



**DSP 12 (O)**

**Diploma in Statistical Process Control and Operations Research  
(DSPCOR) Examination, August 2014  
(Old Scheme)**

**Paper – ST-II : ELEMENTS OF PROBABILITY AND STATISTICAL METHODS**

Time : 3 Hours

Max. Marks : 90

**SECTION – I**

Answer **any 2** questions :

**(2×15=30)**

1. a) Explain equally likely outcomes and probabilities in the case of equally likely outcomes.  
b)  $P(A | B) = 0.2$ ,  $P(B | A) = 0.5$ ,  $P(B) = 0.25$ , find  $P(A)$ .  
c) A production centre receives raw materials from two suppliers,  $S_1$  and  $S_2$ . He observes that 10% of the raw materials are defective. Also, he has the information that 6% of raw materials supplied by  $S_1$  are defective. Given a defective raw material, what is the probability that it is supplied by  $S_2$  ?
2. a) Define Normal distribution and mention its properties.  
b) In a competitive examination of 5000 students, the marks of the examinees in statistics were found to be distributed normally with mean 45 and S.D. 14. Find the number of examinees whose marks out of 100 were :  
i) Less than 30      ii) Between 30 and 70      iii) More than 40  
(Given that  $P(0 < Z < 1.07) = 0.35769$ ,  $P(0 < Z < 1.79) = 0.46327$  and  $P(0 < Z < 0.36) = 0.14058$ ).
3. Define and explain the sampling distributions.
4. a) In 64 randomly selected hours of production, the mean and standard deviation of acceptable pieces produced by an automatic stamping machine are  $\bar{x} = 1038$ ,  $s = 146$ . At 0.05 level of significance, does this enable us to reject the null hypothesis  $\mu = 1000$  against the alternative hypothesis  $\mu > 1000$ .  
b) Suppose that the sample correlation co-efficient of a sample of size 18 is 0.45. Can we conclude that the corresponding population correlation coefficient is significantly different from zero ? (Tabulated value of  $t_{0.025} = 2.12$  at 5% level of significance with 16 degrees of freedom).

**P.T.O.**



## SECTION – II

Answer **any 4** questions :**(4×10=40)**

5. Explain the terms with an example each :
  - a) Events
  - b) Complementary event
  - c) Union of events
  - d) Intersection of events
  - e) Mutually Exclusive Events.
6. a) An urn has 6 red balls and 4 white balls, 2 of the red balls and 2 of the white balls have black markings. If a ball is picked at random, what is the probability that the ball is red with black dots ?  
b) If  $A \subset B$  and  $P(A) > 0$ , what is  $P(B | A)$  ?
7. Write down the probability function of a binomial random variable. Determine the mean and standard deviation of binomial distributions with parameters :
  - a)  $n = 25, q = 0.4$
  - b)  $n = 40, p = 0.05$ .
8. a) In a competitive examination of 5000 students, the marks of the examinees in statistics were found to be normally distributed with mean 45 and standard deviation 14. Find the number of examinees whose marks out of 100 were less than 30, given that  $P(0 < z < 1.07) = 0.35769$ .  
b) In a sample of 120 workers in a factory the mean and the S.D. of wages were Rs. 11.35 and Rs. 3.03 respectively. Find the percentage of workers getting wages between Rs. 9.00 and Rs. 17.00 in the factory assuming the wages are normally distributed, given that  $P(0 < z < 0.78) = 0.28230$  and  $P(0 < z < 1.86) = 0.46856$ .
9. Explain the method of finding percentage points of the sampling distributions by using tables.
10. What are the two types of errors in testing of statistical hypotheses ? Give examples of simple and composite hypotheses.
11. Describe the one way ANOVA procedure in detail.
12. What is the t-test for testing significance of population correlation coefficient in a bivariate population ?



SECTION – III

Answer **any 4** questions :

**(4×5=20)**

13. Explain mutually exclusive and exhaustive events with an example each.
  14. State and prove Bayes' theorem.
  15. It is known that the number of breaks in a coil of 100 meters insulated electric wire, on an average, is two. Let  $X$  be the number of breaks in a hundred meters insulated wire. Find the probability of exactly 4 breaks in 100 meters wire.
  16. The toe length of human beings follows a normal distribution with mean 3 cms and S.D. 0.5 cms. Find the percentage of population whose toe length is below 2.0 cms.
  17. Write a note on finite population correction.
  18. How does one formulate a null hypothesis ? Give reasons for your answer.
  19. Explain the large sample test for equality of two population proportion.
  20. Explain the terms : Confidence limits, confidence level, confidence coefficient.
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