

Reg No.: \_\_\_\_\_

Name: \_\_\_\_\_

**APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY**

SIXTH SEMESTER B.TECH DEGREE COMPREHENSIVE EXAMINATION, MAY 2019

**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**

- The infinite series  $\sum_{n=1}^{\infty} \frac{1}{n^p}$ 
  - Converges if  $p < 1$
  - Converges if  $p > 1$
  - Converges if  $p = 1$
  - Diverges if  $p > 1$
- The Wronskian of  $\cos x$  and  $\sin x$  is
  - 0
  - $\cos^2 x - \sin^2 x$
  - $2 \cos x \sin x$
  - 1
- The equivalent stiffness of two springs of stiffness  $s_1$  and  $s_2$  joined in series is
  - $s_1 s_2 / (s_1 + s_2)$
  - $(s_1 / s_2) / (s_1 + s_2)$
  - $s_1 + s_2$
  - $s_1 s_2$
- A bullet of mass 0.03kg moving with a speed of 400m/s penetrates 12cm into a fixed block of wood. The average force exerted by the wood on the bullet will be
  - 10kN
  - 20kN
  - 0kN
  - 15kN
- Which among the following is not a Functional constraint?
  - Overall Geometry
  - Forces Involved
  - Quality control
  - Materials to be used
- A structured planning method used to evaluate weakness, strength ,opportunities and threats of design:
  - SWOT analysis
  - Design analysis
  - WOST analysis
  - Matrix design
- Eutrophication of water bodies is caused by the presence of
  - excessive dissolved oxygen
  - Excessive dissolved  $\text{CO}_2$
  - phosphorous and nitrogen nutrients
  - Algae
- A major advantage of Pyrolysis in converting biomass to energy is
  - its heating to  $1000^{\circ}\text{F}$
  - that Carbon Dioxide is not produced
  - the Oxygen generated as the by-product
  - the absorption  $\text{CO}_2$  during the process

9. 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) Isometric projection      d) Orthographic projection
10. In AutoCAD, to obtain parallel lines, concentric circles and parallel curves; \_\_\_\_\_ is used
- a) Array      b) Fillet      c) Copy      d) Offset

### PART B- CORE COURSES

11. A source of angular frequency of 1 rad/s has a source impedance consisting of a  $1\Omega$  resistance in series with a 1H inductance. The load that will obtain maximum power is
- a)  $1\Omega$  resistance      b)  $1\Omega$  resistance in parallel with 1H inductance      c)  $1\Omega$  resistance in parallel with 1F capacitance      d)  $1\Omega$  resistance in series with 1F capacitance
12. Laplace transform of the delayed unit impulse function  $\delta(t-1)$  is:
- a) 1      b) 0      c)  $e^{-s}$       d) infinity
13. An RC circuit has capacitance  $C=2\mu\text{F}$  in series with a resistance  $R = 1\text{M}\Omega$ . The time constant of the circuit (in seconds) is:
- a) 3      b) 0.5      c)  $1/3$       d) 2
14. As the poles of a network shift away from the x-axis, the response
- a) Remains constant      b) Becomes less oscillating      c) Becomes more oscillating      d) None of these
15. 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)  $AD/BC$       d)  $AB/CD$
16. A series RLC circuit has a resonance frequency of 1kHz and a quality factor Q of 200. If each of R, L, and C is doubled from its original value, the new Q of the circuit is
- a) 25      b) 50      c) 100      d) 200
17. 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
18. The odd part of  $x(t)=1+\sin^2(t)$  is
- a) 1      b)  $\sin^2(t)$       c)  $1+\sin^2(t)$       d) 0
19. A stable LTI system will have its impulse response,
- a) stable      b) causal      c) Finite for all times      d) Absolutely summable
20. A continuous time non-periodic signal is characterised with a
- a) Fourier series      b) Fourier transform      c) Z-transform      d) Discrete time fourier series
21. For an RC low pass filter the frequency response,  $H(s)$ , where  $s=j\omega$ , is
- a)  $1/(sCR+1)$       b)  $s/(sCR+1)$       c)  $R/(sCR+1)$       d)  $C/(sCR+1)$
22. If Z-transform of  $x(n)$  is  $X(z)$ , then Z-transform of  $a^n x(n)$  is
- a)  $a^z X(z)$       b)  $aX(z/a)$       c)  $X(z/a)$       d)  $a X(z)$
23. A stable and causal discrete system will have all its poles of its transfer function
- a) On the unit circle      b) Inside the unit circle      c) Outside the unit      d) Location of poles

- circle does not matter
24. The derivative of  $\delta(t)$ ,  $(d\delta(t)/dt)$  is  
 a) undefined                      b) 0                                      c) 1                                      d)  $u(t)$
25. The emitter bypass capacitor (capacitor across  $R_E$ ) is used in RC coupled amplifier to  
 a) Increase the O/P impedance of the transistor                      b) Avoid voltage gain drop                      c) Forward bias the transistor                      d) Reduce RC noise in amplifier
26. Multi stage amplifiers are also called  
 a) Cascode amplifiers                      b) Darlington pair                      c) Cascade amplifiers                      d) None of the above
27. If the feedback factor of an amplifier is 0.01, the gain with negative feedback is approximately  
 a) 100                                      (b) 1                                      c) 1000                                      (d) 500
28. Which of the following improvements is (are) a result of the negative feedback in a circuit?  
 a) Lower output impedance                      (b) Reduced noise                      c) More linear operation                      (d) All of the above
29. Class D amplifiers differ from all other classes of amplifiers because  
 a) the output transistors are operated as switches                      (b) of their very low input capacitance                      c) of their high-frequency response capabilities                      (d) they employ dual MOSFETs.
30. The output impedance of a voltage regulator is  
 a) Very high                                      (b) Equal to load voltage divided by load current                      c) Very Small                                      (d) Equal to input voltage divided by output current
31. At channel pinch-off of MOSFET  
 a) The width of the induced channel become non linear                      (b) The width of the induced channel become very large                      c) Width is  $1/e$  times maximum possible width                      (d) Width of induced channel is zero and current saturates
32. A vector can be completely prescribed within a region by its  
 a) Curl & Gradient                      (b) Divergence & Curl                      c) Gradient, Divergence & Curl                      (d) Laplacian
33. In metals which of the following equation will hold good?  
 a)  $\text{Curl}(H) = J$                                       (b)  $\text{Curl}(J) = dD/dt$                                       c)  $\text{Curl}(H) = D$                                       (d)  $\text{Curl}(J) = dB/dt$
34. The Brewster angle is expressed as  
 a)  $\tan^{-1}(n)$                                       (b)  $\tan^{-1}(n_1/n_2)$                                       c)  $\tan^{-1}(n_2/n_1)$                                       (d)  $\tan(n)$
35. Which of the statements are true for Coaxial line  
 a) It supports TEM waves                      (b) Also supports other higher modes like TE, TM                      c) Power flow is confined in the region between the conductors                      (d) All of the above
36. The characteristic impedance of a line having open and short impedances of 20 and 5 respectively is  
 a) 100                                      (b) 10                                      c) 20                                      (d) 5
37. The dominant mode in waveguide is the mode which has  
 a) Highest frequency                      (b) Highest attenuation                      c) Lowest phase constant                      (d) Highest wavelength

38. Which is the incorrect expression  
 a) Grad Div (b) Div Curl (c) Grad Curl (d) Curl Grad
39. The range of signed decimal numbers that can be represented by 6-bits 1's complement number is  
 a) -31 to +31 (b) -63 to +63 (c) -64 to +63 (d) -32 to +32
40. A digital system is required to amplify a binary-encoded audio signal. The user should be able to control the gain of the amplifier from minimum to a maximum in 100 increment. The minimum number of bits required to encode, in straight binary, is  
 a) 8 (b) 6 (c) 5 (d) 7
41. Choose the correct one from among the alternatives a, b, c, d after matching an item from Group 1 to the most appropriate item in Group 2.  
 Group 1: Group 2:  
 P. Shift register 1. Frequency division  
 Q. Counter 2. Addressing in memory chips  
 R. Decoder 3. Serial to parallel data conversion  
 a) P-3, Q-2, R-1 (b) P-3, Q-1, R-2 (c) P-2, Q-1, R-3 (d) P-1, Q-2, R-2
42. A 4 bit ripple counter and synchronous counter are made using flip flops having a propagation delay of 10 ns each. If the worst case delay in the ripple counter and the synchronous counter be  $R$  and  $S$  respectively, then  
 a)  $R = 10$  ns, (b)  $R = 40$  ns, (c)  $R = 10$  ns (d)  $R = 30$  ns,  
 $S = 40$  ns (b)  $S = 10$  ns (c)  $S = 30$  ns (d)  $S = 10$  ns
43. What is the modulus of 3-bit Ring counter?  
 a) 3 (b) 8 (c) 6 (d) None of the above
44. Two states are said to be equal if they have exactly same  
 a) inputs (b) Next state (c) Output (d) Both a and b
45. Which of the following is a low frequency noise?  
 a) Thermal noise (b) Flicker noise (c) Shot noise (d) Partition noise
46. For AM, with 100% modulation, power in each sideband is \_\_\_\_\_ of that of carrier?  
 a) 50% (b) 70% (c) 25% (d) 60%
47. Which of the following analog modulation scheme requires minimum transmitted power and minimum channel bandwidth?  
 a) DSB-FC (b) VSB (c) DSB-SC (d) SSB
48. Super heterodyne principle provides selectivity at  
 a) RF stage (b) IF stage (c) Demodulating stage (d) Audio stage
49. Armstrong method is used for the generation of  
 a) Direct FM (b) Indirect FM (c) SSB-SC (d) DSB-SC
50. PSTN stands for  
 a) Public Switched Telephone Network (b) Private Switched Telephone Network (c) Primary Service Telephone Network (d) Primary Service Telephone Numbers

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