for making certain bearings is under-control if the diameter of the bearings have the mean 0.5. What can we say about the process if the sample of 10 of these has a mean diameter of 0.5060 cm and a standard deviation 0.0040 cm.  
 (b) Two independent samples of 8 and 7 items have the following values:

Sample 1	11	11	13	11	15	9	12	4
Sample 2	9	11	10	13	9	8	10	-

6. (a) If independent random samples of sizes  $n_1 = n_2 = 8$  come from a normal population having same variance. What is the probability that the variance of one sample is at least seven times greater than the other?  
 (b) An urn contains 1000 white and 2000 black balls. Let  $X$  denotes the number of white balls when 300 balls are drawn without replacement, then find  $P(180 < X < 220)$ .
7. (a) In a random samples of tourists 84 of 250 men and 80 of 200 women bought the guide book. Can we say that men and women equally buy the guide book at 5% level of significance.

- (b) The following table gives the number of times each side appears when a die is tossed 42 times.

No. of points on the side.	1	2	3	4	5	6	
Frequency	5	6	9	6	7	9	42

Is the die a balanced one at 5% level as significance?

8. (a) Define pearsons measure of correlation for the data  $(X_i, Y_i), i = 1, 2, \dots, n$ , and show that it lies in the interval  $(-1, 1)$ .
- (b) Fit the curve  $y = ax^b$  to the following data.

x	1	2	3	4	5	6
y	2.98	4.26	5.21	6.10	6.80	7.50

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