Reg No.:_____ Name:_____

APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY

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

Course Code: EC352
Course name: COMPREHENSIVE EXAM (EC)

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. A complex wave is 5 + 5sinωt. Its rms value is

(a) 7.07V (b) 6.12V (c) 5.0V (d) 10.0V

12. Which system is causal system

(a) y(t) = sin[u(t+3)] (b) y(t) = 5u(t)+3u(t-1) (c) y(t) = 5u(t)+ u(t+1) (d) y(t) = sin[u(t-3)]+ sin[u(t+3)]

13. If $x(\omega) = \delta(\omega - \omega_o)$ then x(t) is

(a) $e^{-j\omega_o t}$ (b) δ(t) (c) $\frac{1}{2\pi} e^{j\omega_o t}$ (d) 1

14. The original signal x(t) can ideally be reconstructed from $x_p(t)$ using ideal low pass filter g(t) mathematically

(a) $x(t) = x_p(t)\, g(t)$ (b) $x(t) = x_p(t) * g(t)$ (c) $X(j\omega) = X_p(j\omega)\, G(j\omega)$ (d) by (b) or (c)

15. If $H(z) = \frac{1+z^{-1}}{1-\frac{5}{6}z^{-1}+\frac{1}{6}z^{-2}}$ the poles of h(z) are at

(a) $z = \frac{1}{2}$ and $z = \frac{1}{3}$ (b) z = 1 and z= 3 (c) $z = \frac{-1}{2}$ and $z = \frac{-1}{3}$ (d) z = -1 and z= -3

16. The number of possible regions of convergence of the function $\frac{(e^{-2}-2)z}{(z-e^{-2})(z-2)}$ is

(a) 1 (b) 2 (c) 3 (d) 4

17. Gray code of $(010101)_2$ is

(a) 010101 (b) 101011 (c) 011111 (d) 110001

18. F(A,B,C)=∑m(0,2,4,6) reduces to

(a) A’ (b) C’ (c) A’B (d) AB

19. NOT gate using CMOS can be implemented using

(a) One PMOS and Two NMOS (b) Two PMOS and Two NMOS (c) One PMOS and Three NMOS (d) One PMOS and One NMOS

20. A mod 5 counter counts from

(a) 0 to 6 (b) 0 to 4 (c) 0 to 5 (d) 1 to 5

21. Which of the following sequence doesnot occur in a Johnson counter

(a) Q2Q1Q0=000 (b) Q2Q1Q0=100 (c) Q2Q1Q0=111 (d) Q2Q1Q0=101

22. Which of the states have 1 equivalence

Present State	x=0	x=1	Next State
A	A	B	0
B	A	C	0
C	B	C	0

(a) A, B (b) A, B, C (c) A, C (d) B, C

23. Electric vector potential is related to

(a) Magnetic current (b) Electric current (c) Magnet (d) None

24. A wave passing through distilled water (ε_{cr}=34-j9.01) at 25GHz.Find depth of penetration

(a) 2.49mm (b) 3.49mm (c) 1.49mm (d) 4.49mm

25. Brewster angle is rare in which oblique incidence case

(a) Horizontal (b) Vertical (c) Linear (d) Circular

26. An air line has Zo=70;β=3 rad/m at 100MHz.Calculate inductance/m

(a) 334.2nH/m (b) 337.4nH/m (c) 347.8nH/m (d) 373.4nH/m

27. Which of the statement is incorrect

(a) A single stub can match any load (b) Single stub matching can even be used in matching of coaxial lines (c) Quarter wave matching is possible with real loads (d) None of the above

28. The standard ‘a ‘ dimension for X band waveguide is

(a) 2.286cm (b) 1.106cm (c) 2.3cm (d) 2.414cm

29. A transistor is said to be in quiescent state, when

(a) No signal is applied to the input (b) It is unbiased (c) No currents are flowing (d) Emitter junction bias is just equal to collector junction bias

30. A multistage amplifier has two stages. The voltage gain of each stages are 20dB and 30dB respectively. The overall gain in dB is

(a) 30dB (b) 600dB (c) 50dB (d) 45dB

31. The unity gain frequency f_T of a BJT is related to its g_m, C_π and C_μ as follows

(a) $f_T = 2\pi(C_\pi + C_\mu)/ g_m$ (b) $f_T = (C_\pi + C_\mu)/ g_m$ (c) $f_T = g_m /[2\pi(C_\pi + C_\mu)]$ (d) $f_T = g_m /(C_\pi + C_\mu)$

32. If 15% of the output of an amplifier is feedback positively to the input, the minimum gain required of the amplifier for oscillations to occur is

(a) 16.6 (b) 44.4 (c) 66.6 (d) 75

33. Class AB operation is often used in power amplifier in order to

(a) Get maximum efficiency (b) Remove even harmonics (c) Overcome crossover distortion (d) Reduce collector dissipation

34. Gain of Common Source MOSFET amplifier having trans conductance g_m and load resistance R_D is A_V =

(a) g_m/R_D (b) $g_m/(1+R_D)$ (c) $g_m R_D$ (d) $g_m (1+R_D)$

35. $\int_{-\infty}^{\infty} \sin(t)\,\delta(t)dt$ *is*

a) ∞ b) $\pi/2$ c) 0 d) $1/2$

36. If x(t) has the Fourier transform X(f), the Fourier transform of x(-t) is

a) X(f) b) IX(f)I c) -X(f) d) X(-f)

37. An integrator circuit is

a) LPF b) HPF c) BPF d) BEF

38. If a two port network has transmission parameters A,B,C & D, the impedance measured at input port with output open circuited is

a) A/C b) B/D c) AB/CD d) AD/BC

39. Find the value of x if the mutual inductance is 20H, the inductance of coil 1 is x H and the inductance of coil 2 is 8H. The coupling coefficient is 5.

a) 2H b) 4H c) 6H d) 8H

40. A voltage source has 10 V across its terminals when no load is connected. With a load current of 2 A, the voltage across the terminals of the source drops to 9.5 V. What is the value of the internal resistance of the voltage source?

a) 0.25Ω b) 5Ω c) 4.75Ω d) 0.5Ω

41. The value of source resistance of a voltage source of 10 V is 100Ω. What is the value of maximum power that can be transferred to a load resistor which is connected to this source?

a) 10W b) 1W c) 0.25W d) 0.5W

42. Which among the following gets cancelled under the resonance condition in ac circuits, if inductive and capacitive reactances are in parallel?

a) Reactance b) Susceptance c) Resistance d) Non

43. In semiconductors, Flicker noise arises from fluctuations in the

(a) temperature (b) current (c) Carrier densities (d) resistance

44. The RC load resistor for a diode detector consists of a 1000-pF capacitor in parallel with a 10 kΩ resistor, Calculate the maximum modulation depth that can be handled for a sinusoidal modulation at a frequency of 10 KHz if diagonal peak clipping is to be avoided

(a) 0.866 (b) 0.9 (c) 0.69 (d) 0.85

45. In FET singly balanced modulator , two FETs connected in a

(a) Differential amplifier (b) Operational amplifier (c) Feedback amplifier (d) none

46. A receiver tunes signals from 550 kHz with an IF of 455 kHz. Find the frequency tuning range and capacitor tuning range for the oscillator section

(a) R_f = 2.045, R_c= 4.182 (b) R_f = 0, R_c= 5 (c) R_f = 5.1, R_c= 4.182 (d) R_f = 2.045, R_c= 11.89

47. In Armstrong frequency modulation, the modulated signal is generated with the help of

(a) Amplitude modulation (b) Frequency modulation (c) Both (d) & (b) (d) Phase Modulation

48. If a telephone exchange serves 1500 users with the average BHCA of about 9000 and CCR is about 50 %, what would be the busy hour calling rate?

(a) 2 (b) 3 (c) 4.5 (d) 5

49. A material has a conductivity of 10^{-2} mho/m and a relative permittivity of 4. The frequency at which the conduction current in the medium is equal to the displacement current is

(a) 45 MHz (b) 90 MHz (c) 450 MHz (d) 900 MHz

50. In a twin wire transmission line in air, the adjacent voltage maximum are at 12.5cm and 27.5 cm. The operating frequency is

(a) 300 MHz (b) 1 GHz (c) 2 GHz (d) 6.28 GHz

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