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Name: _____

APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY

SIXTH SEMESTER B.TECH DEGREE COMPREHENSIVE EXAMINATION(S), DECEMBER 2019

Course Code: AE352**Course name: COMPREHENSIVE EXAM**

Max. Marks: 50

Duration: 1Hour

- Instructions:** (1) Each question carries one mark. No negative marks for wrong answers
 (2) Total number of questions: 50
 (3) All questions are to be answered. Each question will be followed by 4 possible answers of which only ONE is correct.
 (4) If more than one option is chosen, it will not be considered for valuation.
 (5) Calculators are not permitted

PART A- COMMON COURSES

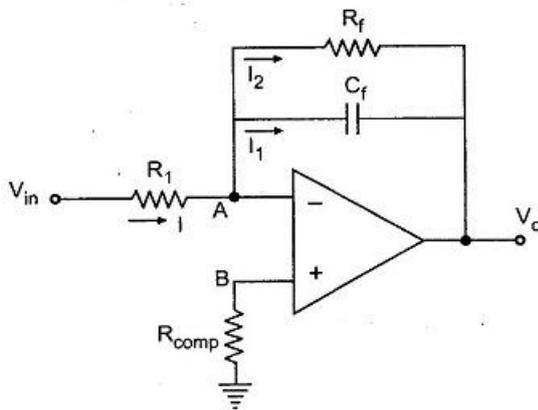
- The sum of the series $\sum_{k=0}^{\infty} \left(\frac{1}{3}\right)^k$ is
 a) $\frac{1}{3}$ b) $\frac{2}{3}$ c) $\frac{1}{2}$ d) 1
- The solution of the differential equation $y'' - 4y' + 4y = 0$ is
 a) $y = (A + Bx)e^{2x}$ b) $y = (A + Bx)e^{-2x}$ c) $y = (A + Bx)e^x$ d) $y = (A + Bx)e^{-x}$
- The resultant of two equal forces has the same magnitude as either of the forces, then the angle between the two forces is
 a) 120° b) 30° c) 90° d) 60°
- Two bodies of masses m_1 and m_2 are dropped from the top of a tower of same height. When these bodies reach the ground, their kinetic energies will be in the ratio
 a) 1 : 2 b) 1: $\sqrt{2}$ c) 1: 4 d) 1 : 1
- The top view of a pentagonal prism with axis perpendicular to the vertical plane and parallel to horizontal plane will be a
 a) Pentagon b) Rectangle c) Trapezoid d) Straight line
- In perspective projection the object is assumed to be kept on which of these planes.
 a) Picture plane b) Horizon plane c) Ground plane d) Central plane
- Which is the most abundant element available in the atmosphere?
 a) Oxygen b) Nitrogen c) Argon d) Carbon di oxide
- The total amount of greenhouse gases produced to directly and indirectly support human activities, usually expressed in equivalent tons of carbon dioxide
 a) Carbon Dating b) Carbon Trading c) Carbon Footprint d) Carbon Factor
- One of the pins in a 3 pin plug top is bigger than the rest. This is most closely related to design for 'X', where 'X' is
 a) Assembly b) Manufacturing c) Life cycle Cost d) Environment

10. Which of the following can be most appropriately associated with the design space of a ball?
- a) Speed b) Velocity c) Diameter d) Height

PART B- CORE COURSES

11. The output voltage of the log-amplifier is
- a) $V_O = - (kT/q) \times \ln(V_i/V_{ref})$ b) $V_O = - (kT/q) \times \ln(V_i/V_{ref})$ c) $V_O = - (kT/q) \times \ln(V_{ref}/V_i)$ d) $V_O = (kT/q) \times \ln(V_i/V_{ref})$
12. Astable multivibrator operating at 150Hz has a discharge time of 2.5ms. Find the duty cycle of the circuit.
- a) 50% b) 75% c) 95.99% d) 37.5%
13. Find the resolution of a 10-bit A-D converter for an input range of 10v.
- a) 97.7mv b) 9.77mv c) 0.977mv d) 977mv

14.



The expression for the transfer function of the given circuit is

- a) $(R_f/R_1)/(1 + j\omega C_f R_f)$ b) $-(R_f/R_1)/(1 + j\omega C_f R_f)$ c) $(R_f/R_1)/(1 - j\omega C_f R_f)$ d) $-(R_f/R_1)/(1 - j\omega C_f R_f)$
15. For a second order low pass Butterworth filter the pass band voltage gain of is given by
- a) 1.586 b) 0.707 c) 1.414 d) 0.586
16. Which of the following is an integrating type ADC
- a) Flash type converter b) Counter type converter c) Successive approximation type converter d) Dual Slope ADC
17. The addition of open loop zero pulls the root loci towards
- a) The left and therefore system becomes more stable b) The right and therefore system becomes unstable c) Imaginary axis and therefore system becomes marginally stable d) The left and therefore system becomes unstable
18. If the unity feedback system is given by the open loop transfer function

$$G(s) = \frac{KS^2}{(1 + 0.3S)(1 + 0.5S)}$$

what would be the initial slope of magnitude plot?

- a) 20 dB/decade b) 40 dB/decade c) 60 dB/decade d) -20 dB/decade
19. Routh Hurwitz criterion gives:
- a) Number of roots in the right half of the s-plane b) Value of the roots c) Number of roots in the left half of the s-plane d) Number of roots in the top half of the s-plane
20. Consider the loop transfer function $K(s+6) / (s+3)(s+5)$ In the root locus diagram the centroid will be located at:
- a) -4 b) -1 c) -2 d) -3
21. Cayley Hamilton Theorem states that
- a) Every symmetric matrix satisfies its own characteristic equation b) Every square matrix satisfies its own characteristic equation. c) Every orthogonal matrix satisfies its own characteristic equation d) Every real symmetric matrix satisfies its own characteristic equation
22. State space analysis is applicable even if the initial conditions are _____
- a) Zero b) Non-zero c) Equal d) Not equal
23. During a measurement, for a measure value “B”, absolute error is obtained as “A”, what will be the relative error of measurement?
- a) A/B b) B/A c) (A+1)/B d) (B+A)/A
24. A galvanometer of 50 Ω gives full scale deflection with 2 mA current. To convert it into ammeter, range of 10 A is connected with it, shunt resistance should be
- a) 0.1 Ω b) 0.2 Ω c) 0.01 Ω d) 0.02 Ω
25. The household energy meter is
- a) An indicating instrument b) Recording instrument c) An integrating instrument d) None of the above
26. For measurement of high voltage capacitors, suitable bridge is
- a) Wein bridge b) Maxwell’s bridge c) Schering bridge d) None of the above
27. The nominal ratio of current transformer is given by
- a) Rated primary winding current/rated secondary winding current b) Number of turns in primary winding/number of turns in secondary winding c) Number of turns in secondary winding/Number of turns in primary winding d) Rated secondary winding current/Rated primary winding current
28. For the measurement of resistances, Kelvin’s double bridge has high accuracy because
- a) It has two set of ratio arms which eliminates effect of resistance of connecting lead b) It has null indicating galvanometer c) It has two null indicator d) It has four sets of ratio arms which eliminates the effect of resistance of connecting lead

29. Determine the decimal equivalent of the signed binary number 11110100 in 1's complement form
 a) 126 b) 11 c) -126 d) -11

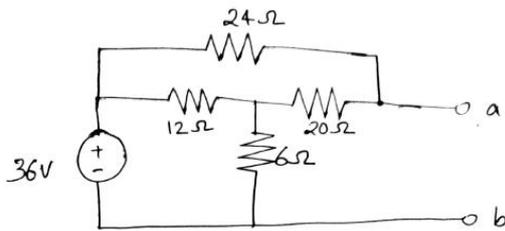
30. The Excess-3 code for 586 is:
 a) 010110001001 b) 100010111001 c) 100110000110 d) 110001100001

31. The simplest equation that can be derived from the given K-map:

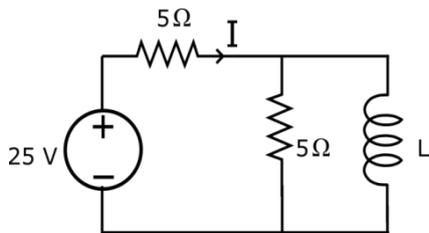
	\bar{C}	C
$\bar{A}\bar{B}$	0	0
$\bar{A}B$	1	1
AB	1	1
$A\bar{B}$	0	1

- a) $Y = AB$ b) $Y = A+B$ c) $Y = AC + B$ d) $Y = AB+ C$
32. How many flip-flops are required to implement a mod 200 counter?
 a) 7 b) 20 c) 8 d) 200
33. On the fifth clock pulse, a 4-bit Johnson sequence is $Q_0 = 0, Q_1 = 1, Q_2 = 1,$ and $Q_3 = 1$. On the sixth clock pulse, the sequence is.....
 a) $Q_0 = 1, Q_1 = 0, Q_2 = 0, Q_3 = 0$ b) $Q_0 = 1, Q_1 = 1, Q_2 = 1, Q_3 = 0$ c) $Q_0 = 0, Q_1 = 0, Q_2 = 1, Q_3 = 1$ d) $Q_0 = 0, Q_1 = 0, Q_2 = 0, Q_3 = 1$
34. Using Moore state machine, how many states are minimum required to construct a state machine for sequence detector that detects the sequence 1001 (non-overlapping)
 a) 4 b) 3 c) 8 d) 5
35. In carbon microphones, a variation in which of the following parameter was correlated to find out Sound Pressure Level (SPL)?
 a) Inductance b) Resistance c) Capacitance d) None of these
36. An example of a flow sensor not based on Bernoulli's Principle
 a) Venturimeter b) Orifice plate c) Pivot tube d) Anemometer
37. Factor to be considered while selecting transducer: it should have _____input impedance and _____output impedance, to avoid loading effect
 a) Low input impedance and low output impedance b) Low input impedance and high output impedance c) High input impedance and low output impedance d) High input impedance and high output impedance
38. Gymbels are used for _____
 a) Improving rotational speed b) Supporting gyro wheel c) As damping agent d) None of the above
39. Dead weight gauge is used for the measurement of pressure of

- a) About 1000 bar b) About 2000 bar c) About 7000 bar d) About 5000 bar
40. Bernoulli's Equation is a mathematical expression of:
- a) The ratio of kinetic to viscous forces in a flow stream b) Friction loss as fluid moves through a rough pipe c) Potential and kinetic energies in a flow stream d) Fluid density and compressibility in a restriction
41. A $24\ \Omega$ resistor, an inductor with a reactance of $120\ \Omega$, and a capacitor with a reactance of $120\ \Omega$ are in series across a $60\ \text{V}$ source. The circuit is at resonance. The voltage across the inductor is
- a) $30\ \text{V}$ b) $300\ \text{V}$ c) $330\ \text{V}$ d) $270\ \text{V}$
42. The Thevenin's equivalent of the network shown in figure is



- a) $4\ \text{V}, 48\ \Omega$ b) $24\ \text{V}, 12\ \Omega$ c) $24\ \text{V}, 24\ \Omega$ d) $12\ \text{V}, 12\ \Omega$
43. For parallel RLC circuit, which one of the following statements is NOT correct?
- a) The bandwidth of the circuit decreases if R is increased b) The bandwidth of the circuit remains same if L is increased c) The bandwidth of the circuit remains same if L is increased d) At resonance, the magnitude of input impedance attains its minimum values
44. In the below circuit, find the current flowing through inductor L, if $L = 5\ \text{H}$



- a) $2.5 + j10\ \text{A}$ b) $2.5\ \text{A}$ c) $5\ \text{A}$ d) *None of the above*
45. Which among the below specified assertions are precisely related to the conditions applicable for a path to be an improper subgraph?
- A. Incidence of a single branch at a terminating node
B. Incidence of two branches at the remaining nodes
- a) A is true & B is false b) A is false & B is true c) Both A & B are true d) Both A & B are false
46. The principle of superposition cannot be applied to analyse a circuit for
- a) voltage response b) current response c) power response d) none of the above

47. Which of the following is not a correct statement for symmetrical two port network
- a) $A=D$ b) $A'=D'$ c) $AD-BC=1$ d) None of the above
48. Which of the following has the lowest propagation delay time?
- a) ECL b) TTL c) CMOS d) PMOS
49. Which of the following are true regarding root locus plot?
- a) The value of K decreases from infinity to zero. b) The root locus on the real axis always lies in a section of the real axis to the left of an even number of poles and zeros c) The root locus begins at the poles and ends at the zero d) None of these
50. A moving iron type ammeter has far turns of thick wire so that
- a) Sensitivity is high b) Damping is effective c) Scale is large d) Resistance is less