STAT50 Final Exam Show All Work (obviously)!!! Good Luck!!!

Usual Rules Apply. By submitting your exam, you agree to and have not violated any of these rules.

Part 1

1. A crypto currency investment club consist 60 members who only invest in Bitcoin, 30 who only invest in Ethereum, and 10 who only invest in Dogecoin.
2. A research committee of 10 randomly selected members is being formed. What is the probability that the committee will consist of 5 Bitcoin investors, 3 Ethereum investors, and 2 Dogecoin investors? You do not need to simplify your answer or provide a decimal answer.
3. Once the committee is formed, 2 committee members will be chosen from the 10 member committee as President and Vice President. In how many ways can this choice be made?
4. Ships arrive at a port according to a Poisson process at a mean rate of 2 per hour.
5. Let be the time until the 3nd ship arrives, starting at any point in time. Identify the distribution of , including any parameters, then find .
6. Let be the time until the next ship arrives, starting at any point in time. Identify the distribution of , including any parameters, then find . Also, if it has been 2 hours since the last ship arrived, what is the probability that it will be more than 2 hours until the next ship arrives.
7. Let be the number of ships arriving in the next 30 minutes, starting at any point in time. Identify the distribution of , including any parameters, then find .
8. Random variable A~N(20,4), while random variable B~N(30,9), and random variable C~N(80,12). Assuming independence, find .
9. The human resources department at a large corporation ranks employees as excellent, acceptable, or unacceptable. Historically 10% are ranked excellent, 75 % are ranked acceptable, and 15% are ranked unacceptable. It is anticipated that 90% of the employees ranked excellent will receive a raise this year, 60% of those ranked acceptable will receive a raise, and 2% of those ranked unacceptable will receive a raise. If a randomly selected employee receives a raise, what is the probability that they are ranked acceptable?
10. Suppose first names are assigned independently with constant probability, and are equally likely to begin with any of the 26 letters. That is, the probability that a randomly selected person’s first name begins with the letter H isP(H) = , the probability that a randomly selected person’s name begins with one of the letters D through G is P(D – G) = , and so on.
11. Fifteen people are selected at random. Let X represent the number of the fifteen who have first names beginning with letters A through E. Find P(X< 2).
12. Individuals are randomly selected until the 4th person is found with a first name beginning with the letters A through E. Let X be the number of people selected up to and including the 4th person selected whose first name begins with the letters A through E. Find P(X = 10).
13. Find P(A-G or D-K)
14. The joint density of and is given by:
15. Find the marginal densities of and .
16. Find Var(
17. Write an expression in terms of integrals which gives .

Part 2

1. A random sample of 20 former astronauts had a mean body mass index (BMI) of 37 with a standard deviation of 2.3. NASA claims all former astronauts are in excellent physical condition and that the mean BMI is definitely less than 38. Does the data support NASA’s claim? Assuming the normality condition is satisfied, conduct an appropriate hypothesis test (use as follows:
2. State the null and alternative hypotheses.
3. Compute the appropriate test statistic (correctly labeled).
4. Determine a P-value.
5. State your conclusion in context.
6. A comparison of mean reaction times for two different stimuli in a psychological word association experiment was conducted using independent samples of 40 people receiving stimuli A and 40 people using stimuli B. The results were . Do the data present sufficient evidence to indicate the mean reaction time to stimulus A is different than the mean reaction time to stimulus B? Conduct an appropriate hypothesis test as follows:
7. State the null and alternative hypotheses.
8. Compute the appropriate test statistic (correctly labeled).
9. Compute the P-value.
10. State your conclusion in context.
11. A hospital wished to estimate the average number of days required for treatment of patients between the ages of 25 and 34. A random sample of 500 hospital patients between these ages produced a mean and standard deviation equal to 5.4 and 3.1 days, respectively.
12. Construct a 95% confidence interval for the mean length of stay.
13. Interpret your confidence interval in context and explain what is meant by the statement “we are 95% confident that …”
14. Determine the sample size necessary to reduce the margin of error to .25 days while maintaining 95% confidence.
15. A random sample of 400 radio tubes was tested and 40 tubes were found to be defective. Does this data support the claim that the true proportion of defective radio tubes is greater than 0.08?.Conduct a test of hypotheses using as follows (The necessary conditions are satisfied):
16. State the null and alternative hypotheses.
17. Compute the appropriate test statistic (correctly labeled).
18. Compute the P-value.
19. State your conclusion in context.