



SSCT

"For Nation's Greater Heights"

S.1.2. summative tests such as
mid-term and final
examination;



Document Code No.	FM-SSCT-ACAD-004
Revision No.	00
Effective Date	01 January 2019
Page No.	1 of 3

COLLEGE OF ENGINEERING & INFORMATION TECHNOLOGY
First Semester, AY 2021-2022

TEST QUESTIONNAIRE
Final Examination in **Math 114 – Engineering Data Analysis**

Instruction:

1. Read the questions carefully. You are not permitted to share calculators or any other materials during the examination;
2. For problem analysis, show the detailed solution of the problem in a separate sheet of paper;
3. Shade the bubble in the answer sheet that corresponds to the correct answer of the given test question.

Multiple Choice:

1. It is any function of the observations in a random sample.
 - a. Sampling distribution
 - b. Statistic**
 - c. Probability
 - d. Central limit theorem
2. The probability distribution of a statistic is called
 - a. Sampling distribution**
 - b. Statistic
 - c. Probability
 - d. Central limit theorem
3. If we consider all unbiased estimators of θ , the one with the smallest variance is called the
 - a. Minimum Variance Unbiased Estimator**
 - b. Standard Error of an Estimator
 - c. Bootstrap Standard Error
 - d. None of the above
4. Consider the following sample of observations on coating thickness for low-viscosity paint ("Achieving a Target Value for a Manufacturing Process: A Case Study," *J. of Quality Technology*, 1992: 22–26):

.83 .88 .88 1.04 1.09 1.12 1.29 1.31
1.48 1.49 1.59 1.62 1.65 1.71 1.76 1.83

Assume that the distribution of coating thickness is normal (a normal probability plot strongly supports this assumption). Calculate a point estimate of the mean value of coating thickness.

- a. 1.457
 - b. 1.348**
 - c. 1.436
 - d. 1.763
5. An interval estimate for a population parameter is called
 - a. Prediction interval
 - b. Tolerance interval
 - c. Probability interval
 - d. Confidence interval**
 6. Consider a normal population distribution with the value of σ known. What is the confidence level for the interval $\bar{x} \pm 2.81\sigma/\sqrt{n}$?
 - a. 99.5%**
 - b. 85%
 - c. 99%
 - d. 95.5%
 7. In number 6, What is the confidence level for the interval $\bar{x} \pm 1.44\sigma/\sqrt{n}$?
 - a. 99.5%
 - b. 85%**
 - c. 99%
 - d. 95.5%
 8. Assume that the helium porosity (in percentage) of coal samples taken from any particular seam is normally distributed with true standard deviation .75. Compute a 95% CI for the true average porosity of a certain seam if the average porosity for 20 specimens from the seam was 4.85.
 - a. (3.52, 5.16)
 - b. (4.42, 4.38)
 - c. (4.52, 5.18)**



Document Code No.	FM-SSCT-ACAD-004
Revision No.	00
Effective Date	01 January 2019
Page No.	2 of 3

- d. (4.12, 5.24)
9. In number 9, how large a sample size is necessary if the width of the 95% interval is to be .40?
- .35
 - .60
 - .46
 - .55**
10. It is a method for using sample data to decide whether the null hypothesis should be rejected.
- Test of hypothesis**
 - Null hypothesis
 - Statistical interference
 - Linear regression
11. It is the claim that is initially assumed to be true (the "prior belief" claim).
- Alternative hypothesis
 - Null hypothesis**
 - Null value
 - P-value
12. A statement that contradicts the null hypothesis.
- Alternative hypothesis**
 - Null hypothesis
 - Null value
 - P-value
13. It is the smallest level of significance that would lead to rejection of the null hypothesis H_0 with the given data.
- Alternative hypothesis
 - Null hypothesis
 - Null value
 - P-value**
14. For which of the given P-values would the null hypothesis be rejected when performing a level .05 test?
- i. .001 ii. .021 iii. .078 iv. .047 v. 1.48
- i, ii, iv**
 - ii, iv, v
 - i, ii, iii
 - iii, iv, v
15. The melting point of each of 16 samples of a certain brand of hydrogenated vegetable oil was determined, resulting in $\bar{x} = 94.32$. Assume that the distribution of the melting point is normal with $\sigma = 1.20$. If a level .01 test is used, what is $\beta(94)$, the probability of a type II error when $\mu = 94$?
- .2322
 - .3467
 - .2266**
 - .4312
16. This results when investigators assign subjects to the two treatments in a random fashion.
- Statistical experiment
 - randomized controlled experiment**
 - retrospective experiment
 - none of the above
17. Engineers and scientists are often interested in comparing two different conditions to determine whether either condition produces a significant effect on the response that is observed. These conditions are sometimes called
- Treatments**
 - Randomized experiment
 - Study
 - None of the above
18. A mechanical engineer wishes to compare strength properties of steel beams with similar beams made with a particular alloy. The same number of beams, n , of each type will be tested. Each beam will be set in a horizontal position with a support on each end, a force of 2500 lb will be applied at the center, and the deflection will be measured. From past experience with such beams, the engineer is willing to assume that the true standard deviation of deflection for both types of beam is .05 in. Because the alloy is more



Document Code No.	FM-SSCT-ACAD-004
Revision No.	00
Effective Date	01 January 2019
Page No.	3 of 3

expensive, the engineer wishes to test at level .01 whether it has smaller average deflection than the steel beam. What value of n is appropriate if the desired type II error probability is .05 when the difference in true average deflection favors the alloy by .04 in.?

- a. 60
- b. 50**
- c. 55
- d. 45

(19 & 20) Determine the number of degrees of freedom for the two-sample t test or CI in each of the following situations:

19. $m = 10, n = 10, s_1 = 5.0, s_2 = 6.0$

- a. 17**
- b. 21
- c. 18
- d. 26

20. $m = 10, n = 15, s_1 = 5.0, s_2 = 6.0$

- a. 17
- b. 21**
- c. 18
- d. 26

21. The part of statistics that investigates the relationship between two or more variables related in a nondeterministic fashion.

- a. Linear regression
- b. Correlation
- c. Regression analysis**
- d. None of the above

22. We can think of the regression model as an _____ model.

- a. Mechanistic
- b. Linear
- c. Empirical**
- d. Statistical

23. Suppose that in a certain chemical process the reaction time y (hr) is related to the temperature ($^{\circ}\text{F}$) in the chamber in which the reaction takes place according to the simple linear regression model with equation $y = 5.00 - .01x$ and $\sigma = .075$. What is the expected change in reaction time for a 1°F increase in temperature? For a 10°F increase in temperature?

- a. 3.00, 2.50
- b. -.15, 2.10
- c. 2.50, 3.01
- d. -.01, -.10**

24. What is the expected reaction time when temperature is 200°F ? When temperature is 250°F ?

- a. 3.00, 2.50**
- b. -.15, 2.10
- c. 2.50, 3.01
- d. -.01, -.10

25. The flow rate y (m^3/min) in a device used for air-quality measurement depends on the pressure drop x (in. of water) across the device's filter. Suppose that for x values between 5 and 20, the two variables are related according to the simple linear regression model with true regression line $y = -.12 + .095x$. What change in flow rate can be expected when pressure drop decreases by 5 in.?

- a. -.475**
- b. .095
- c. -.645
- d. .830



Document Code No.	FM-SSCT-ACAD-004
Revision No.	00
Effective Date	01 January 2019
Page No.	1 of 4

COLLEGE OF ENGINEERING & INFORMATION TECHNOLOGY
First Semester, AY 2021-2022

TEST QUESTIONNAIRE
Midterm Examination in EE 304 – Electrical Apparatus and Devices

Instruction:

1. Read the questions carefully. You are not permitted to share any materials or answers during the examination.
2. Write your answers and detailed solution in a separate sheet of paper.

Multiple Choice – Choose the best answer.

1. What is the purpose of a breather in a transformer?
 - a. it is used to blast air to the transformer tank
 - b. it is used to prevent the transformer windings inside the transformer tank from overheating
 - c. **it is used to extract moisture of the air that enters the transformer tank**
 - d. it is used to supply oil to the transformer tank
2. Which of the following transformer bank connections is the best to apply for three to two phase conversions?
 - a. star-star
 - b. star-delta
 - c. **scott**
 - d. double scott
3. Power electronic circuits that can convert dc to ac are called
 - a. shunt circuits
 - b. rectifier circuits
 - c. converter circuits
 - d. **inverter circuits**
4. The primary and secondary currents of a transformer were measured and found to be 3.8 and 152 amp, respectively. If the secondary load voltage is 116 volts, what is the primary emf?
 - a. 4200 V
 - b. 3800 V
 - c. **4640 V**
 - d. 5420 V
5. A 5 kVA transformer has a nominal voltage rating of 1,100/110 volts. With the low voltage winding short-circuited, it is found by experiment that 33 V is required to circulate rated full load current, and the corresponding power input is 85 watts. Find the percent regulation when the load takes rated current at a power factor of 80% lagging.
 - a. 2.21%
 - b. 3.12%
 - c. 3.42%
 - d. **2.85%**
6. In this winding insulation system, the winding is permeated in a varnish under vacuum pressure.
 - a. Coated
 - b. **Vacuum-pressure impregnated**
 - c. Vacuum-pressure encapsulated
 - d. Cast coil
7. What is the purpose of connecting a reactor in series to a transformer?
 - a. to deliver more kVA
 - b. to improve its voltage regulation
 - c. to correct its operating power factor
 - d. **to control the fault current**
8. In a three-phase delta-connected system, how does the line current related to the phase current?
 - a. line current is 3 times the phase current
 - b. **line current is sqrt(3) times the phase current**
 - c. line current is equal to the phase current
 - d. line current is 1/sqrt(3) times the phase current
9. In a three phase Y-Y transformer connection, the neutral is fundamental to the
 - a. provision of dual electric service
 - b. passage of unbalance currents due to unbalanced loads
 - c. balancing of phase voltages with respect to line voltages
 - d. **suppression of harmonics**
10. The per-unit impedance of a circuit element is 0.15. If the base kV and MVA are halved, the new value of the per-unit impedance of the circuit element will be
 - a. 0.15
 - b. 0.06
 - c. 0.56
 - d. **0.30**
11. The core loss in a transformer equivalent circuit is represented by which of the following circuit element?
 - a. A shunt capacitance
 - b. A series resistance
 - c. A series inductance
 - d. **A shunt resistance**
12. The energy from the primary of a transformer is transferred to the secondary due to which of the following?
 - a. Due to changes of the current in the two windings
 - b. Due to the electrical connection between the two windings
 - c. **Due to the flux linkage between the two windings**
 - d. Due to the difference in the number of turns in the primary and secondary windings
13. A single-phase transformer rated 1.2 kV/120 V, 7.2 kVA has the following winding parameters: $R_1=0.8 \Omega$, $X_1=1.2 \Omega$, $R_2=0.01 \Omega$, and $X_2=0.01 \Omega$.



Document Code No.	FM-SSCT-ACAD-004
Revision No.	00
Effective Date	01 January 2019
Page No.	2 of 4

- Determine the voltage regulation of the transformer when it is delivering rated load at 0.8 pf lagging.
- 4.09 %
 - 1.38 %**
 - 2.98 %
 - 3.47 %
- The no-load input power of a transformer is practically equal to which of the following?
 - Friction and windage loss
 - iron loss**
 - Stray power loss
 - Copper loss
 - This winding is also referred to as screw or spiral winding.
 - helical winding**
 - pancake winding
 - disc winding
 - layer winding
 - In this core construction, the core provides multiple paths for the magnetic circuit.
 - double-core construction
 - core-form construction
 - single-core construction
 - shell-form construction**
 - Which transformer would be suitable for enhancing voltage-sag tolerance of industrial process-control elements?
 - Rectifier transformers
 - Constant-voltage transformers**
 - Distribution transformers
 - Phase-shifting transformers
 - This test is performed with the secondary open-circuited and a voltage impressed on the primary.
 - open-circuit test**
 - polarity test
 - short-circuit test
 - ratio test
 - Why is a transformer more efficient compared to rotating machines?
 - its friction and windage loss is small
 - its winding has less resistance
 - it uses both inductive and capacitive coupling
 - it is a static device**
 - A 1:2 ratio transformer has secondary winding resistance of 1/2 ohm. What is the total resistance in ohms referred to the primary?
 - 1
 - 2
 - 1/8**
 - 1/4
 - What is the reason why the cores of large transformers are built up to nearly circular cross section?
 - to reduce copper loss**
 - to reduce leakage reactance
 - to reduce iron loss
 - to reduce eddy current loss
 - Which winding in a transformer has more turns?
 - secondary windings
 - low-voltage windings
 - high-voltage windings**
 - primary windings
 - The tank and cabinet parts of overhead and pad-mounted transformers are made of this material.
 - mild steel**
 - aluminum
 - composites
 - stainless steel
 - What is the reason why the transformer cores are laminated?
 - to minimize the eddy current loss**
 - to reduce the hysteresis loss
 - to reduce the cost
 - to simplify its construction
 - The core loss in a transformer equivalent circuit is represented by which of the following circuit element?
 - series inductance
 - shunt resistance
 - shunt inductance**
 - series resistance
 - What is an ideal transformer?
 - a transformer that does not work
 - a transformer that has no losses and leakage reactance**
 - a transformer whose primary and secondary windings are not equal in turns
 - a transformer that has only one winding
 - Current limiting reactors installed between a single source and two buses are called
 - Bus tie reactors
 - Phase reactors
 - Neutral grounding reactors
 - Duplex reactors**
 - What is the purpose of putting the transformer windings under oil?
 - To insulate and lubricate the windings
 - To cool, insulate and lubricate the windings
 - To insulate and cool the windings**
 - To lubricate and cool the windings
 - What is the normal life expectancy of a power transformer when operated within its rating?
 - 20 years
 - 30 years**
 - 50 years
 - 40 years
 - This connection has the advantage that one transformer can be removed for repair or maintenance while the remaining two continue to function as a three-phase bank.
 - delta-delta
 - v-v**
 - delta-wye
 - wye-wye
 - The maximum efficiency of a 100 kVA, 6600/240 V, 60 Hz single phase transformer occurs at half load and is 98% at unity power factor. What is the full load efficiency at 0.8 lagging power factor?
 - 92.45%
 - 93.86%
 - 96.91%**
 - 95.01%



Document Code No.	FM-SSCT-ACAD-004
Revision No.	00
Effective Date	01 January 2019
Page No.	3 of 4

32. Which of the following transformers is best suited for general-purpose monitoring and temporary installations.
- Wound-Type CT
 - Window-Type CT
 - Split-Core Type CT**
 - Bar-Type CT
33. A transformer will work on what type of voltage?
- ac only**
 - both ac and dc
 - dc only
 - any kind of supply voltage
34. What type of coupling is used in the primary and secondary windings of a transformer?
- magnetic**
 - electrical
 - mechanical
 - all of these
35. Two single-phase transformers having equal turns ratio supply is in parallel having a secondary load of 1000 A at 0.80 lagging pf. For each transformer secondary emf on open circuit is 3300 V and the total leakage impedance referred to secondary are $(0.10 + j0.20)$ ohms and $(0.05 + j0.40)$ ohms, respectively. Determine the output current of one transformer.
- 362.8
 - 567.2
 - 486.3
 - 652.1**
36. This connection is used where it is necessary to step up the voltage.
- delta-delta
 - wye-delta
 - delta-wye**
 - wye-wye
37. What is the reason why transformers are rated in kVA instead of kW?
- it is already customary based on early transformers
 - the kVA is fixed while the kW is dependent on load pf
 - total transformer loss depends on volt-ampere**
 - Load power factor is normally not known
38. These transformers are self-cooled, liquid-filled, sealed units designed for step-down operation from an underground primary cable supply.
- constant-voltage transformers
 - overhead distribution transformers
 - phase-shifting transformers
 - underground distribution transformer**
39. A 25 kVA transformer has 500 turns on the primary winding and 40 turns on the secondary winding. If the primary is connected to a 3000 V, 50 Hz supply, calculate the maximum flux in the core.
- 0.085 Wb
 - 0.053 Wb
 - 0.027 Wb**
 - 0.034 Wb
40. What is a conservator in a transformer?
- It is the metal tank of a transformer that housed the core and the windings
 - It is a protective device that protects the transformer from lightning surges
 - It is an air-tight metal drum located at the top of a transformer tank**
 - It is a protective device that protects the transformer from overloading
41. Three single-phase, 50-kVA 2400:240-V transformers, are connected wye-delta in a three-phase 150-kVA bank to step down the voltage at the load end of a feeder whose impedance is $0.15 + j1.00$ ohm/phase. The voltage at the sending end of the feeder is 4160 V line-to-line. On their secondary sides, the transformers supply a balanced three-phase load through a feeder whose impedance is $0.0005 + j0.0020$ ohm/phase. Find the line-to-line voltage at the load when the load draws rated current from the transformers at a power factor of 0.80 lagging.
- 240 V
 - 230 V
 - 233 V**
 - 220 V
42. Which one is the main cause of noise in transformers?
- alternating current in the windings
 - cooling oil which heating up
 - all of these
 - magnetic flux**
43. What is the reason why open circuit test is performed on the low voltage winding of the transformer?
- it involves only lesser core loss, which means more efficient results
 - it needs only minimum power input to perform the test
 - it draws sufficiently large current on load current for convenient reading**
 - it requires lesser voltage to perform the test
44. Which of the following is true about an ideal transformer?
- the core has no losses
 - the core has infinite permeability
 - the windings has no resistances
 - all of these**
45. Three 25-kVA transformers are connected to delta-delta. To what kVA should the load be reduced if one of the transformers is removed so that the bank operates V-V?
- 43.3 kVA**
 - 14.43 kVA
 - 31.50 kVA
 - 50 kVA
46. The core of a 50 Hz single-phase transformer has a cross-section of 20 cm square. Find the emf per turn if the maximum core density is not to exceed 1.3 T.
- 11.54**
 - 13.85
 - 12.82
 - 10.13



Document Code No.	FM-SSCT-ACAD-004
Revision No.	00
Effective Date	01 January 2019
Page No.	4 of 4

47. As compared to transformer bank, what is the percentage capacity of the V– V or open – delta bank?
- 57.7 %
 - 73.3 %
 - 86.6%
 - 66.7 %
48. Which of the following is true about a Buchholz relay used in transformers?
- it is a current actuated relay
 - it is an oil actuated relay**
 - it is a gas actuated relay
 - it is an oil-temperature actuated relay
49. In single-phase transformers, additive polarity is when like-numbered winding terminal markings are in _____ position.
- opposite
 - diagonal**
 - parallel
 - adjacent
50. Which of the following is the purpose of cooling a transformer?
- to reduce the humming sound
 - to reduce the losses
 - to increase the efficiency
 - to dissipate the heat generated in the windings**
51. Two single-phase transformers A and B are in parallel supplying power to a 3.3 kV bus bar known to have a total load of 1000 A at 0.8 pf lagging. The equivalent impedances referred to the secondary side of each transformer are $0.1+j0.2$ and $0.05+j0.4$ ohm, respectively. Determine the kW output delivered by transformer B.
- 677.74 kW
 - 776.47 kW**
 - 685.86 kW
 - 866.55 kW
52. In transformer the changing current in primary coil induces changing magnetic field in
- Secondary coil**
 - Resistor
 - Insulator
 - Inductor
53. Which kind of transformers are used for high voltage power transfer applications?
- Power Transformers**
 - Distribution Transformers
 - Measurement Transformers
 - Indoor Transformers
54. A 100 kVA, 6600/330 V, 60 Hz single-phase transformer took 10 A and 436 W at 100 V in a short circuit test, performed on the high side. Determine the voltage to be applied to the high side on full load at 0.80 lagging power factor when the secondary voltage is 330 V.
- 7200 V
 - 6520 V
 - 6735 V**
 - 5765 V
55. A 230/460 volt transformer has a primary impedance of $(0.20 + j0.50)$ ohm and a secondary winding impedance of $(0.75 + j1.8)$ ohms. If the primary voltage is 230 V,

determine the secondary or load voltage if the load current is 10 A at 0.80 lagging power factor.

- 450.3 V
- 424.8 V**
- 421.5 V
- 410.6 V



Document Code No.	FM-SSCT-ACAD-004
Revision No.	00
Effective Date	01 January 2019
Page No.	1 of 3

COLLEGE OF ENGINEERING & INFORMATION TECHNOLOGY
First Semester, AY 2021-2022

TEST QUESTIONNAIRE
Final Examination in **EE 304 – Electrical Apparatus and Devices**

Instruction:

1. Read the questions carefully. You are not permitted to share any materials or answers during the examination.
2. Write your answers and detailed solution in a separate sheet of paper.

Multiple Choice – Choose the best answer.

1. Which of the following circuit breakers is preferred for EHT applications?
a. Bulk oil circuit breakers
b. Air blast circuit breakers
c. Minimum oil circuit breakers
d. SF₆ circuit breakers
2. The current which exists at the instant of contact separation in a circuit breaker is called
a. Recovery current
b. Breaking current
c. Surge current
d. Restriking current
3. Which of the following circuit breakers has the lowest voltage range?
a. Air blast circuit breaker
b. Minimum oil circuit breaker
c. Air circuit breaker
d. SF₆ circuit breaker
4. Air blast circuit breakers are usually used for
a. Permanent duty
b. Intermittent duty
c. Repeated duty
d. Instantaneous duty
5. This circuit breaker was developed to avoid unwanted fire hazard.
a. Minimum oil circuit breaker
b. Bulk oil circuit breaker
c. Vacuum circuit breakers
d. Air blast circuit breakers
6. In this type of air-blast circuit breaker, the air-blast is directed at right angles to the arc path.
a. Axial-blast type
b. Cross-blast type
c. Radial-blast type
d. None of the above
7. This component indicates the status of the circuit breaker (on or off tripped).
a. Actuator mechanism
b. Bimetallic strip
c. Contacts
d. Actuator lever
8. In a circuit breaker, the further the contacts separate the _____ the arc.
a. Longer
b. Shorter
c. Larger
d. It depends on the type contact
9. If a circuit breaker does not operate, the probable reason could be
a. Trip circuit open
b. Spring defective
c. Trip latch defective
d. Any of the above
10. In a circuit breaker, as the force on contact is increased, the contact resistance will
a. Decrease
b. Increase exponentially
c. Increase linearly
d. Remain unchanged
11. The active recovery voltage of a circuit breaker depends upon the
a. Circuit conditions
b. Power factor
c. Armature reaction
d. All of these
12. Which of the following circuit breaker will produce the least arc energy?
a. Air blast circuit breaker
b. Vacuum circuit breaker
c. Minimum oil circuit breaker
d. All will produce same energy
13. Which of the following circuit breaker must be equipped for remote operation?
a. Shunt trip
b. Time delay trip
c. Inverse time trip
d. All of the above
14. The air used in air blast circuit breaker should
a. Be ionized
b. Have oil mist
c. Be free from moisture
d. Have no CO₂
15. A circuit breaker operates when
a. The switch is put on
b. Line is checked
c. Power is to be supplied
d. Fault in the line occurs
16. In a circuit breaker, the heat produced at the contact point due to passage of current will least depend on
a. Current flowing
b. Contact resistance
c. Temperature of the surrounding medium
d. Time during which the current flow
17. The contact resistance of a circuit breaker is least affected by the
a. Ambient temperature
b. Applied mechanical force
c. Shape of the contact faces
d. Amount of surface contamination
18. Circuit breakers are essentially
a. Arc extinguishers
b. Circuits that break the system



Document Code No.	FM-SSCT-ACAD-004
Revision No.	00
Effective Date	01 January 2019
Page No.	2 of 3

- c. **Current carrying contacts called electrodes**
d. None of the above
19. This circuit breaker has a rating of not more than 100 A.
a. Air circuit breaker
b. Molded case circuit breaker
c. **Miniature circuit breaker**
d. Earth leakage circuit breaker
20. This type of circuit breaker combines the functions of an residual current device (RCD) and miniature circuit breaker (MCB).
a. Molded case circuit breaker
b. Earth leakage circuit breaker
c. **Residual current circuit breaker with overcurrent protection**
d. Residual current circuit breaker
21. HRC fuses are
a. High resistance and capacitance fuses
b. Holding and resisting current fuses
c. Heat reflecting cooled fuses
d. **High rupturing capacity fuses**
22. These devices are sometimes referred to as smart fuses.
a. Cartridge fuses
b. HRC fuses
c. I_s limiters
d. **Automatic Sectionalizing Links**
23. Fuses used for protection of electronic and other similar apparatus.
a. **Miniature fuses**
b. Low voltage fuses
c. High voltage fuses
d. Cartridge fuses
24. This a switch where the fuse link forms the moving contact of the switch.
a. Switch fuse
b. **Fuse switch**
c. Fuse link
d. Fixed fuse
25. This is the time between the commencement of a current large enough to cause a break in the fuse element and the instant that the arc is initiated.
a. Cut-off
b. Arcing time
c. **Pre-arcing time**
d. Total operating time
26. These fuses are usually employed on outdoor distribution equipment and overhead line poles.
a. **Expulsion type fuses**
b. HRC type fuses
c. Automatic Sectionalizing Links
d. I_s limiter
27. A fuse is essentially a
a. Voltage limiting device
b. **Current limiting device**
c. Power limiting device
d. Power factor correcting device
28. Which of the following is the main function of a fuse?
a. Protect the line
b. Open the circuit
c. **Prevent excessive currents**
d. All of the above
29. A fuse wire should have
a. Low specific resistance and high melting point
b. High specific resistance and high melting point
c. Low specific resistance and low melting point
d. **High specific resistance and low melting point**
30. HRC fuses provides best protection in case of
a. **Short circuits**
b. Overloads
c. Open circuits
d. All of these
31. A fuse melts well _____ the first peak of fault current is reached
a. After
b. **Before**
c. The same time
d. None of the above
32. The melting point of a fuse element should be
a. **Low**
b. High
c. Very low
d. Same
33. Having more fuse elements within the cartridge in parallel _____ the chance of arc extinction.
a. **Increases**
b. Decreases
c. Reduces
d. None of the above
34. Which of the following statement is true about fuse?
a. **Greater the current smaller is the time taken by the fuse to blow out.**
b. Greater the current greater is the time taken by the fuse to blow out.
c. The current is directly proportion to the blow out time of fuse.
d. Is dependent on the temperature and atmospheric conditions.
35. The over voltage surges in power systems are caused by
a. Switching
b. Resonance
c. Lightning
d. **Any of these**
36. Protection against over voltage due to lightning is provided by
a. Use of overhead ground wires
b. Use of surge diverters
c. Lightning arresters
d. **Any of these**
37. What type of lightning arrester is suitable for gas insulated sub-stations (GIS)?
a. **Metal-Oxide Surge Arrester**
b. Non-Linear Surge Diverter
c. Expulsion Type Lightning Arrester
d. Linear Surge Diverters
38. This arrester is used to prevent flashover of line insulators, isolators and bus insulators.
a. Metal-Oxide Surge Arrester
b. Non-Linear Surge Diverter
c. **Expulsion Type Lightning Arrester**



Document Code No.	FM-SSCT-ACAD-004
Revision No.	00
Effective Date	01 January 2019
Page No.	3 of 3

- d. Linear Surge Diverters
39. This lightning arrester is sometimes called thyrite type lightning arrester.
- Metal-Oxide Surge Arrester
 - Non-Linear Surge Diverter**
 - Expulsion Type Lightning Arrester
 - Linear Surge Diverters
40. Which of the following discharges high-energy surges without any change in sparkover characteristics?
- non-linear resistors
 - diverter's divided spark-gap**
 - series gap unit
 - leak tight porcelain housing
41. Lightning arresters should have a _____ impulse ratio
- Low**
 - High
 - Very low
 - Slightly high
42. The resistance in a thyrite lightning arrester
- Varies linearly with the applied voltage
 - Is high at low current and low at high current**
 - Increases with the applied voltage
 - Decreases linearly with the applied voltage
43. A lightning arrester provides
- A low impedance path between line and ground, during operation**
 - A low resistance path between line and ground, during operation
 - A high impedance path between line and ground, during operation
 - A high resistance path between line and ground, during operation
44. In power system, lightning arresters are used to protect electrical equipments against
- Over currents due to lightning
 - over voltages due to indirect lightning stroke
 - Direct strokes of lightning
 - Power frequency over-voltages**
45. Which of the following is a non-linear diverter?
- Rod gap arrester
 - Electrolytic type arrester
 - Valve type arrester**
 - Expulsion type arrester



Document Code No.	FM-SSCT-ACAD-004
Revision No.	00
Effective Date	01 January 2019
Page No.	1 of 4

COLLEGE OF ENGINEERING & INFORMATION TECHNOLOGY
First Semester, AY 2021-2022
TEST QUESTIONNAIRE
Midterm Examination in **EE 110 – Illumination Engineering Design**

Instructions:

1. Read the questions carefully. You are not permitted to share any materials during the examination;
2. For problem analysis, show the detailed solution of the problem in a separate sheet of paper.

Multiple Choice:

1. What is the illuminance level for hallways?
 - a. 80 lux
 - b. 50 lux
 - c. 3.4 lux
 - d. 1 lux
2. Which of the following is provided by a reflector?
 - a. To protect the lamp
 - b. To avoid glare
 - c. To provide better illumination
 - d. All of these
3. It involves the selection, analysis, and layout of all lighting hardware, including the control system of lighting.
 - a. Control Program
 - b. Design Development
 - c. Schematic Design
 - d. Contract Documents
4. _____ determines the perception of the room and the reflected light which gives the room's brightness.
 - a. Maintenance factor
 - b. Absorption Factor
 - c. Reflectance factor
 - d. Depreciation Factors
5. A lamp of 500 cd is placed at the center of a room, 20 m x 10 m x 5 m. Calculate the illumination in each corner of the floor.
 - a. 0.98 lux
 - b. 0.81 lux
 - c. 0.78 lux
 - d. 0.83 lux
6. This light source has a life of up to 100,000 hours.
 - a. Metal-halide lamps
 - b. LED
 - c. Xenon lamps
 - d. Incandescent lamp
7. Which of the following glass transmits the most light?
 - a. Milky glass
 - b. Opalescent glass
 - c. Serrated glass
 - d. Clear glass
8. It is a mercury vapor lamp with other metal compounds added to the arc tube to improve both color and luminous efficacy.
 - a. High-Pressure Sodium Lamps
 - b. Metal-Halide Lamps
 - c. Fluorescent Lamps
 - d. Xenon Lamps
9. This law states that the illumination is directly proportional to the cosine of the angle made by the normal to the illuminated surface with the direction of the incident flux.
 - a. Lambert's Cosine Law
 - b. Planck's law
 - c. Doppler's law
 - d. Inverse square law
10. What is the SI unit of illuminance?
 - a. Lux
 - b. Lumen/watt
 - c. Lumen
 - d. cd/m^2
11. Two lamps A and B are hung at a height of 9 m from the floor level. The distance between lamps is 1 m. Lamp A is 500 candela. If the illumination on the floor vertically below this lamp is 20 lux, find the candle power of lamp B.
 - a. 1140
 - b. 1250
 - c. 1550
 - d. 1820
12. How much should a 60-W lamp be lowered to double the illumination on an object which is 60 cm directly under it?
 - a. 17.6 cm
 - b. 16.5 cm
 - c. 13.4 cm
 - d. 15.4 cm
13. The light loss factors range from
 - a. 0.4 to 0.6
 - b. 0.5 to 0.7
 - c. 0.65 to 0.75
 - d. 0.45 to 0.65
14. This lighting control strategy permits the user to select a preset lighting configuration by pressing a single button.
 - a. Scene Control
 - b. Task Tuning
 - c. Dimming
 - d. On/off switching
15. This lighting control technology is commonly applied in exterior environments to switch luminaires on at dusk and off at dawn.
 - a. Photosensors
 - b. Dimmers
 - c. Vacancy Sensors
 - d. Occupancy Sensors
16. It is the simplest of lighting control techniques, providing the lowest installed cost.
 - a. On/Off Switching
 - b. Scene Control
 - c. Dimming
 - d. Daylight Integrated Controls
17. Which of the following will need the lowest level of illumination?
 - a. Displays
 - b. Railway platforms
 - c. Auditoriums



Document Code No.	FM-SSCT-ACAD-004
Revision No.	00
Effective Date	01 January 2019
Page No.	2 of 4

- d. Fine engravings
18. These luminaires usually have a reflector that allows them to be placed close to the wall when required.
- Compact fluorescent lamp
 - LED wallwasher
 - Linear fluorescent wallwasher
 - Recessed LED troffer
19. What is the UGR limit for craft and light industries?
- ≤ 25
 - ≤ 22
 - ≤ 28
 - ≤ 16
20. Which of the following workplace requires the least illumination in comparison to the others?
- Skilled bench work
 - Drawing office
 - Hospital ward
 - Fine machine work
21. The frequency of flickers in a fluorescent lamp at 60 Hz supply is how much?
- 180 per second
 - 60 per second
 - 120 per second
 - 30 per second
22. How do you call the instrument used to compare the different candle powers of the different light sources?
- Bunsen meter
 - Radiometer
 - Photometer
 - Candle meter
23. What is the total flux of light emitted from a source having a uniform intensity of 150 cp?
- 1770 lumens
 - 1890 lumens
 - 1885 lumens
 - 2000 lumens
24. Lumen per watt is the unit of which one?
- Candle power
 - Lamp rating
 - Luminous intensity
 - Luminous efficiency
25. These are measured according to the intensity and direction of light emitted from them.
- Luminaires
 - Directional Lamps
 - Both A and B
 - None of the above
26. Typical values of the maintenance factors range from ___ for poor maintenance and ___ for good maintenance.
- 0.6, 0.8
 - 0.4, 0.8
 - 0.7, 0.9
 - 0.5, 0.6
27. These luminaires are typically mounted in inaccessible places and have particularly strong housing and lenses to help make them vandal proof.
- Landscape luminaires
 - Custom Luminaires
 - Exit luminaires
 - Security luminaires
28. Which of the following statements about light is correct?
- It is a form of electrical energy
 - It consists of electromagnetic waves
 - It is a form of energy
 - It consists of shooting particles
29. The quantities used to characterize how light is perceived by humans are called
- photometric
 - radiometric
 - scotopic
 - phonic
30. Which one is another term for the maintenance factor?
- Utilization factor
 - Depreciation factor
 - Use factor
 - Index factor
31. Carbon arc lamps are commonly used in which of the following applications?
- Domestic lighting
 - Photography
 - Cinema projectors
 - Street lighting
32. Two lamps of 36 and 16 CP are respectively one meter apart. Determine the distance from the 36 CP lamp of a point along the line passing through and between the lamps so as to have equal illumination.
- 0.4 m
 - 2 m
 - 0.6 m
 - 0.8 m
33. This system is used for roadway and area lighting luminaires where a complete analysis is required of how light is distributed.
- CIE System
 - NEMA Classification
 - Outdoor Environmental Classification
 - IES Distribution Classification
34. If lighting must be controlled from two different locations, what switching technology is used?
- Three-way
 - Multi-level Switching
 - relay switching
 - two-way
35. Which of the following type of lamps uses a starting switch?
- Instant start
 - Rapid start
 - Preheat
 - All of these
36. What is the unit of illumination equal to one lumen per square meter?
- footcandle
 - lumen
 - lux
 - candela
37. Luminaires that emit 60-90% of their output upward are classified as
- Direct-Indirect Lighting
 - Semi-direct Lighting
 - Indirect Lighting
 - Semi-Indirect Lighting
38. The total flux required in any lighting system depends inversely on which of the following?



Document Code No.	FM-SSCT-ACAD-004
Revision No.	00
Effective Date	01 January 2019
Page No.	3 of 4

- a. Surface area
 - b. Coefficient of utilization
 - c. Illumination
 - d. Space/height ratio
39. It is applied when repeatable patterns of space use make the time of day scheduling desirable.
- a. Scene control
 - b. Occupancy control
 - c. Dimming
 - d. Time control
40. The heat from the filament of a lamp is transmitted to the surroundings through which of the following heat transfer principles?
- a. Conduction
 - b. Radiation
 - c. Convection
 - d. All of these
41. These are used to spread and redirect incident light in many directions.
- a. Refractors
 - b. Reflectors
 - c. Diffusers
 - d. Louvers
42. What percent of the input energy is radiated by filament lamps?
- a. about 10 to 15%
 - b. about 2 to 5%
 - c. about 40 to 50%
 - d. about 25 to 30%
43. A point source unshaded electric lamp of luminous intensity of 100 candles is 4 ft above the top of a table. Find the illumination of the table at a point 3 ft from the point directly below the lamp.
- a. 4 fc
 - b. 3.2 fc
 - c. 6.5 fc
 - d. 10.11 fc
44. This lighting control is activated by low voltage switches or control signals received from other devices.
- a. Dimmers
 - b. Vacancy Sensors
 - c. Relays
 - d. Photosensors
45. The unit called "candela" is the unit of which of the following?
- a. Lumen per square meter
 - b. Luminous intensity
 - c. Lumen per watt
 - d. Luminous flux
46. Which of the following statements is true about the coating in a fluorescent lamp?
- a. It will reduce glare
 - b. It will protect the tube and prolong the life of the lamp
 - c. It will convert ultra-violet radiations into visible light
 - d. It will convert visible light into ultra-violet radiations
47. The filament of a GLS lamp is made from which materials?
- a. Aluminum
 - b. Silicon
 - c. Tungsten
 - d. Carbon
48. Which of the following gases is sometimes used in filament lamps?
- a. Carbon dioxide
 - b. Argon
 - c. Nitrogen
 - d. Krypton
49. For the same wattage, which lamp is the cheapest?
- a. GLS lamp
 - b. Fluorescent lamp
 - c. Sodium vapor lamp
 - d. Mercury vapor lamp
50. The flicker effect of a fluorescent lamp is more at which of the following conditions?
- a. At lower voltage
 - b. At higher voltage
 - c. At higher frequencies
 - d. At lower frequencies
51. The level of illumination on the surface least depends on which of the following?
- a. Distance of the source
 - b. Type of reflector used
 - c. Ambient temperature
 - d. Candle power of the source
52. Which one is involved in the study of illumination?
- a. Design of lighting system
 - b. Calculation of wiring sizes for various lighting fixtures
 - c. Study of photometry and its applications
 - d. Study of lighting and wiring system
53. It is required to provide illumination of 150 meter-candle in a factory hall 45 m x 15 m. Assume that the depreciation factor is 0.80, the coefficient of utilization is 0.40 and the efficiency of the lamp is 20 lumens per watt. Calculate the number of 250 W lamps.
- a. 60
 - b. 72
 - c. 63
 - d. 56
54. Which one is most affected by changes in voltage in a filament lamp?
- a. Wattage
 - b. Life of lamp
 - c. Light output
 - d. Luminous intensity
55. The direct lighting system is most efficient but is liable to cause which of the following?
- a. Monotony
 - b. Glare
 - c. Hard shadows
 - d. Both B and C
56. What is the primary purpose of the choke in a fluorescent lamp?
- a. To reduce the starting current
 - b. To initiate the arc and stabilize it
 - c. To minimize the starting surge
 - d. To reduce the flicker
57. The illumination of a room is being designed: room length = 30 ft; room width = 20 ft; coefficient of utilization = 50%; maintenance factor = 76%; required foot-candle = 50; lumens per lamp = 3300; watts per lamp = 50. Estimate the total power drawn by the lamps to satisfy the above requirements.



Document Code No.	FM-SSCT-ACAD-004
Revision No.	00
Effective Date	01 January 2019
Page No.	4 of 4

- a. 1300 W
 - b. 1500 W
 - c. 1400 W
 - d. 1200 W
58. How is light produced in an electric discharged lamp?
- a. by magnetic effect of current
 - b. by carbon electrodes
 - c. by heating effect of current
 - d. by ionization in a gas
59. It describes the efficiency and effectiveness with which a luminaire delivers the light produced by the lamp to the intended target.
- a. Luminaire performance
 - b. Photometric performance
 - c. mechanical performance
 - d. Electrical performance
60. It is a complete lighting unit composed of light sources, together with the parts that distribute light and other components that made up the entire lighting systems.
- a. Industrial luminaire
 - b. Lamp
 - c. Residential luminaire
 - d. Luminaire
61. The floor area of a room is 10 m x 10 m. The desired illumination level is 150 lux. Assume the coefficient of utilization is 0.51, the maintenance factor is 0.95 and in the market, a fluorescent luminaire provides 1200 lumens output of light. Determine the number of luminaires needed for the room.
- a. 19 lamps
 - b. 26 lamps
 - c. 21 lamps
 - d. 30 lamps
62. Which of the following lamps cannot sustain much voltage fluctuations?
- a. Fluorescent lamp
 - b. Mercury vapor lamp
 - c. Sodium vapor lamp
 - d. Incandescent lamp
63. The mercury vapor discharge tube used for domestic lighting has how many filament tubes?
- a. Two filaments
 - b. Three filaments
 - c. No filament
 - d. Only one filament
64. It is generally made of linear extruded aluminum, containing copper wires to form a continuous electrical raceway.
- a. Cove
 - b. Decorative Accents
 - c. Track
 - d. Accent
65. How many lumens does a 9 watt LED lamp have?
- a. 9500 lumens
 - b. 900 lumens
 - c. 890 lumens
 - d. 2850 lumens
66. These luminaires use HID lamps to produce general lighting in an industrial area.
- a. Low Bay
 - b. Striplights
 - c. High Bay
 - d. Linear fluorescent
67. Four lamps are suspended 6 m above the ground at the corners of a lawn 4 m on each side. If each lamp emits 250 cd, solve the illumination at the center of the lawn.
- a. 22.34 lux
 - b. 20.56 lux
 - c. 21.62 lux
 - d. 19.98 lux
68. Filament lamps normally operate at what power factor?
- a. Unity
 - b. 0.5 lagging
 - c. 0.8 lagging
 - d. 0.8 leading
69. Which of the following lamps requires a cooling period prior to restarting?
- a. Incandescent lamp
 - b. Fluorescent lamp
 - c. Mercury vapor
 - d. None of these
70. Which of the following factors is the depreciation factor dependent on?
- a. Cleaning of lamp
 - b. Ageing of lamp
 - c. Type of work carried on the premises
 - d. All of these
71. It is used when users of space will benefit from access to different preset lighting scenes.
- a. Time control
 - b. Dimming
 - c. Scene control
 - d. Occupancy control
72. To create more realistic images, _____ is used to get a more precise form of calculation.
- a. ray tracing
 - b. radiosity
 - c. None of the above
 - d. Rendering
73. The most common control protocol for fluorescent dimming ballasts.
- a. 0-10 V Control
 - b. Digital Control
 - c. Three-wire Phase Control
 - d. Two-wire Control
74. Luminaires that emit 60-90% of their output predominantly downward but with a small upward component to illuminate the ceiling and upper walls are classified as
- a. Semi-direct Lighting
 - b. Direct-Indirect Lighting
 - c. Direct Lighting
 - d. Semi-Indirect Lighting
75. Which of the following is the definition of luminous intensity?
- a. Lumens per square foot
 - b. Luminous flux per unit solid angle
 - c. Lumens per square meter
 - d. Candela per unit solid angle



Document Code No.	FM-SSCT-ACAD-004
Revision No.	00
Effective Date	01 January 2019
Page No.	1 of 4

COLLEGE OF ENGINEERING & INFORMATION TECHNOLOGY
First Semester, AY 2021-2022

TEST QUESTIONNAIRE
Final Examination in **EE 110 – Illumination Engineering Design**

Instruction:

1. Read the questions carefully. You are not permitted to share calculators or any other materials during the examination;
2. For problem analysis, show the detailed solution of the problem in a separate sheet of paper;
3. Shade the bubble in the answer sheet that corresponds to the correct answer of the given test question.

Multiple Choice:

1. The basic purpose of lighting for motorised traffic is to enhance the motorist's _____.
a. Visual performance
b. Visual comfort
c. only b
d. both a and b
2. The lumen range of low-pressure sodium lamps are available in the range of
a. 2000 to 30000 lm
b. 1500 to 25000 lm
c. 2100 to 30000 lm
d. 1800 to 25000 lm
3. What is the system efficacy of low wattage high pressure sodium lamps?
a. 80 lm/W
b. 140 lm/W
c. 100 lm/W
d. 75 lm/W
4. These lamps are also called "electrodeless lamps".
a. High-Pressure Mercury Lamps
b. Compact Fluorescent Lamps
c. Induction Lamps
d. Tubular-Fluorescent Lamps
5. Retrofit LED bulbs have a lifetime of
a. 20000-30000 hrs
b. 15000-20000 hrs
c. 10000-15000 hrs
d. 25000-35000 hrs
6. The angle through which the light is bent is dependent on both the shape of the refractor and its refractive index
a. Snell's law
b. Lambert's law
c. Inverse law
d. None of the above
7. The system that is normally used for road-lighting luminaires is called
a. C-gamma system
b. Z-gamma system
c. Y-gamma system
d. None of the above
8. Which safety class provides basic insulation with protective earth connector?
a. Safety class I
b. Safety class II
c. Safety class III
d. Safety class IV
9. Which of the following gas discharge lamps have the highest lumen range?
a. Low-Pressure Sodium Lamps
b. High-Pressure Sodium Lamps
c. High-Pressure Mercury Lamps
d. Metal Halide Lamps
10. Is proper glare restriction necessary in roadway lighting?
a. Yes
b. No
11. What category of lighting quality parameter depends only on lighting installation aspect?
a. Photometric
b. Performance
c. Radiometric
d. None of the above
12. When reacting to position changes of other cars, cycles or pedestrians in a roadway, what lighting quality parameter is best suited?
a. Photometric
b. Performance
c. Radiometric
d. None of the above
13. What lighting quality parameter category is best and most practical to base the quality of road-lighting installations?
a. Photometric
b. Performance
c. Radiometric
d. None of the above
14. If the ratio of the minimum to the maximum road-surface luminance on a lengthwise line parallel to the road axis has a slower actual luminance rate of change, the problem for non-uniformity is
a. Greater
b. Lesser
c. Minimum
d. Negligible
15. This is defined as the ratio of the average horizontal illuminance on 5m strips adjacent to the left and right-hand sides of the road to the average illuminance on 5m strips on the left and right-hand sides of the road itself.
a. Uniformity
b. Lighting of the Surrounds
c. Glare Restriction
d. Non uniformity
16. The roadway lighting shall be designed so that the farthest luminaire in the branch circuit shall operate within the voltage supply level of
a. 230 +/- 5%



Document Code No.	FM-SSCT-ACAD-004
Revision No.	00
Effective Date	01 January 2019
Page No.	2 of 4

- b. 230 +/- 20%
c. 230 +/- 10%
d. 230 +/- 15%
17. Poles should have an average luminaire mounting height of _____ meters for the single and double arm post.
a. 20 m
b. 15 m
c. 10 -15 m
d. 8 – 12 m
18. Independent lighting poles used in roadway shall have a minimum thickness of
a. 2.5 mm
b. 3.5 mm
c. 4.0 mm
d. 3.0 mm
19. What is the glare threshold increment minimum value for rural highways?
a. 15
b. 20
c. 10
d. 10.5
20. For lamps and drivers, retrofit control gear shall have a power factor of _____ and above.
a. 0.80
b. 0.707
c. 0.85
d. 0.90
21. The luminaire spacing for a 20 m width expressway with opposite arrangement is
a. 25-35 m
b. 20-35 m
c. 20-45 m
d. 20-40 m
22. What is the minimum value of threshold increment for express road classification?
a. 10
b. 20
c. 15
d. 25
23. In this lighting arrangement, all the luminaires are located at one side of the road.
a. single-sided
b. staggered
c. opposite
d. twin central
24. This lighting arrangement exhibit advantages over the single-sided during periods of wet weather.
a. opposite
b. staggered
c. twin central
d. central
25. This lighting arrangement is essentially two single-sided arrangements placed back to back.
a. opposite
b. staggered
c. twin central
d. central
26. What is the minimum mounting height for a staggered lighting arrangement?
a. 0.7
b. 1
c. 0.5
d. 0.4-0.5
27. This term is generally used to describe lighting in which the luminaire mounting height is 20m or more.
a. High-Mast Lighting
b. Mast Lighting
c. low-Mast Lighting
d. none of the above
28. This form of lighting is often employed in complex junctions on main roads and in motorway interchanges.
a. High-Mast Lighting
b. Catenary Installation
c. Irregular Arrangement
d. Twin-Central Arrangement
29. This high-mast mounting arrangement is used where the aim is to spread the light more or less evenly in all directions.
a. radial-symmetric
b. plane-symmetric
c. asymmetric
d. none of the above
30. In this arrangement, the luminaires are orientated such that the longitudinal luminaire axis is parallel to the road axis.
a. High-Mast Lighting
b. Catenary Installation
c. Irregular Arrangement
d. Twin-Central Arrangement
31. If the effective road width is large compared to the mounting height, tilting the luminaires will _____ the amount of light reaching the far side of the road.
a. Decrease
b. Increase
c. Double
d. Triple
32. When you have wider roads, what arrangement is usually employed?
a. Staggered
b. Opposite
c. Twin central
d. Catenary
33. What luminaire mounting arrangement should you employ when you want make the best possible use of the available light?
a. Plane-symmetric
b. Radial-symmetric
c. Asymmetric
d. Plane-Asymmetric



Document Code No.	FM-SSCT-ACAD-004
Revision No.	00
Effective Date	01 January 2019
Page No.	3 of 4

34. Which of the following lighting arrangement is best suited in a foggy weather?
- High-Mast Lighting
 - Catenary Installation
 - Irregular Arrangement
 - Twin-Central Arrangement
35. Which of the following lighting arrangement is best suited in a snowy weather?
- High-Mast Lighting
 - Catenary Installation
 - Irregular Arrangement
 - None of the above
36. Which of the following has a negative impact on the environment?
- use of polluting or hazardous materials such as mercury in fluorescent, high-pressure sodium and metal halide lamps
 - use of non-renewable materials
 - use of materials with limited availability such as the rare-earth metals needed for the phosphors employed in white LEDs
 - all of the above
37. What are the advantages of a dynamic roadway lighting systems?
- maintenance operations can be optimized based on actual burning hours and system failures.
 - street patrols to check the status of the installation at regular intervals are no longer needed.
 - dangerous situations on the road due to failures in the installation are reduced to an absolute minimum.
 - all of the above
38. The zone on the open road before the tunnel entrance where the approaching motorist should be able to see into the tunnel is called
- Threshold zone
 - Access zone
 - Transition zone
 - Interior zone
39. This zone requires special lighting during the hours of daylight.
- Threshold zone
 - Access zone
 - Transition zone
 - Interior zone
40. In long tunnels, the transition zone is followed by this zone in which the luminance level is kept constant.
- Threshold zone
 - Access zone
 - Transition zone
 - Interior zone
41. This tunnel-entrance lighting systems provide lighting on the road surface, but very little on the surfaces of obstacles seen by the approaching motorist.
- symmetrical system
 - counter-beam system
 - pro-beam system
 - assymetrical system
42. This tunnel lighting system light both the road surface and obstacles on the road, very much as do normal road-lighting systems.
- symmetrical system
 - counter-beam system
 - pro-beam system
 - assymetrical system
43. This is familiar to those who have driven in fog where the motorist's eye visibility is hampered.
- Adaptation state
 - Difficulty of Driving Task
 - Atmospheric Scattering
 - None of the above
44. Luminances closer to the tunnel entrance, contribute more to the adaptation state of the approaching driver than do luminances towards the outer field of view.
- Depends on the amount of available light
 - Depends on the glare
 - True
 - False
45. The delay in adaptation when entering a relatively dark underpass during the hours of daylight is not usually a problem for pedestrians and cyclists for what reasons?
- Relatively slow speed
 - Underpasses are more brighter
 - There is enough lighting
 - None of the above
46. A tunnel is more dangerous than an open road because
- there is less room available to manoeuvre
 - motorists often feel less confident when approaching and driving through a tunnel
 - of flicker
 - all of the above
47. To ensure adequate vision via the rear-view mirror the exit zone should have _____ lighting level as the interior zone.
- Twice
 - Less
 - The same
 - Slightly higher
48. The basic purpose of tunnel lighting for motorised traffic is
- to enhance the motorist's visual performance
 - to maintain his sense of confidence
 - to feel security
 - all of the above



Document Code No.	FM-SSCT-ACAD-004
Revision No.	00
Effective Date	01 January 2019
Page No.	4 of 4

49. A short tunnel requires daytime electric lighting required when the Look-Through Percentage (LTP) is
- Less than 20
 - Greater than 20
 - Greater than 50
 - Less than 50
50. The extent to which a driver is troubled by flicker is largely dependent on which of the following?
- number of flickers occurring per second
 - total duration of the flicker
 - photometric properties of the luminaire
 - all of the above



Document Code No.	FM-SSCT-ACAD-002
Revision No.	00
Effective Date	01 January 2019
Page No.	1 of 2

COLLEGE OF ENGINEERING & INFORMATION TECHNOLOGY
First Semester, AY 2021-2022

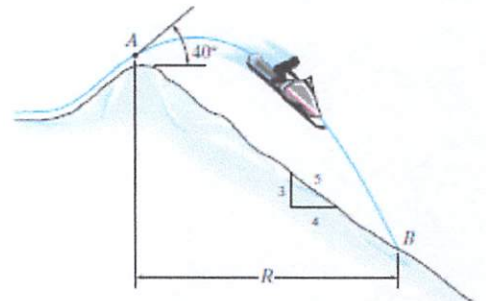
TEST QUESTIONNAIRE
Midterm Examination in **ES 135 – Dynamics of Rigid Bodies**

Instruction:

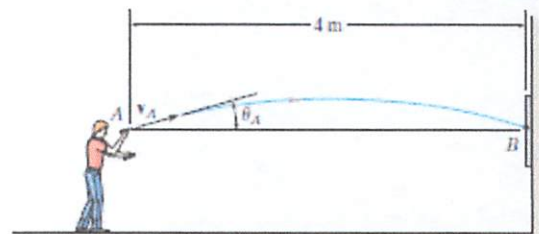
1. Read the questions carefully. You are not permitted to share any materials or answers during the examination.
2. Submit your answers and solutions in a separate sheet of paper.

Multiple Choice-Choose the best answer.

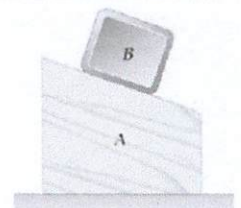
1. The position of a particle along a straight-line path is defined by $s = (t^3 - 6t^2 - 15t + 7)$ ft, where t is in seconds. Determine the total distance traveled when $t = 10$ s.
 - a. 425 ft
 - b. 450 ft
 - c. 345 ft
 - d. 510 ft
2. In problem number 1, what is the particle's instantaneous acceleration at this time?
 - a. 43 ft/s²
 - b. 50 ft/s²
 - c. 48 ft/s²
 - d. 32 ft/s²
3. The acceleration of a particle is defined by the relation $a = kt^2$. Knowing that $v = -8$ m/s when $t = 0$ and that $v = 8$ m/s when $t = 2$ s, determine the constant k .
 - a. 6
 - b. 3
 - c. 5
 - d. 4
4. A ball is dropped from a boat so that it strikes the surface of a lake with a speed of 16.5 ft/s. While in the water the ball experiences an acceleration of $a = 10 - 0.8v$, where a and v are expressed in ft/s² and ft/s, respectively. Knowing the ball takes 3 s to reach the bottom of the lake, determine the speed of the ball when it hits the bottom of the lake.
 - a. 9.5 ft/s
 - b. 13.4 ft/s
 - c. 12.86 ft/s
 - d. 10 ft/s
5. In problem no. 4, determine the depth of the lake.
 - a. 42 ft
 - b. 25 ft
 - c. 36 ft
 - d. 44 ft
6. A motorist enters a freeway at 30 mi/h and accelerates uniformly to 60 mi/h. From the odometer in the car, the motorist knows that she traveled 550 ft while accelerating. Determine the acceleration of the car.
 - a. 4.2 ft/s²
 - b. 2.8 ft/s²
 - c. 5.28 ft/s²
 - d. 3.21 ft/s²
7. The snowmobile is traveling at 10 m/s when it leaves the embankment at A. Determine the time of flight from A to B and the range R of the trajectory.
 - a. $R=19.0$ m, $t=2.48$ s
 - b. $R=16.1$ m, $t=2.84$ s
 - c. $R=18.0$ m, $t=1.48$ s
 - d. $R=20.3$ m, $t=2.88$ s



8. If the dart is thrown with a speed of 10 m/s, determine the longest possible time when it strikes the target.
 - a. 2.00 s
 - b. 2.1 s
 - c. 1.5 s
 - d. 0.8 s



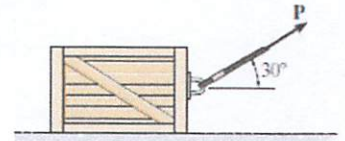
9. The system shown is released from rest in the position shown. Neglecting friction, the normal force between block A and the ground is
 - a. Less than the weight of A plus the weight of B
 - b. Equal to the weight of A plus the weight of B
 - c. Greater than the weight of A plus the weight of B
 - d. None of the above



10. Astronauts who landed on the moon during the Apollo 15, 16 and 17 missions brought back a large collection of rocks to the earth. Knowing the rocks weighed 139 lb when they were on the moon; determine (a) the weight of the rocks on the earth. The acceleration due to gravity on the moon is 5.30 ft/s².
 - a. 844 lb
 - b. 413 lb
 - c. 333 lb
 - d. 900 lb



11. If the coefficient of kinetic friction between the 50-kg crate and the ground is $\mu_k = 0.3$, determine the distance the crate travels when $t = 3$ s. The crate starts from rest, and $P = 200$ N.



- a. 5.6 m
- b. 5.04 m
- c. 6 m
- d. 3.5 m

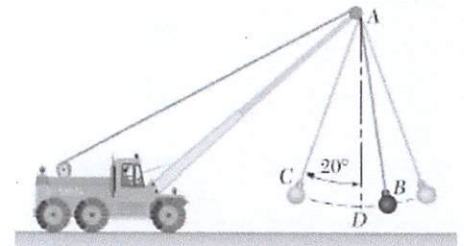
12. Determine the angle of the super elevation for a 200 m highway curve so that there will be no side thrust at a speed of 90 kph.

- a. 16.77°
- b. 15.47°
- c. 17.67°
- d. 18.53°

13. It states that acceleration of any moving body is directly proportional to the net force acting on it and inversely proportional to the mass of the body.

- a. Newton's second law
- b. Newton's law of universal gravitation
- c. newton's first law
- d. newton's third law

14. A 130-lb wrecking ball B is attached to a 45-ft-long steel cable AB and swings in the vertical arc shown. Determine the tension in the cable at the bottom D of the swing, where the speed of B is 13.2 ft/s.



- a. 214 lb
- b. 115 lb
- c. 135.8 lb
- d. 145.6 lb

15. It states that the particle's initial kinetic energy plus the work done by all the forces acting on the particle as it moves from its initial to its final position is equal to the particle's final kinetic energy.

- a. Principle of Work and Energy
- b. Conservation of energy
- c. Principle of Impulse and Momentum
- d. Conservation of momentum

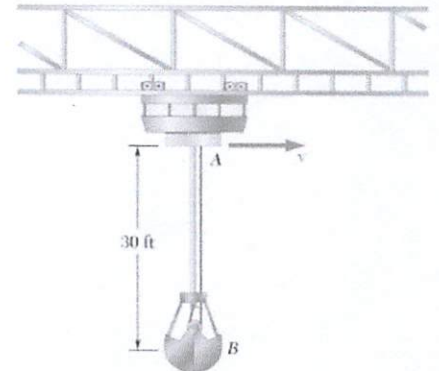
16. The product of a body/particle's mass and its velocity is called_____.

- a. Kinetic energy
- b. Impulse
- c. Momentum
- d. Potential energy

17. It states that during the motion the sum of the particle's kinetic and potential energies remains constant.

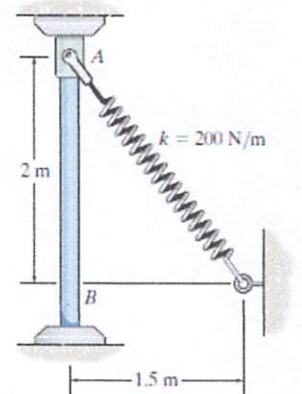
- a. Principle of Work and Energy
- b. Conservation of Energy
- c. Principle of Impulse and Momentum
- d. Conservation of momentum

18. In an ore-mixing operation, a bucket full of ore is suspended from a traveling crane which moves along a stationary bridge. The bucket is to swing no more than 10 ft horizontally when the crane is brought to a sudden stop. Determine the maximum allowable speed v of the crane.



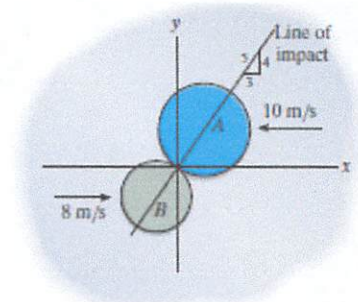
- a. 10.51 ft/s
- b. 11 ft/s
- c. 14 ft/s
- d. 8.4 ft/s

19. The spring has a stiffness $k = 200$ N/m and an unstretched length of 0.5 m. If it is attached to the 3-kg smooth collar and the collar is released from rest at A, determine the speed of the collar when it reaches B. Neglect the size of the collar.



- a. 10.5 m/s
- b. 20.53 m/s
- c. 15.5 m/s
- d. 30.6 m/s

20. Disks A and B have a mass of 15 kg and 10 kg, respectively. If they are sliding on a smooth horizontal plane with the velocities shown, determine their speeds just after impact. The coefficient of restitution between them is $e = 0.8$.



- a. $(v_A)_2 = 8.19$ m/s, $(v_B)_2 = 9.38$ m/s
- b. $(v_A)_2 = 8.36$ m/s, $(v_B)_2 = 6.20$ m/s
- c. $(v_A)_2 = 9.38$ m/s, $(v_B)_2 = 8.19$ m/s
- d. $(v_A)_2 = 6.20$ m/s, $(v_B)_2 = 8.36$ m/s



Document Code No.	FM-SSCT-ACAD-002
Revision No.	00
Effective Date	01 January 2019
Page No.	1 of 3

COLLEGE OF ENGINEERING & INFORMATION TECHNOLOGY
First Semester, AY 2021-2022

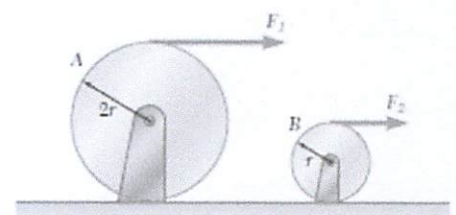
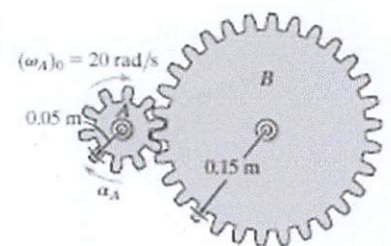
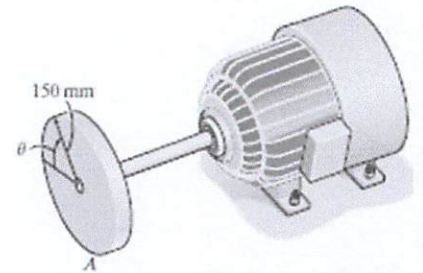
TEST QUESTIONNAIRE
Final Examination in **ES 135 – Dynamics of Rigid Bodies**

Instruction:

1. Read the questions carefully. You are not permitted to share any materials or answers during the examination;
2. Write your answers and solutions in a separate sheet of paper.

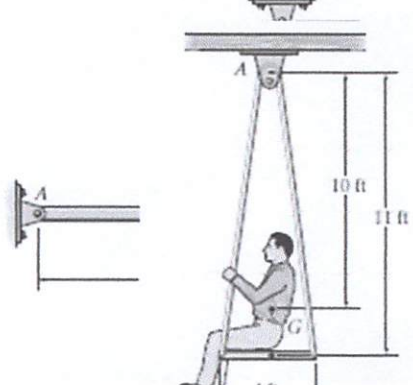
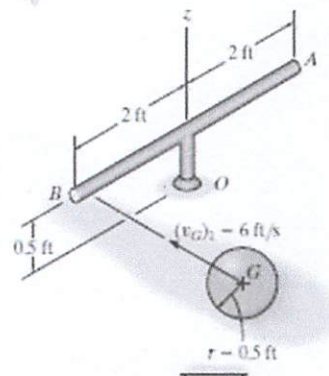
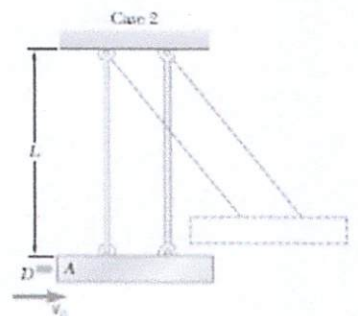
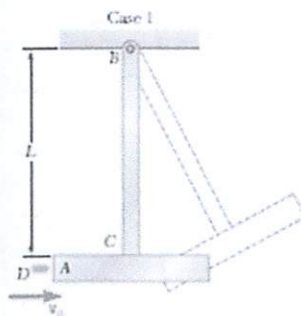
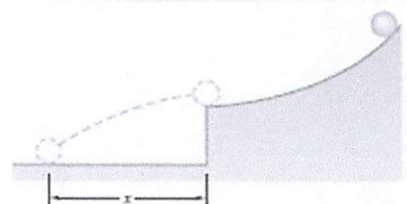
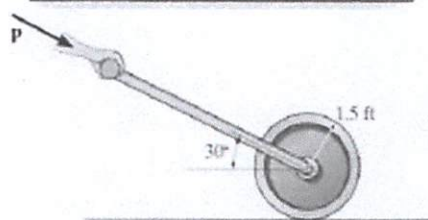
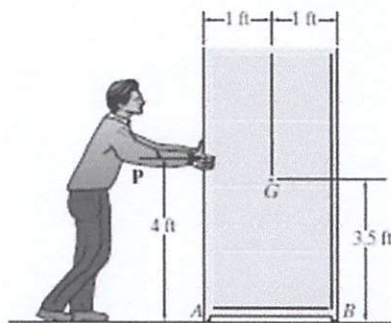
Multiple Choice-Choose the best answer.

1. The motor turns the disk with an angular velocity of $\omega = (5t^2 + 3t)$ rad/s, where t is in seconds. Determine the magnitude of the velocity of the point A on the disk when $t = 3$ s.
 - a. **8.10 m/s**
 - b. 10 m/s
 - c. 4.3 m/s
 - d. 9 m/s
2. Refer to problem number 1. What is magnitude of the n component of acceleration of the point A on the disk at $t = 3$ s?
 - a. 4.95 m/s²
 - b. **437 m/s²**
 - c. 5.36 m/s²
 - d. 373 m/s²
3. In this motion, the particles forming the rigid body move in parallel planes along circles centered on the same fixed axis.
 - a. Translation
 - b. General plane motion
 - c. Motion about a fixed point
 - d. **Rotation about a fixed axis**
4. It measures the time rate of change of the angular velocity.
 - a. Angular displacement
 - b. **Angular acceleration**
 - c. Constant angular acceleration
 - d. Angular position
5. This motion occurs when all the particles of a rigid body move along paths which are equidistant from a fixed plane.
 - a. Rectilinear translation
 - b. Rotation about a fixed axis
 - c. **Planar motion**
 - d. General motion
6. A motor gives gear A an angular acceleration of $\alpha_A = (4t^3)$ rad/s², where t is in seconds. If this gear is initially turning at $(\omega_A)_0 = 20$ rad/s, determine the angular velocity of gear B when $t = 2$ s.
 - a. **12 rad/s**
 - b. 9 rad/s
 - c. 15 rad/s
 - d. 6 rad/s
7. It states that the sum of the moments of all the external forces about the body's mass center G is equal to the product of the moment of inertia of the body about an axis passing through G and the body's angular acceleration.
 - a. Equation of translational motion
 - b. **Rotational equation of motion**
 - c. Curvilinear translation
 - d. Rectilinear equation of motion
8. Two solid cylinders, A and B, have the same mass m and the radii $2r$ and r , respectively. Each is accelerated from rest with a force applied as shown. In order to impart identical angular accelerations to both cylinders, what is the relationship between F_1 and F_2 ?
 - a. $F_1 = 0.5F_2$
 - b. $F_1 = F_2$





- c. $F_1 = 2F_2$
d. $F_1 = 4F_2$
9. A front-wheel-drive car starts from rest and accelerates to the right. Knowing that the tires do not slip on the road, what is the direction of the friction force the road applies to the rear tires?
a. Right
b. Left
c. Friction force is zero
d. None of the above
10. All the particles of a body travel along parallel straight line paths when it is subjected to this motion.
a. Curvilinear translation
b. Rectilinear translation
c. Rotational motion
d. General plane motion
11. Determine the acceleration of the 150-lb cabinet if $P = 35$ lb. The coefficients of static and kinetic friction between the cabinet and the plane are $\mu_s = 0.2$ and $\mu_k = 0.15$, respectively. The cabinet's center of gravity is located at G.
a. 2.01 ft/s^2
b. 3.12 ft/s^2
c. 2.74 ft/s^2
d. 2.68 ft/s^2
12. If the coefficient of static friction between the 50-lb roller and the ground is $\mu_s = 0.25$, determine the normal reaction N of the ground. The roller rolls on the ground without slipping. Assume the roller to be a uniform cylinder.
a. 90.10 lb
b. 69 lb
c. 76.4 lb
d. 88.18 lb
13. A round object of mass m and radius r is released from rest at the top of a curved surface and rolls without slipping until it leaves the surface with a horizontal velocity as shown. Will a solid sphere, a solid cylinder, or a hoop travel the greatest distance x ?
a. Solid sphere
b. Solid cylinder
c. Hoop
d. They will all travel the same distance.
14. Slender bar A is rigidly connected to a massless rod BC in Case 1 and two massless cords in Case 2 as shown. The vertical thickness of bar A is negligible compared to L . If bullet D strikes A with a speed v_0 and becomes embedded in it, how will the speeds of the center of gravity of A immediately after the impact compare for the two cases?
a. Case 2 will be larger
b. Case 1 will be larger
c. The speeds will be the same
d. None of the above
15. The mass center of the 3-lb ball has a velocity of $(v_G)_1 = 6 \text{ ft/s}$ when it strikes the end of the smooth 5-lb slender bar which is at rest. Determine the angular velocity of the bar about the z axis just after impact if $e = 0.8$.
a. 3.34 rad/s
b. 4.27 rad/s
c. 3.47 rad/s
d. 2.65 rad/s
16. The slender 6-kg bar AB is horizontal and at rest and the spring is unstretched. Determine the angular velocity of the bar when it has rotated clockwise 45° after being released. The spring has a stiffness of $k = 12 \text{ N/m}$.
a. 3 rad/s
b. 2.49 rad/s
c. 3.33 rad/s
d. 2.67 rad/s





Document Code No.	FM-SSCT-ACAD-002
Revision No.	00
Effective Date	01 January 2019
Page No.	3 of 3

17. The platform swing consists of a 200-lb flat plate suspended by four rods of negligible weight. When the swing is at rest, the 150-lb man jumps off the platform when his center of gravity G is 10 ft from the pin at A . This is done with a horizontal velocity of 5 ft/s, measured relative to the swing at the level of G . Determine the angular velocity he imparts to the swing just after jumping off.
 - a. 0.21 rad/s
 - b. 0.190 rad/s**
 - c. 1.15 rad/s
 - d. 0.080 rad/s
18. It occurs when the line connecting the mass centers of the two bodies does not coincide with the line of impact.
 - a. Eccentric impact**
 - b. Collision
 - c. eccentric momentum
 - d. None of the above
19. This principle can be used when a body or a system of bodies is acted upon by conservative forces.
 - a. impulse and momentum
 - b. conservation of energy**
 - c. conservation of momentum
 - d. work and energy
20. When a rigid body rolls without sliding on a fixed surface, the friction force F at the point of contact C does _____.
 - a. Positive work
 - b. Negative work
 - c. No work**
 - d. Negligible work



"For Nation's Greater Heights"

SURIGAO STATE COLLEGE OF TECHNOLOGY

Document Code No.	FM-SSCT-ACAD-004
Revision No.	00
Effective Date	01 January 2019
Page No.	1 of 2

COLLEGE OF ENGINEERING & INFORMATION TECHNOLOGY First Semester, AY 2021-2022

TEST QUESTIONNAIRE

Final Examination in Math 113 – Differential Equations

Instruction:

1. The duration of this final examination is good only for 2 hours;
2. Shade the bubble in the ANSWER SHEET that corresponds to the answer of the given question;
3. Show the detailed solution of the problem in a separate sheet of paper;
4. Work silently, turn-off your mobile phone and other electronic gadgets;
5. Once the examination has started, no one is allowed to go out from the examination room;
6. If you are found CHEATING or aide the CHEATER, you will automatically get a zero score in this exam.

Problem Analysis:

1. The functions f_1, f_2, \dots, f_n with constants c_1, c_2, \dots, c_n not all zero are said to be linearly dependent in some interval $a \leq x \leq b$ such that $c_1f_1 + c_2f_2 + \dots + c_nf_n = \underline{\hspace{2cm}}$. (2 pts)

- A. C
- B. 0
- C. 2
- D. 1

2. List the roots of the auxiliary equation for a homogeneous linear equation with real constant coefficients that has the given function as a particular solution: (2 pts)

$$y = x \cos 2x - 3 \sin 2x$$

- A. $m = 2i, -2i$
- B. $m = 2i, 2i$
- C. $m = 2i, 2i, -2i, -2i$
- D. $m = -2i, -2i$

3. Find the characteristic roots of the differential equation: (2 pts)

$$\frac{d^3y}{dx^3} - 7\frac{dy}{dx} + 6x = 0$$

- A. $m = 1, -2, 3$
- B. $m = 1, -2, -3$
- C. $m = 1, 2, 3$
- D. $m = 1, 2, -3$

4. List the roots of the auxiliary equation for linear differential equation with real, constant coefficients that has the given function as a particular solution. (2 pts)

$$y = x^2 - x + e^{-x}(x + \cos x)$$

- A. $m = 0, 0, 0, -1, -1, -1 \pm i$
- B. $m = 0, 0, 0, -1, -1, 1 \pm i$
- C. $m = 0, 0, 0, 1, 1, 1 \pm i$
- D. $m = 0, 0, 0, -1, -1, -1 \pm i$

5. Find the general solution of (10 pts)

$$(D^4 - 2D^3 + D^2)y = 0$$

- A. $y = c_1 + c_2x + (c_3 + c_4x)e^x$
- B. $y = c_1 + c_2 + (c_3 + c_4x)e^x$
- C. $y = c_1 + (c_2 + c_3x)e^x$
- D. $y = c_1 + c_2x + c_3e^x$

6. Find the general solution of the differential equation: (10 pts)

$$4\frac{d^3y}{dx^3} - 13\frac{dy}{dx} - 6x = 0$$

- A. $y = c_1e^{2x} - c_2e^{3x/2} + c_3e^{x/2}$
- B. $y = c_1e^{2x} + c_2e^{-3x/2} + c_3e^{-x/2}$
- C. $y = c_1e^{2x} - c_2e^{-3x/2} - c_3e^{x/2}$
- D. $y = c_1e^{2x} + c_2e^{3x/2} - c_3e^{-x/2}$

7. Find the particular solution of the differential equation: $(D^4 + 3D^3 + 2D^2)y = 0$ when $x = 0, y = 0, y' = 4, y'' = -6, y''' = 14$ (10 pts)

- A. $y = 2(x + e^{-x} - 2e^{-2x})$
- B. $y = 2(x + e^{-x} + e^{-2x})$
- C. $y = 2(x + e^{-x} - e^{-2x})$
- D. $y = 2(x + e^{-x} + 2e^{-2x})$

8. Find the general solution of the equation: (10 pts)

$$(D^3 - 3D^2 + 4) = 6 + 80 \cos 2x$$

- A. $y = c_1e^{2x} + (c_2 + c_3x)e^{-x} + \frac{3}{2} - 2 \sin 2x + 4 \cos 2x$
- B. $y = c_1e^{-x} + c_2e^{2x} + c_3x + \frac{3}{2} - 2 \sin 2x + 4 \cos 2x$
- C. $y = c_1e^{-x} + (c_2 + c_3x)e^{2x} + \frac{3}{2} - 2 \sin 2x + 2 \cos 2x$
- D. $y = c_1e^{-x} + (c_2 + c_3x)e^{2x} + \frac{3}{2} - 2 \sin 2x + 4 \cos 2x$

9. The solution of $(D^4 - 1)y = e^{-x}$ is (10 pts)

- A. $y = c_1 e^x + c_2 e^{-x} + c_3 \cos x + c_4 \sin x$
- B. $y = c_1 e^x + \left(c_2 - \frac{x}{4}\right) e^{-x} + c_3 \cos x + c_4 \sin x$
- C. $y = c_1 e^x + \left(c_2 - \frac{x}{4}\right) e^{-x} + c_3 \cos x$
- D. $y = c_1 e^x + \left(c_2 - \frac{x}{4}\right) e^{-x} + c_3 \sin x$

10. Find the particular solution of the differential equation: $(D^2 + 3D)y = -18$ when $x = 0$, $y = 0$, $y' = 5$ (10 pts)

- A. $y = 2x - 3x^2 - e^{-3x}$
- B. $y = 1 + 2x - 3x^2 - e^{-3x}$
- C. $y = 1 + 2x - 3x^2 - e^{-x}$
- D. $y = 1 + 2x - 3x^2 - e^x$

11. Evaluate $L[3e^{4t} - e^{-2t}]$ (10 pts)

- A. $\frac{2s+10}{(s+4)(s+2)} \quad s > -4$
- B. $\frac{2s+10}{(s-4)(s+2)} \quad s > 4$
- C. $\frac{2s+10}{(s+4)(s-2)} \quad s > -4$
- D. None of the choices

12. Find the inverse Laplace transform of (10 pts)

$$\frac{s^2 + s}{(s^2 + 4)^2}$$

- A. $\cos 2t - t \sin 2t$
- B. $\cos 4t - \frac{1}{2}t \sin 4t$
- C. $\cos 2t - \frac{3}{4}t \sin 2t$
- D. $\cos 2t - \frac{3}{4}t$

13. Solve the problem by using Laplace transform method. Verify that your solution satisfies the differential equation and the initial conditions: (10 pts)

$$y' - y = e^{-t}; \quad y(0) = 1$$

- A. $y = e^t - \frac{1}{2}e^{-t}$
- B. $y = \frac{3}{2}xe^t - \frac{1}{2}e^{-t}$
- C. $y = \frac{3}{2}e^t - \frac{1}{2}e^{-t}$
- D. $y = xe^t - \frac{1}{2}e^{-t}$

14. Solve the Laplace transform of the given initial-value problem: (10 pts)

$$y' = -y + e^{-2t}; \quad y(0) = 2$$

- A. $Y(s) = \frac{2s+7}{(s-1)(s-2)}$
- B. $Y(s) = \frac{2s+5}{(s-1)(s+2)}$
- C. $Y(s) = \frac{2s+7}{(s+1)(s-2)}$
- D. $Y(s) = \frac{2s+5}{(s+1)(s+2)}$

15. The Laplace transform of any function $f(t)$ will exist if the object function $f(t)$ is discontinuous. Choose True if the given statement is true. Otherwise, select among the choices what made the statement false. (2 pts)

- A. will exist
- B. any function
- C. discontinuous
- D. True



COLLEGE OF ENGINEERING & INFORMATION TECHNOLOGY

First Semester, AY 2021-2022

TEST QUESTIONNAIRE

Midterm Examination in **MATH 113 – Differential Equations**

Instruction:

1. The duration of this examination is good for 2 hours;
2. Read the questions carefully. You are not permitted to share any materials during the examination;
3. Show the detailed solutions of the problems in a separate sheet of paper.

Problem Analysis:

1. What is the order and degree of the differential equation $y'' + (y')^2 = y$?
 A. 2 & 1
 B. 1 & 2
 C. 1 & 1
 D. 2 & 2
2. The solution to a differential equation that does not contain any arbitrary constants.
 A. General solution
 B. Particular solution
 C. Ordinary solution
 D. None of the choices
3. Determine the particular solution of $e^x e^y dx - e^{-2y} dy = 0$; $y = 0$ when $x = 0$.
 A. $e^{2x} + e^{3y} = 4$
 B. $e^x - e^{-3y} = 4$
 C. $e^x + e^{3y} = 2$
 D. $3e^x + e^{-3y} = 4$
4. Find the complete solution of the differential equation, $y' = \frac{y}{x} - \cot \frac{y}{x}$.
 A. $\sin \frac{y}{x} = Cx^2$
 B. $\cos \frac{x}{y} = 2Cx$
 C. $\cos \frac{y}{x} = Cx$
 D. $\sin \frac{y}{x} = Cx$
5. Find the general solution of $\frac{dx}{y} - \frac{xdy}{y^2} = 0$.
 A. $x = Cy$
 B. $y = Cx$
 C. $2x = Cy^3$
 D. $X^2 = 3Cy$
6. Find the complete solution of $ydx - 4xdy = y^6$; $x = 4$ when $y = 1$.
 A. $2x^2 = y^4 (y^2 + 7)$
 B. $2x = y^4 (y^2 + 7)$
 C. $x = y^4 (y^2 + 5)$
 D. $2y = x^4 y^2$
7. A certain radioactive material follows the law of exponential change and has a half-life of 38 hours. Find how long it takes for 90% of the radioactivity to be dissipated?
 A. 126 hrs.
 B. 100 hrs.
 C. 90 hrs.
 D. 150 hrs.
8. A thermometer reading 75° F is taken out where the temperature is 20° F. The reading is 30° F 4 minutes later. Find the thermometer reading 7 minutes after the thermometer was brought outside.
 A. 23° F
 B. 20° F
 C. 23° C
 D. 32° F
9. An inductance of 2 henries and a resistance of 20 ohms are connected in series with an emf of E volts. If the current is zero at time, $t = 0$, find the current at the end of 0.01 sec if $E = 100\sin 150t$ volts.
 A. $I = 0.1$ A
 B. $I = 0.3$ A
 C. $I = 0.2$ A
 D. $I = 3$ A
10. A tank originally contains 380 liters of brine holding 450 g of dissolved salt. 8 liters/min of brine containing 3.75 g/L of salt enters the tank and the mixture assumed uniform leaves the rate of 12 L/min. Determine the amount of salt after 10 min.
 A. 500 g
 B. 577 g
 C. 550 g
 D. 470 g



COLLEGE OF ENGINEERING & INFORMATION TECHNOLOGY
First Semester, AY 2021-2022

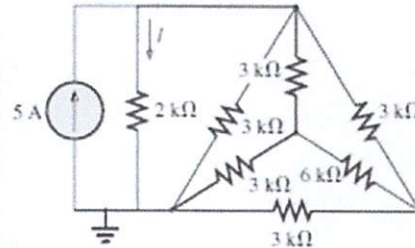
TEST QUESTIONNAIRE
Midterm Examination in **EE 201 – Electrical Circuits 1**

Instruction:

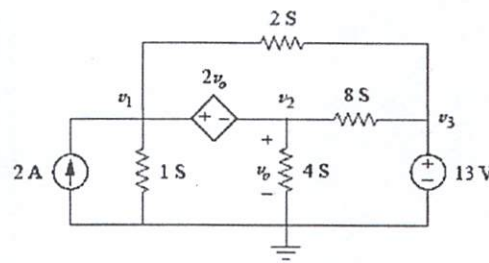
1. Read the questions carefully. You are not permitted to share any other materials during the examination;
2. Show the detailed solution of the problem in a separate sheet of paper;

Problem Analysis:

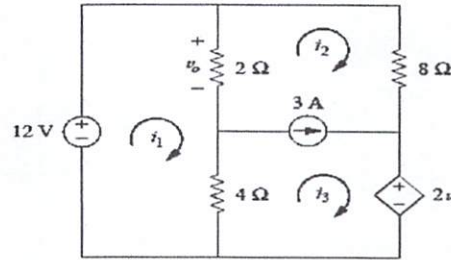
1. Determine I in the circuit shown.
 - a. 4.18 A
 - b. 1.15 A
 - c. 2.14 A
 - d. 3.24 A



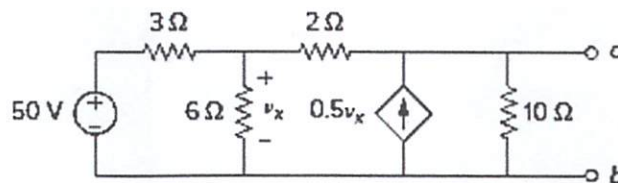
2. Determine the voltages v_1 , v_2 and v_3 in the circuit shown respectively using nodal analysis.
 - a. 18.86V, 6.29V, 13V
 - b. 18.86V, 6.29V, 13V
 - c. 18.86V, 6.29V, 13V
 - d. 18.86V, 6.29V, 13V



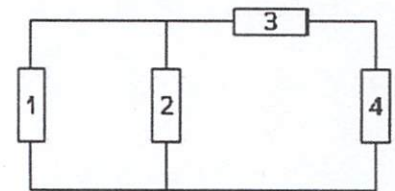
3. Use mesh analysis to find i_1 , i_2 and i_3 in the circuit shown respectively.
 - a. 3 A, 0.5 A, 3.5 A
 - b. 3.5 A, -0.5 A, 2.5 A
 - c. 5 A, -0.5 A, 1.5 A
 - d. 2.5 A, 0.5 A, 5.5 A



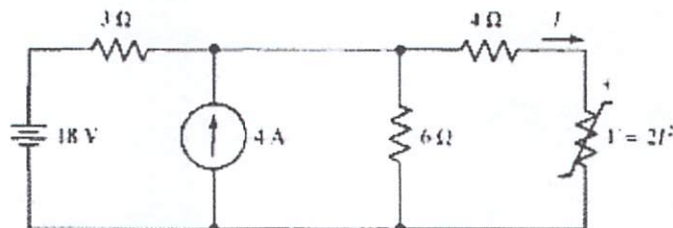
4. Obtain the Thevenin voltage and Norton current respectively at terminals $a-b$ of the circuit shown.
 - a. 166.67 V & 16.667 A
 - b. 16.67 V & 176.667 A
 - c. 13.33 V & 136.3 A
 - d. 18.86 V & 188.68 A



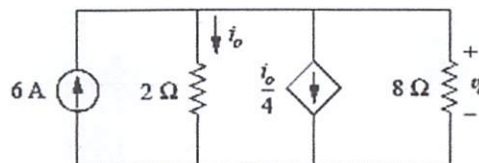
5. The figure shows a circuit with four elements, $p_1 = 60$ W absorbed, $p_3 = -145$ W absorbed, and $p_4 = 75$ W absorbed. How many watts does element 2 absorb?
 - a. 65 W
 - b. 12 W
 - c. 10 W
 - d. 70 W



6. Use repeated transformation in obtaining I in the circuit shown.
 - a. 1.5 A
 - b. 2.1 A
 - c. 3 A
 - d. 2 A



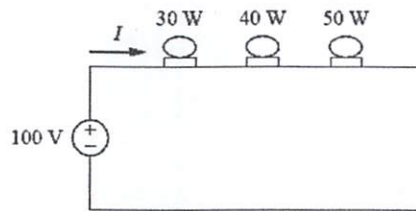
7. Find V_o and I_o in the circuit shown.
 - a. 4 V, 8 A
 - b. 5 V, 6 A
 - c. 8 V, 4 A
 - d. 7 V, 4 A





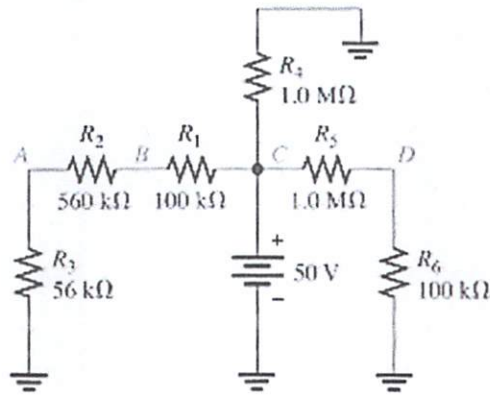
8. Find the current I through the bulbs.

- a. 1.5 A
- b. 1.2 A
- c. 3 A
- d. 2 A



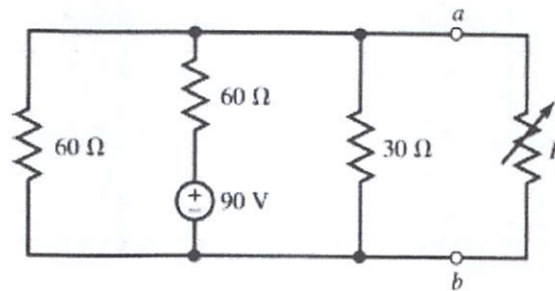
9. Determine the resistance of the circuit as seen from the voltage source.

- a. 200 k Ω
- b. 440 k Ω
- c. 130 k Ω
- d. 303 k Ω



10. Find the maximum power that the active network to the left of terminals ab can deliver to the adjustable resistor R .

- a. 3.84 W
- b. 8.44 W
- c. 6 W
- d. 9.6 W





COLLEGE OF ENGINEERING & INFORMATION TECHNOLOGY
First Semester, AY 2021-2022

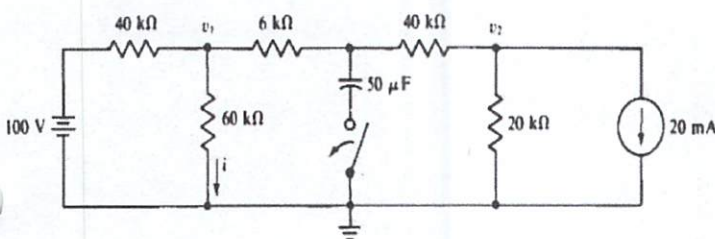
TEST QUESTIONNAIRE
Final Examination in EE 201 – Electrical Circuits 1

Instruction:

1. Read the questions carefully. You are not permitted to share calculators or any other materials during the examination;
2. Show the detailed solution of the problem in a separate sheet of paper;
3. Shade the bubble in the answer sheet that corresponds to the correct answer of the given test question.

Problem Analysis:

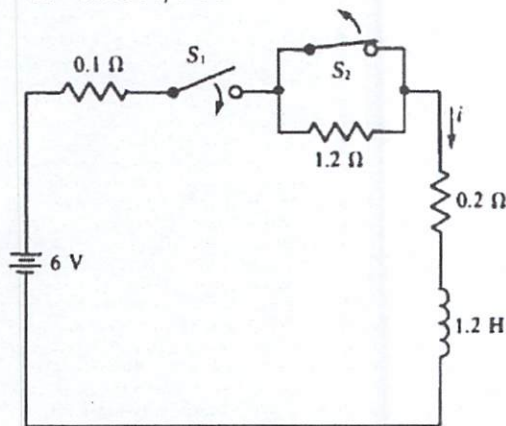
1. The switch is closed at $t = 0$ s in the circuit shown. Find i for $t > 0$ s. The capacitor is initially uncharged. (20 pts.)



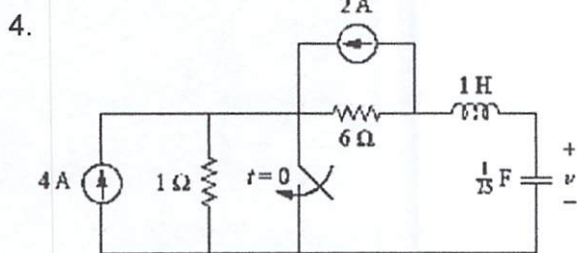
- a. $-1.04 + 1.24e^{-t}$ mA
- b. $1.4 + 2.24e^{-t}$ mA
- c. $-2.1 - 1.24e^{-t}$ mA
- d. $1.04 - 1.24e^{-t}$ mA

2. In the circuit shown, switch S_1 is closed at $t = 0$ s, and switch S_2 is opened at $t = 3$ s. Find $i(2)$ and $i(4)$ respectively. (20 pts.)

- a. 5.88 A, 7.87 A
- b. 7.87 A, 5.88 A
- c. 7.7 A, 5 A
- d. 5.88 A, 7 A

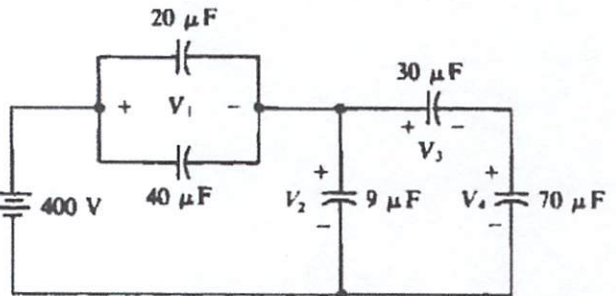


3. Find $v(t)$ for $t > 0$. (20 pts.)



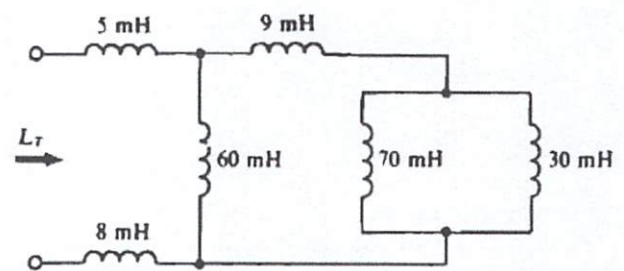
- a. $\{-12 + [(4\cos 4t + 3\sin 4t)e^{-3t}]\}$ A
- b. $\{-10 + [(3\cos 4t + 5\sin 4t)e^{-3t}]\}$ A
- c. $\{12 + [(4\cos 4t + 3\sin 4t)e^{-3t}]\}$ A
- d. $\{10 + [(2\cos 4t + 4\sin 4t)e^{-3t}]\}$ A

4. Find the voltage of the $9 \mu\text{F}$ capacitor in the circuit shown. (10 pts.)

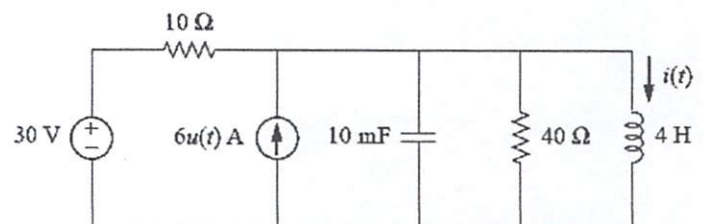


5. Find the total inductance of the circuit shown. (5 pts.)

- a. 25 mH
- b. 33 mH
- c. 33 H
- d. 18 mH



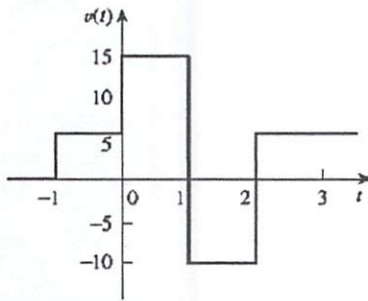
6. Find $i(t)$ for $t > 0$. (20 pts.)



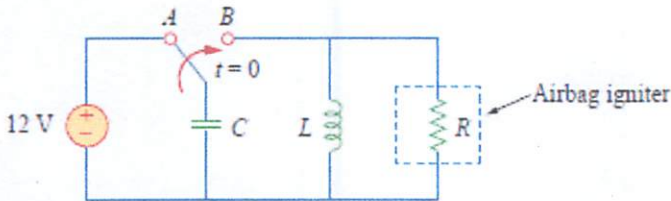
- a. $\{9 + [2e^{-10t}] + [-8e^{-2.5t}]\}$ A
- b. $\{9 + [2e^{-10t}] + [-8e^{-2.5t}]\}$ A
- c. $\{9 + [2e^{-10t}] + [-8e^{-2.5t}]\}$ A
- d. $\{9 + [2e^{-10t}] + [-8e^{-2.5t}]\}$ A



7. Express the voltage in terms of step functions.
(5 pts.)



- $u(t-1)+10u(t)+25u(t+1)+15u(t-2)V$
 - $u(t+1)+10u(t)-20u(t-1)+15u(t)V$
 - $5u(t+1)-10u(t)-15u(t-1)+15u(t-2)V$
 - $5u(t+1)+10u(t)-25u(t-1)+15u(t-2)V$
8. An op amp differentiator has $R = 250 \text{ k}\Omega$ and $C = 10\mu\text{F}$. The input voltage is a ramp $r(t) = 12t$ mV. Find the output voltage.
- 18.33 mV
 - 33.18 mV
 - 30 mV
 - 30 mV
9. An automobile airbag igniter is modeled by the circuit below. Determine the time it takes the voltage across the igniter to reach its first peak after switching from A to B. let $R = 3 \Omega$, $C = 1/30 \text{ F}$, $L = 60 \text{ mH}$.



- 20.68 ms
 - 12.45 ms
 - 21.4 ms
 - 31.3 ms
10. For the following pairs of sinusoids, determine which one leads and by how much.
- (a) $v(t) = 10 \cos(4t - 60^\circ)$ and $i(t) = 4 \sin(4t + 50^\circ)$
 - (b) $v_1(t) = 4 \cos(377t + 10^\circ)$ and $v_2(t) = -20 \cos 377t$
 - (c) $x(t) = 13 \cos 2t + 5 \sin 2t$ and $y(t) = 15 \cos(2t - 11.8^\circ)$



COLLEGE OF ENGINEERING & INFORMATION TECHNOLOGY
First Semester, AY 2021-2022

TEST QUESTIONNAIRE
Midterm Examination in **Math 114 – Engineering Data Analysis**

Instruction:

1. Read the questions carefully. You are not permitted to share calculators or any other materials during the examination;
2. For problem analysis, show the detailed solution of the problem in a separate sheet of paper;
3. Shade the bubble in the answer sheet that corresponds to the correct answer of the given test question.

Identification:

1. In this method of data collection, an engineer observes the process or population, disturbing it as little as possible, and records the quantities of interest. _____
Ans. **Observational Study**
2. This sampling method involves the researcher using their judgment to select a sample that is most useful to the purposes of the research. _____
Ans. **Purposive Sampling**
3. This model uses our engineering and scientific knowledge of a phenomenon, but it is not directly developed from our theoretical or first-principles understanding of the underlying mechanism.

Ans. **Empirical Model**
4. In this sampling method, all members of a population has an equal chance of being selected in which bias is avoided. _____
Ans. **Simple Random Sampling**
5. A selection of all or part of a set of objects, without regard to the order in which objects are selected.

Ans. **Combination**
6. The event consisting of all outcomes that are not in A is called _____.
Ans. **Complement of A**
7. If the two events A and B have no outcomes in common they are called _____.
Ans. **Mutually Exclusive or Disjoint**
8. If the set of possible values of a random variable is a discrete set then it is _____.
Ans. **Discrete**
9. Any rule that associates a number with each outcome in a given sample space S. _____
Ans. **Random Variable**
10. A trial with only two possible outcomes is used so frequently as a building block of a random experiment that it is called a _____.
Ans. **Bernoulli Trial**
11. It is the discrete probability distribution of the number of events occurring in a given time period, given the average number of times the event occurs over that time period. _____
Ans. **Poisson distribution**
12. A random variable which represents some measurement on a continuous scale. _____
Ans. **Continuous Random Variable**
13. A continuous distribution that is commonly used to measure the expected time for an event to occur.

Ans. **Exponential Distribution**
14. The individual probability distribution of a random variable in a joint probability distribution is referred to as its _____.
Ans. **Marginal Probability Distribution**
15. If X and Y are two random variables, the probability distribution that defines their simultaneous behavior is called a _____.
Ans. **Joint Probability Distribution**

Problem Analysis:

16. How many licensed plates can be made if each plate has 3 different digits followed by 2 different letters?
a. **468000 plates**
b. 320000 plates
c. 543000 plates
d. 400000 plates



Document Code No.	FM-SSCT-ACAD-004
Revision No.	00
Effective Date	01 January 2019
Page No.	2 of 3

17. A Broadway show wants to hire 6 women and 3 men. In how many ways can the choice be made if 9 women and 5 men are available?
- 840 ways**
 - 580 ways
 - 320 ways
 - 480 ways
18. There is a 30% chance of rain today. If it does not rain today, there is a 20% chance of rain tomorrow. If it rains today, there is a 50% chance of rain tomorrow. What is the probability that it rains tomorrow?
- 0.18
 - 0.21
 - 0.29**
 - 0.15
19. In a box of 25 external hard disks, there are 2 defectives. An inspector examines 5 of these hard disks. Find the probability that there is at least 1 defective hard disk among the 5.
- 0.367**
 - 0.667
 - 0.076
 - 0.763
20. In a classroom of 30 students, 3 of the students wear wrist watches. If 14 students are selected *with replacement*, what is the probability that exactly 2 of them wear wrist watches?
- 0.257**
 - 0.3586
 - 0.3223
 - 0.2924
21. In a classroom of 30 students, 3 of the students wear wrist watches. If 14 students are selected *without replacement*, what is the probability that exactly 2 of them wear wrist watches?
- 0.257
 - 0.3586**
 - 0.3223
 - 0.2924
22. Find the probability that number 5 appears only once when a fair die is tossed 4 times.
- 1/126
 - 3/4
 - 1/78
 - 1/216**
23. The pdf of X is $f(x) = 0.2, 1 < x < 6$. Find $P(2 < X < 5)$.
- 1/3
 - 2/3
 - 3/5**
 - 2/5
24. Let X be a random variable with pdf $f(x) = kx, 0 < x < 4$. Find the value of k .
- 1/6
 - 1/8**
 - 2/7
 - 2/3
25. Let X be a random variable with pdf $f(x) = kx, 0 < x < 4$. Find $E(X)$.
- 8/3**
 - 8/9
 - 3/8
 - 1/8
26. It is known that the IQ scores of people in the United States have a normal distribution with mean 100 and standard deviation 15. If a person is selected at random, find the probability that the person's IQ score is less than 85.
- 0.1587**
 - 0.0912
 - 0.1957
 - 0.7835
27. Suppose the random variables X and Y have joint pdf $f(x, y) = 6y, 0 < y < x < 1$. Find $E(X)$ and $E(Y)$.
- $\frac{3}{4}, \frac{1}{2}$**



Document Code No.	FM-SSCT-ACAD-004
Revision No.	00
Effective Date	01 January 2019
Page No.	3 of 3

- b. $4/3, 1/4$
- c. $1/2, 1/4$
- d. $4/3, 1/3$

28. Suppose the random variables X and Y have joint pdf $f(x, y) = 6y, 0 < y < x < 1$. Find $\text{Var}(X)$ and $\text{Var}(Y)$.

- a. $3/40, 1/30$
- b. $1/40, 3/20$
- c. **$3/80, 1/20$**
- d. $1/20, 3/60$

29. Suppose the random variables X and Y have joint pdf $f(x, y) = 6y, 0 < y < x < 1$. Find $\text{Cov}(X, Y)$.

- a. **$1/40$**
- b. $1/20$
- c. $1/30$
- d. $1/50$

30. You have two lightbulbs for a particular lamp. Let X = the lifetime of the first bulb and Y = the lifetime of the second bulb (both in 1000s of hours). Suppose that X and Y are independent and that each has an exponential distribution with parameter $\lambda = 1$. What is the joint pdf of X and Y ?

- a. e^{-x-2y} for $x \geq 0, y \geq 0$
- b. e^{-y} for $x \geq 0, y \geq 0$
- c. e^{-2x-y} for $x \geq 0, y \geq 0$
- d. **e^{-x-y} for $x \geq 0, y \geq 0$**