Reg No.:_____   Name:_____

APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY

SIXTH SEMESTER B.TECH DEGREE COMREHENSIVE EXAMINATION, MAY 2019

Course Code: AE352
Course name: COMPREHENSIVE EXAM (AE)

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

1. The slope of the surface $z = xe^{-y} + 5y$ in the x-direction at the point (4,0) is

   a) 0   b) -1   c) 1   d) 2

2. The solution of $(D^2 + 1)y = 0$ is

   a) $c_1 \cos x + c_2 \sin x$ b) $c_1 e^x + c_2 e^{-x}$ c) $(c_1 + c_2 x)e^x$ d) $(c_1 + c_2 x)e^{-x}$

3. A simple spring mass vibrating system has a natural frequency of N. if the spring stiffness is halved and the mass is doubled then the natural frequency will be

   a) N   b) 0.5N   c) 2N   d) 0.25N

4. The proportion of second moment of area about centroidal axis to second moment of area about base of a rectangle will be

   a) 0.3   b) 0.1   c) 0.25   d) 0.08333

5. An algorithm for scheduling a set of project activities:

   a) Critical Path Method   b) Crucial Practicing Method   c) Centre Processing Method   d) None

6. The fundamental rethinking and radical redesign of the business process to achieve dramatic improvements in critical contemporary measures of performances such as cost,quality,service and speed:

   a) Recycling   b) Quality engineering   c) Contemporary design   d) Re - engineering

7. Composting is

   a) anaerobic degradation process for solid waste treatment   b) anaerobic treatment for sullage   c) aerobic treatment for sewage   d) an aerobic degradation process for solid waste treatment

8. The rating system of India which is focussed on conservation and efficient energy use is

    a) GRIHA   b) LEED India   c) IGBC   d) BEE

9. In orthographic projection, each projection view represents how many dimensions of an object?

    a) 1   b) 2   c) 3   d) 0

10. The front view, side view and top view of a cylinder standing on horizontal plane base on horizontal plane.

| a) circle, rectangle and rectangle	b) rectangle, rectangle and circle	c) rectangle, circle and rectangle	d) circle, triangle and triangle

PART B- CORE COURSES

11. An emitter bias Dual Input Balanced Output differential amplifier has V_{CC}=20 V, β=100, V_{BE}=0.7 V, R_E=1.3 kΩ. Find I_E

    a) 7.42mA   b) 9.8mA   c) 10mA   d) 8.6mA

12. What output voltage will be produced by a 4 bit D/A converter of range 0 to 10V for an input binary number 0110?

    a) 37.5 V   b) 375V   c) 3.75V   d) 0.375V

13. If the value of Common Mode Rejection Ratio and Common Mode Gain are 40db and -0.12 respectively, then determine the value of differential mode gain?

    a) 0.036   b) -1.2   c) 4.8   d) 12

14. What is PSRR value of an ideal op-amp?

    a) Zero   b) Unity   c) Infinite   d) Unpredictable

15. Which among the following types of ADCs require/s the shortest conversion time?

a) Flash type	b) Successive Approximation	c) Dual Slope	d) All of the above

16. The number of comparator required for flash type A/D converter

a) triples for each added bit	b) Reduce by half for each added bit	c) Double for each added bit	d) Doubles exponentially for each added bit

17. What will be the sensitivity of a voltmeter for 0 to 50mA meter movement?

    a) 20 Ω/V   b) 25 Ω/V   c) 50 Ω/V   d) 5 Ω/V

18. The range of resistance measured in a Kelvin bridge is _____

    a) 10 Ω to 10 mΩ   b) 1 Ω to 10 µΩ   c) 0.01 Ω to 10 MΩ   d) 0.1 Ω to 10 nΩ

19. What is the frequency range for a headphone as a detector?

a) 20 Hz to 20 kHz   b) 10 kHz to 1 MHz   c) 10 MHz to 1 GHz   d) 250 Hz to 4 kHz

20. Inductive proximity sensors can be effective only when the objects are of _____ materials.

a) Ferro Magnetic   b) Paramagnetic   c) Diamagnetic   d) All of the above

21. Turbine meters are generally preferred for

a) Low-viscosity and high flow measurements   b) High viscosity and low flow measurements   c) High viscosity and high flow measurements   d) Low viscosity and low flow measurements

22. A 120 Ω strain gauge of Gauge Factor 2.0 is subjected to a positive strain of $1*10^{-6}$. Find the change in resistance.

a) 0.24 m**Ω**   b) 0.24 M**Ω**   c) 240 m**Ω**   d) 240 M**Ω**

23. What is the preferred shape of frequency response curve for a good microphone?

a) It should be linear in the band width of interest   b) It should be linear with slope zero in the band width of interest   c) It should be non linear in the band width of interest   d) It should be linear with negative slope in the band width of interest

24. Calculate the error of a displacement sensor which give a displacement reading of 29.8 mm, when the actual displacement had been 30 mm.

a) –0.2 mm   b) 2.98mm   c) 0.3mm   d) -0.002mm

25. Which of the following can be measured using a Ring-type load cell?

a) Large weight   b) Small weight   c) Both large and small weight   d) None of the above

26. Commercial Schering bridge can be used for the measurement of capacitances

a) from 10pF to 0.1nF   b) from 100pF to 1μF   c) from 50nF to 10mF   d) from 25mF to 5F

27. 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

28. Sensitivity of a DVM is given by

   a) $S=1$ b) $S=(fs)min$ c) $S=(fs)min \times R$ d) $S = R$

29. At a certain current, energy stored in iron cored coil is 1000 J and its copper loss is 2000 W. The time constant (in seconds) of the coil is

   a) 0.25   b) 0.5   c) 1   d) 2

30. The differential equation for the current i(t) in the circuit of the figure is
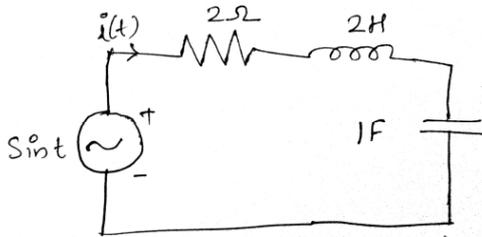
   a) $2\frac{d^2i}{dt^2} + 2\frac{di}{dt} + i(t) = \cos t$

   b) $2\frac{d^2i}{dt^2} + 2\frac{di}{dt} + 2i(t) = \cos t$

   c) $2\frac{d^2i}{dt^2} + 2\frac{di}{dt} + i(t) = \sin t$

   d) $2\frac{d^2i}{dt^2} + 2\frac{di}{dt} + 2i(t) = \sin t$

31. In the following figure C_1 and C_2 are ideal capacitors. C_1 had been charged to 12V before the ideal switch S is closed at $t = 0$. The current i(t) for all t is
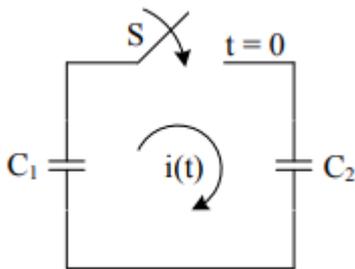
   a) Zero   b) A step function   c) An exponentially decaying function   d) An impulse function

32. The effective inductance of the circuit with inductance of 1H each shown across terminal AB is
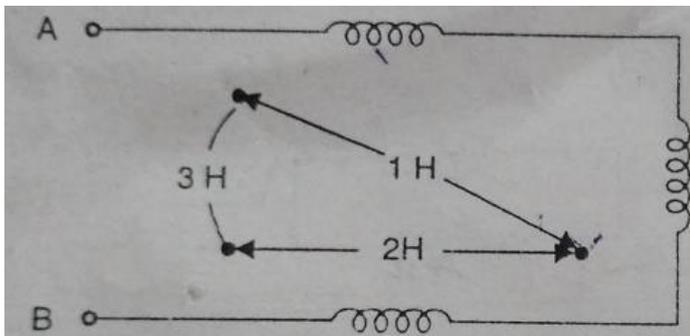
a)   9 H   b)   21 H   c)   11 H   d)   6 H

33.   Using Moore state machine, how many states are minimum required to construct a state machine for sequence detector that detects the sequence 0110 (overlapping)

a)   4   b)   3   c)   5   d)   6

34.   How many $2K \times 8$ ROM chips would be required to build a $16K \times 8$ memory system?

a)   2   b)   4   c)   8   d)   16

35.   For the device shown below, if all the D inputs be HIGH, both S inputs be LOW and $\overline{EN}$ is HIGH, what is the status of Y output?
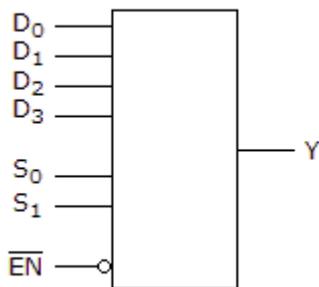
a)   HIGH   b)   LOW   c)   Don't care   d)   Insufficient data

36.   In a bode magnitude plot, which one of the following slopes would be exhibited at high frequencies by a 4th order all-pole system?

a)   -80dB/decade   b)   -40 dB/decade   c)   40 dB/decade   d)   80 dB/decade

37.   A ramp input applied to a unity feedback system results in 5% steady state error. The type number and zero frequency gain of the system are respectively

a)   1and 20   b)   0 and 20   c)   0 and 1/20   d)   1 and 1/20

38.   The characteristic equation of a system is given as $S^4 + 12S^3 + 64S^2 + 128S + K = 0$ .Consider K as a parameter for the root locus plot. The centre of the asymptotes is

a)   -1   b)   -1.33   c)   -3   d)   -4

39.   The transfer function for the state representation of the continuous time LTI system:

$$\frac{dq(t)}{dt} = Aq(t) + Bx(t)$$

$$Y(t) = Cq(t) + Dx(t)$$

is given by:

a) $C(sI - A)^{-1}B + D$ b) $B(sI - A)^{-1}B + D$ c) $C(sI - A)^{-1}B + A$ d) $D(sI - A)^{-1}B + C$

40. What is the value of steady state error in closed loop control systems?

     a) Zero   b) Unity   c) Infinity   d) Unpredictable

41. 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

42. The logic circuit which belongs to non-saturated logic is

     a) ECL   b) TTL   c) NMOS   d) CMOS

43. The value of base 'r' if $(121)_r = (144)_8$ is

     a) 8   b) 7   c) 16   d) 9

44. The counter in the given figure is :
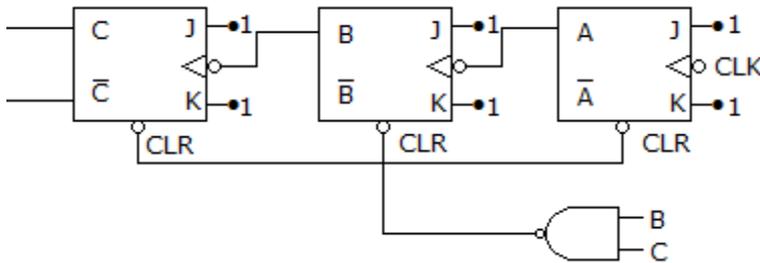
     a) Mod 5   b) Mod 6   c) Mod 7   d) Mod 8

45. What is the value of transmission parameter D?
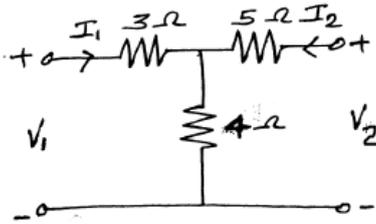
     a) $\dfrac{7}{4}$ b) $\dfrac{9}{4}$ c) $\dfrac{4}{5}$ d) $\dfrac{8}{7}$

46. What is the value of i(t) at t= 0.5 s, after the switch is closed. The input voltage is u(t)= 1V, and the circuit is with zero initial conditions.
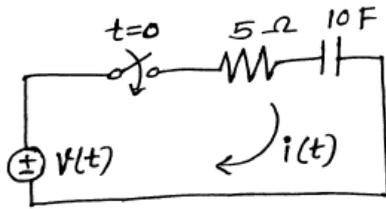
     a)   0.5 A   b)   0.2 A   c)   0.4 A   d)   0.7 A

47.   Which one of the following methods can determine the closed loop system resonance frequency operation?

     a)   Root locus method   b)   Nyquist method   c)   Bode plot   d)   M and N circle

48.   For a Moore machine, the input given is 101010,the output would be of length

     a) |input|+1   b) |input| c) |input-1| d)   Cannot be predicted

49.   The increase in the input frequency of the differentiation amplifier to input impedance creates

     a)   Component noise   b)   External noise   c)   Low frequency noise   d)   High frequency noise

50.   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%

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