College of Sciences
Department of
Statistics and Operations
Research

First Midterm Exam

Sunday, March 3, 2019	STAT 105	Academic year 2018-2019
7 : 00 – 8 : 30 pm		Second Semester

Student's Name	
ID number	
Section No.	
Classroom No.	
Teacher's Name	
Roll Number	

Instructions:

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- ◇ Switch off your mobile and place it under your seat.
- ◇ Time allowed is 90 Minutes.
- ◇ Do not copy answers from your neighbors. They have different questions forms.
- ◇ Choose the nearest number to your answer.
- ◇ Do not use pencils or red pens.
- ◇ For each question, put the code (Capital Letters) of the correct answer in the following table beneath the question number.

1	2	3	4	5	6	7	8	9	10
C	B	C	D	B	C	C	C	B	A
11	12	13	14	15	16	17	18	19	20
D	C	B	C	D	B	D	B	D	A
21	22	23	24	25	26	27	28	29	30
D	B	C	D	A	B	D	C	B	A

Questions (1): The battery failure time, measured in hours, has a probability density function:

$$f(x) = \begin{cases} \frac{2}{(x+1)^3}, & x > 0; \\ 0, & \text{otherwise.} \end{cases}$$

1) The probability that a battery lasts more than five hours is

A	B	C	D
4/9	1/2	1/36	2/5

Questions (2-3): A random variable X has a probability density function:

$$f(x) = \begin{cases} \frac{1}{6}, & x \in \{1, 2, 3, 4, 5, 6\}; \\ 0, & \text{otherwise.} \end{cases}$$

2) The expected value of X, $E(X)$ is equal to

A	B	C	D
2	3	5	1

3) The variance of X, $V(X)$ is equal to

A	B	C	D
1	2	3	4

Questions (4): Let X be a normal random variable with mean 30 and variance 36.

4) $\mathbf{P}(32 < X < 38)$ is equal to

A	B	C	D
0.485	0.342	0.156	0.279

Questions (5): Let X be an exponential random variable with mean $\frac{1}{\lambda} = 5$.

5) $\mathbf{P}(7 < X)$ is equal to

A	B	C	D
0.524	0.246	0.178	0.425

Questions (6): Let X be an exponential random variable with mean 10 and standard deviation 2.

6) The value of x with 9% of the area to its left is

A	B	C	D
5.33	2.75	7.32	1.85

Questions (7-8): The random variable T follows the exponential distribution with mean time to failure is 6 years.

7) The probability that it is still functioning at the end of 10 years is

A	B	C	D
0.211	0.167	0.189	0.231

8) If 4 of these components are installed in different systems. The probability that at least 1 is still functioning at the end of 10 years is

A	B	C	D
0.214	0.133	0.567	0.312

Questions (9): The television picture tubes of manufacturer A have a mean lifetime of 5.5 years and a standard deviation of two years, while those of manufacturer B have a mean lifetime of 5 years and a standard deviation of 1.5 year.

9) The probability that a random sample of 40 tubes from manufacturer A will have a mean lifetime that is 1 year more than the mean lifetime of a sample of 50 tubes from manufacturer B is

A	B	C	D
0.024	0.0951	0.102	0.25

Questions (10): Let T be a student random variable.

10) The probability $\mathbf{P}(-t_{0.25} < T < t_{0.5})$ is

A	B	C	D
0.25	0.35	0.15	0.05

Questions (11-12): Let X be a Chi-squared random variable.

11) Find $\mathcal{X}^2_\alpha$ such that, The probability $\mathbf{P}(\mathcal{X}^2_\alpha < X < 2.204) = 0.075$ with $\nu = 6$

A	B	C	D
0.505	0.325	0.054	1.237

12) Find $\mathcal{X}^2_\alpha$ such that, The probability $\mathbf{P}(\mathcal{X}^2_\alpha < X) = 0.075$ with $\nu = 5$

A	B	C	D
5.125	6.532	2.675	4.521

Questions (13-14): Let F be a Fisher random variable.

13) The $f_{0.95}$ with $\nu_1 = 15$ and $\nu_2 = 15$

A	B	C	D
0.3333	0.4167	0.1543	0.2578

14) The $f_{0.99}$ with $\nu_1 = 19$ and $\nu_2 = 3$

A	B	C	D
0.3212	0.4512	0.1996	0.2141

Questions (15-17): Suppose that 20 percent of adults of a male population were obese. In a simple random sample of size 200 from this population

15) The mean of the proportion $\widehat{P}$ of adults in this sample who were obese is

A	B	C	D
0.5	0.7	0.1	0.2

16) The variance of the proportion $\widehat{P}$ of adults in this sample is

A	B	C	D
0.0052	0.0008	0.0134	0.1022

17) The probability that the proportion $\widehat{P}$ in this sample who are obese is fewer than 15 percent is

A	B	C	D
0.0452	0.0848	0.0152	0.0384

Questions (18-20): Suppose that there are two high schools, in a certain town. At School 1, 55% of students did their homework last night. Besides, 65% of the students at School 2 did their homework last night. The counselor at School 1 takes a simple random sample of 100 students and records the proportion that did the homework $\widehat{P}_1$. School 2 counselor's takes a simple random sample of 150 students and records the proportion that did the homework $\widehat{P}_2$.

18) The standard deviation of the difference $\widehat{P}_2 - \widehat{P}_1$ is

A	B	C	D
0.251	0.0632	0.1588	0.0025

19) The sampling distribution of the difference $\widehat{P}_2 - \widehat{P}_1$ is

A	B	C	D
t	$\mathcal{X}^2$	F	$N(0,1)$

20) The probability of getting a difference $\widehat{P}_2 - \widehat{P}_1 \geq 0.05$ is

A	B	C	D
0.785	0.251	0.512	0.315

Questions (21-26): Let X be a random variable that has the following probability function

X	-1	1	2	3
f(x)	0.1	0.2	0.4	0.3

21) $\mathbf{P}(-1 < X < 3)$ is equal to:

A	B	C	D
0.1	0.2	0.5	0.6

22) $\mathbf{P}(-1 \leq X \leq 2)$ is equal to:

A	B	C	D
0.9	0.7	0.3	0.4

23) $\mathbf{P}(0 \leq X < 2)$ is equal to:

A	B	C	D
0.6	0.8	0.2	0.5

24) $\sum_{k\in\{-1,1,2,3\}} \mathbf{P}(X = k)$ is equal to:

A	B	C	D
2.5	1.1	1.3	1

25) The mean $\mu = E(X)$ is equal to:

A	B	C	D
1.8	2.1	1	1.5

26) The variance σ^2 is equal to:

A	B	C	D
2.11	1.36	1.22	3.16

Questions (27): A dice (a cube with six faces, on each face a number from 1 to 6) is tossed once.

27) The probability of getting a number less than 3 is

A	B	C	D
2/3	1/5	3/5	1/3

Questions (28-29): The probability that a patient recovers from a rare blood disease is 0.4. If 5 people are known to have contracted this disease.

28) The probability that at most 2 will survive this disease.

A	B	C	D
0.258	0.134	0.683	0.912

29) The expected number of survivors from this disease is

A	B	C	D
5	2	1	8

Questions (30): The traffic accidents in a city follows a Poisson distribution with rate of 2 accidents every hour.

30) The probability that in certain hour there will be four accidents is

A	B	C	D
0.09	0.006	0.201	0.512