Reg No.:_____   Name:_____

APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY

Sixth Semester B.Tech Degree Regular and Supplementary Examination July 2021

Course Code: EE352
Course name: COMPREHENSIVE EXAM (EE)

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 sum of the series $\sum_{k=1}^{\infty} \frac{1}{(k+1)(k+3)}$ is …………
   a) $\frac{5}{12}$ b) 0 c) 1 d) $\frac{1}{2}$

2. The Wronskian corresponding to the differential equation $y'' + 25y = 0$ is
   a) 2 b) 3 c) 4 d) 5

3. When the projectors are parallel to each other and also perpendicular to the plane, the projection is called _____
   a) Perspective projection   b) Oblique projection   c) Orthographic projection   d) Isometric projection

4. The true shape of the section of any solid is required to draw, when the section plane is
   a) Inclined to HP or inclined to VP   b) Parallel to HP & perpendicular VP   c) Parallel to VP & perpendicular HP   d) Parallel both HP & VP

5. If two equal forces of magnitude P acts at an angle θ, the value of their resultant force is
   a) P cos θ/2   (b) P sin θ/2   c) 2P sin θ/2   (d) 2P cos θ/2

6. The process of finding out the resultant force is called _____ of forces.
   a) Resolution   (b) Decomposition   c) Composition   (d) None of the above

7. Pick out the odd one based on the characteristics of a design
   a) Constraint   (b) Function   c) Means   (d) Maintenance

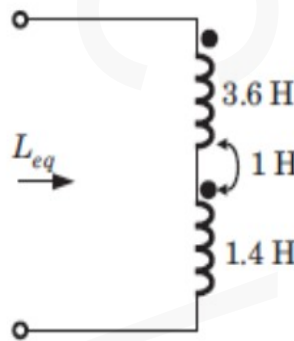8. What is the first step in the engineering design process?

a) Gathering information about an existing product
(b) Coming up with ideas for a new product
c) Recognizing the need for a solution to a problem
(d) None of the above

9. ……….. Legally binds developed nations to quantified emission reduction targets

a) Montreal Protocol
(b) Cartegana protocol
c) CITES
(d) Kyoto Protocol

10. A promising direction towards sustainable development is to design systems that are

a) flexible and irreversible
(b) flexible and reversible
c) inflexible and reversible
(d) inflexible and irreversible

PART B- CORE COURSES

11. According to linear graph theory, the number of possible trees is always equal to the determinant of product of

(a) Complete incidence matrix and its transpose
(b) Reduced incidence matrix and its transpose
(c) Cutset matrix and its transpose
(d) Tieset matrix and its transpose

12. The particular current obtained from the solution of current in sinusoidal response of RL circuit is

(a) $i_p = \dfrac{V}{\sqrt{R^2 + (\omega L)^2}} \cos(\omega t + \theta + \tan^{-1}\dfrac{\omega L}{R})$

(b) $i_p = \dfrac{V}{\sqrt{R^2 + (\omega L)^2}} \cos(\omega t + \theta - \tan^{-1}\dfrac{\omega L}{R})$

(c) $i_p = \dfrac{V}{\sqrt{R^2 + (\omega L)^2}} \cos(\omega t - \theta + \tan^{-1}\dfrac{\omega L}{R})$

(d) $i_p = \dfrac{V}{\sqrt{R^2 + (\omega L)^2}} \cos(\omega t - \theta - \tan^{-1}\dfrac{\omega L}{R})$
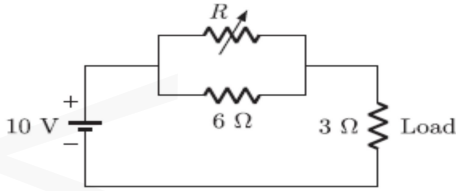
13.

The value of equivalent inductance L_{eq} is
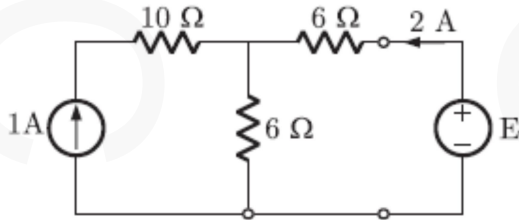
(a) 4H
(b) 6H
(c) 7H
(d) 0H

14.

In the circuit given find the value of R to transfer maximum power to the load

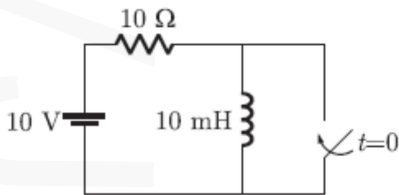(a) zero   (b) 3Ω (c) 6Ω (d) infinity

15. In figure, the value of the source voltage is
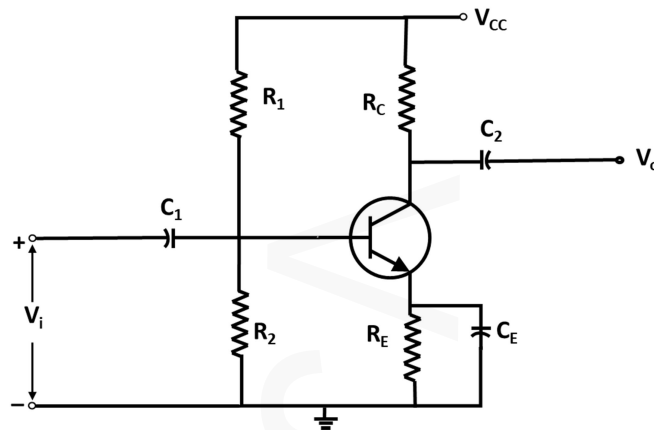

(a) 12V   (b) 24V   (c) 30V   (d) 44V

16.

The circuit shown in the figure is in steady state, when the switch is closed at $t = 0$. Assuming that the inductance is ideal, the current through the inductor at $t = 0^+$ equals
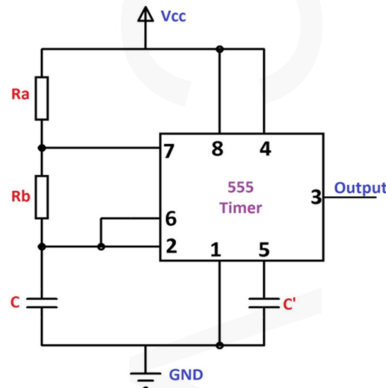

(a) 0A   (b) 0.5A   (c) 1A   (d) 2A

17. In the single stage transistor amplifier circuit shown in fig.4, the capacitor C_E is removed then the ac small signal mid-band voltage gain of the amplifier

(a) increases   (b) decreases   (c) is unaffected   (d) drops to zero

18. An op-amp having a slew rate of 125.6 V/µs, is connected in a voltage follower configuration. If the, maximum amplitude of the input sinusoid is 20V, then the maximum frequency at which the slew rate limited distortion would set in at the output is

    (a) 1 MHz   (b) 6.28 MHz   (c) 1 kHz   (d) 6.28 kHz

19. The phase difference between the output and input voltages of a CE amplifier without feedback is

    (a) 0^0 (b) 90^0 (c) 180^0 (d) 120^0

20. The circuit of an astable multivibrator using 555 timer IC is shown in fig.7. The value of capacitor C=10 nF. The values of resistors R_A and R_B for a frequency of 10 kHz and a duty cycle of 0.75 for the output voltage waveform are

    (a) $R_A = 3.62$ kΩ, $R_B =$ 3.62 kΩ   (b) $R_A = 7.25$ kΩ, $R_B = 3.62$ kΩ   (c) $R_A = 3.62$ kΩ, $R_B = 7.25$ kΩ   (d) $R_A = 7.25$ kΩ, $R_B = 7.25$ kΩ

21. A triangular input with 1 V peak is applied to a Schmitt trigger. What will be the output waveform if the upper and lower trigger points are 0.25V and -0.25V respectively

    (a) Sine wave   (b) Pulse waveform   (c) Saw tooth waveform   (d) Square waveform

22. Frequency of oscillation and the value of feedback resistor R_F for the RC phase shift oscillator using op-amp with RC network having the values R= 3.3 kΩ and C= 0.05µF.

    (a) f = 39.4 Hz, 100 kΩ   (b) f = 39.4 Hz, 10 kΩ   (c) f = 394 Hz, 100 kΩ   (d) f = 394 Hz, 10 kΩ

23. The base of the number system for the addition operation 24+14=41 to be true is

    (a) 5   (b) 6   (c) 7   (d) 8

24. The simplified form of the Boolean expression, Y=(A'BC+D)(A'D+B'C') can be written as

    (a) (A'D+B'C'D)   (b) (A'D+BC'D)   (c) (A'D'+BCD')   (d) (A'+D)(B'+C'+D)

25. For a JK flip flop, its J input is tied to its own complemented output and its K input is connected to its own Q output. If the flip flop is fed with a clock of frequency 1MHz, its Q output frequency will be

  (a) 10 MHz   (b) 2MHz   (c) 0.5MHz   (d) 1MHz

26. A memory used for storing variable quantities is

  (a) EPROM   (b) PROM   (c) RAM   (d) ROM

27. The speed of conversion is maximum in:

  (a) Dual slope ADC (b) Flash ADC (c) Single slope ADC (d) Successive approximation ADC

28. A DAC with a full scale output voltage of 3.5V has a resolution close to 14mV. Its bit size is:

  (a) 16   (b) 32   (c) 4   (d) 8

29. What is the total ampere turns/pole (in AT/pole) if 600 lap wound conductors carry 120A current through conductors (P=4)?

  (a) 18000   (b) 9000   (c) 4500   (d) 13500

30. Which of the following loss is likely to have highest proportion at rated load of the DC generator?

  (a) Hysteresis loss (b) Field copper loss (c) Armature copper loss (d) Eddy current loss

31. A starter is required for a 220-V shunt motor. The maximum allowable current is 55 A and the minimum current is about 35 A. The armature resistance of the motor is 0.4 Ω. What will be the number of sections of starter resistance required?

  (a) 4   (b) 5   (c) 6   (d) 8

32. What will happen if field current of one of the two machines in Hopkinson's test is increased?

  (a) The machine to which field current is increased will act as motor (b) The machine to which field current is increased will act as generator (c) Both machines act as generator and supplies current to the dc mains (d) Both machines act as motor drawing current from dc mains

33. What will happen if excitation of DC shunt motor is changed?

  (a) Torque will remain constant (b) Torque and power both will change (c) Torque will change but power will remain constant (d) Torque, power and speed, all will change

34. KVA rating of a transformer is decided from

  (a) Core loss at no load (b) Copper loss at full load c) Core loss and Copper loss (d) Frictional Loss

35. When bundle conductors are used in place of single conductors, the effective inductance and capacitance will respectively

(a) Increase and decrease   (b) Decrease and increase   (c) Decrease and remain unaffected   (d) Remains unaffected and increase

36. Corona losses are minimized when

(a) Reduced conductor radius   (b) Smooth conductors are used   (c) Increased frequency   (d) Sharp points are provided in the line

37. A 66 KV system has string insulator having five discs and the earth to disc capacitance ratio is 0.1. The string efficiency will be

(a) 89 %   (b) 75 %   (c) 67 %   (d) 56%

38. The insulation resistance of a 10 km long cable is 1 $M\Omega$. Its resistance for 50 km length will be;

(a) 1 $M\Omega$ (b) 5 $M\Omega$ (c) 0.2 $M\Omega$ (d) None of the above

39. Which of the following power system distribution gives the greater reliability

(a) Radial system of the distribution   (b) Ring system of the distribution   (c) D.C. three wire system of the distribution   (d) A.C. three phase four wire system

40. A Buchholz relay is used for

(a) Protection of transformers against all internal faults   (b) Protection of transformers against all external faults   (c) Protection of transformers against both internal and external faults   (d) Protection of transmission lines

41. Distance relays are generally

(a) MHO relays   (b) Reactance relays   (c) Impedance relays   (d) Split – phase relays

42. In Torque-Current analogy, the rotational inertia (J) is analogous to

(a) Inductance (L)   (b) 1/L   (c) Resistance (R)   (d) Capacitance (C)

43. For an armature controlled dc servo motor(with Eb: back emf, w: angular velocity, N: speed in rpm, θ: displacement), the torque constant (KT) is approximately same as

(a) $\Delta Eb/ \Delta N$ (b) $\Delta Eb/ \Delta w$ (c) $\Delta Eb/ \Delta Ia$ (d) $d^2\theta/dt^2$

44. For a second order system, the damped frequency w_d= 4 rad/s, with w_n= 5 rad/s, then the damping factor ξ will be

(a) 0.6   (b) 0.8   (c) 0.9   (d) 1.25

45. For a second order system one pole is at s= (-2 + j 1.4), the settling time for a 2% tolerance band will be

(a) 1 s   (b) 2 s   (c) 4 s   (d) 8 s

46. The type and stability of the closed loop transfer function with G(s)= **1 / [s(s+1)]** and H(s)=**1 / s** are

   (a) 1, unstable   (b) 2, stable   (c) 0, unstable   (d) 0, stable

47. For the closed loop system with $G(s)H(s) = \frac{k}{(s+1)(s+2)}$, the magnitude of k for repeated roots is

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

48. The root locus of the feedback control system having the characteristic equation s²+6Ks+2s+5=0 where K>0, enters into the real axis at

   (a) $s = -1$ (b) $s = -\sqrt{5}$ (c) $s = -5$ (d) $s = \sqrt{5}$

49. The number of imaginary axis roots for the system with characteristic equation $s^4 + 1 = 0$ is

   (a) 0   b) 2   c) 3   d) 4

50. The introduction of a transportation lag to a given system causes

   a) Increase in gain margin   b) Decrease in phase margin   c) Increase in phase margin   d) Decrease in gain margin

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