

III B.Tech I Semester Supplementary Examinations, May 2005**MATHEMATICS-IV****(Metallurgy & Material Technology)****Time: 3 hours****Max Marks: 70**

Answer any FIVE Questions
All Questions carry equal marks

1. (a) A and B throw alternately with a pair of ordinary dice. A wins if he throws 6 before B throws 7 and B wins if he throws 7 before A throws 6. If A begins, show that his chance of winning is $30/61$.
(b) Suppose 5 men out of 100 and 25 women out of 10,000 are colour blind. A colour blind person is chosen at random. What is the probability of the person being a male?(Assume male and female to be in equal numbers).
2. A contractor has to choose between two jobs. The first job promises a profit of Rs.2,40,000 with probability of 0.75 or a loss of Rs.60,000 (due to strikes and other delays) with a probability of 0.25, the second job promises a profit of Rs.3,60,000 with a probability of 0.5 or a loss of Rs.90,000 with a probability of 0.5.
 - (a) Which job should the contractor choose if he wants to minimize his expected profit.
 - (b) Which job would the contractor probably choose if his business is in bad shape and he will go broke unless he can make a profit of at least Rs.3,00,000 on his next job.
3. (a) A random process gives measurements X between 0 and 1 with a probability density function
$$f(x) = 12x^3 - 21x^2 + 10x, 0 \leq x \leq 1.$$
$$= 0, \text{ other wise.}$$
 - i. Find $P(X \leq 1/2)$ and $P(X > 1/2)$
 - ii. Find a number k such that $P(X \leq k) = 1/2$.
- (b) A car hire firm has two cars which it hires out day by day. The number of demands for a car on each day is distributed as poisson variable with mean 1.5. Calculate the proportion of days on which
 - i. Neither car is used and
 - ii. Some demand is refused.
4. (a) A Population is known to follow the normal distribution with mean 2 and standard deviation 3. Find the probability that the mean of a sample of size 16 taken from this population will be greater than 2.5.
(b) A random sample is taken from a normal population with mean 30 and standard deviation 4. How large a sample should be taken if the sample mean is to lie between 25 and 35 with probability 0.98.

5. (a) The S.D of the height of all students in Madras University is 4". Two samples are taken. The S.D of the height of 100 B.Sc. students is 3.5" and the height of 100 B.A. Students is 4.5". Test the significance of the difference of S.D of the samples.
- (b) In a survey of incomes of two classes of workers of two random samples gave the following details. Examine whether the difference between (i) means and (ii) the s.d are significant.

Sample	Size	Mean Annual income in r.s.	Standard deviation in Rs.
I	100	582	24
II	100	546	28

6. (a) It is desired to test the hypothesis $\mu_0 = 40$ against the alternative hypothesis $\mu_1 = 42$ on the basis of a random sample from a normal population with the standard deviation $\sigma = 4$. If the probability of a Type 1 error is to be 0.05 and the probability of a Type II error is to be 0.24, find the required size of the sample.
- (b) The diameter of rotor shafts in a lot has a mean of 0.249 inch and a standard deviation of 0.003 inch. The inner diameters of bearings in another lot have a mean of 0.255 inch and a standard deviation of 0.002 inch. (i) What are the mean and the standard deviation of the clearances between shafts and bearings selected from these lots? (ii) If a shaft and a bearing are selected at random, what is the probability that the shaft will not fit inside the bearing? (Assume that both dimensions are normally distributed)
7. Estimate r by fitting the ideal gas law $PV^r = c$ to the following data

Pressure P (lb/in ²)	16.6	39.7	78.5	115.5	195.3	546.1
Volume V (IN ³)	50	30	20	15	10	5

8. In a certain paired data $n=18$ and $r = 0.44$ test the null hypothesis $\rho = 0.30$ against $\rho > 0.30$ at 0.01 level of significance.
