Nepal Engineering Council Registration Examination

Model Question for <u>Electronics and Communication Engineering (AExE)</u>

(100*1 = 100)

1. Decibel relation for power gain is:
   a) $N_{dB} = 20\ log_{10}(\frac{V_2^2}{V_1^2}) + 20\ log_{10}(\frac{Z_1}{Z_2})$
   b) $N_{dB} = 10\ log_{10}(\frac{V_2^2}{V_1^2}) + 10\ log_{10}(\frac{Z_1}{Z_2})$
   c) $N_{dB} = 20\ log_{10}(\frac{V_2}{V_1}) + 10\ log_{10}(\frac{Z_2}{Z_1})$
   d) $N_{dB} = 10\ log_{10}(\frac{V_2}{V_1}) + 10\ log_{10}(\frac{Z_2}{Z_1})$

2. Maximum power that can be transfer from source to load is:
   a) 25%
   b) 75%
   c) 50%
   d) 100%

3. Power factor $\frac{R}{Z}$ has maximum value of:
   a) 0.0
   b) 0.5
   c) 1.0
   d) 1.5

4. EEPROM has drain and floating gate gap of …..
   a) 5 nm
   b) 10 nm
   c) 12 nm
   d) 15 nm

5. Heisenberg principle of uncertainty says:
   a) Signal of 10Hz can be generated.
   b) Signal of 10MHz can be generated.
   c) Signal of 100MHz can be generated.
   d) Signal of band 100MHz-105MHz can be generated

6. UHF frequency signal can be amplified using:
   a) Class A amplifier
   b) Class AB amplifier
   c) Class C amplifier
   d) Class B amplifier

7. Two's component of 00011011 is:
   a) 11100100
   b) 11100101
   c) 11000101
   d) 11110001

8. Elementary building block of combinational circuit is:
   a) Logic gate
   b) Flip-flop
   c) Both logic gate and flip-flop
   d) Memory

9. Synchronous circuit that changes its state at specific clock signal is:
   a) Event driven
   b) Clock driven
   c) Pulse driven
   d) Frequency driven

10. Bandwidth of microprocessor represents:
    a) Clock speed
    b) Width of internal bus
    c) Number of bit processed/instruction
    d) Number of bit processed/sec

11. PPI 8255 has internal bus of size:
    a) 4 bit
    b) 8 bit
    c) 16 bit
    d) 32 bit

12. Interrupt Service Route (ISR) executes
    a) Before execution of current instructions
    b) With pause of current instructions
    c) After execution of current instructions
    d) With execution of no instruction

13. Which of the following is not a data type in C?
    a) int
    b) float
    c) String
    d) char

14. What is the size of a pointer in C?
    a) 1 byte
    b) 2 bytes
    c) 4 bytes
    d) It depends on the system architecture

15. Which access specifier is used to make the members of a class accessible only within the same class?
    a) public
    b) private
    c) protected
    d) public and protected

16. What is operator overloading in C++?
    a) Defining a new operator.
    b) Overriding an existing operator.
    c) Changing the behaviour of an existing operator.
    d) Changing the behaviour of new operator.

17. What is the difference between ifstream and ofstream in C++?
    a) ifstream is used for input, while ofstream is used for output.
    b) ofstream is used for input, while ifstream is used for output.
    c) both are used as input.
    d) both are used as output

18. What is a class template in C++?
    a) A class that can be used to create objects of different types.
    b) A function that can be used to create objects of different types.
    c) A variable that can be used to create objects of different types.
    d) A character that can be used to create objects of different types.

19. What is the purpose of the control unit in a CPU?
    a) To perform arithmetic and logical operations on data.
    b) To store and retrieve data from memory.
    c) To interpret instructions and control the flow of data within the CPU.
    d) To print data from memory

20. What is the purpose of the cache replacement policy?
    a) To determine which data to store in the cache.
    b) To determine which data to evict from the cache when space is needed.
    c) To determine how many levels of cache to use.
    d) To determined which data to store in RAM.

21. Which of the following is not a type of DMA transfer mode?
    a) Burst mode
    b) Cycle-stealing mode
    c) Interrupt mode
    d) Instruction mode.

22. An instruction set refers to a set of ----------
    a) rules for writing code in a specific programming language.
    b) instructions that a processor can execute.
    c) input/output operations that a processor can perform.
    d) printing command

23. What is a real-time kernel?
    a) The core component of a real-time operating system.
    b) The user interface of a real-time operating system.
    c) The hardware component of a real-time operating system.
    d) The core component of a real-time pointer system.

24. What is a signal in VHDL?
    a) A variable used to store a value in a digital circuit.
    b) A physical wire used to transmit data in a digital circuit.
    c) A function used to perform a specific task in VHDL.
    d) A file used to store a specific task.

25. Which of the following is an example of a physical layer protocol?
    a) Ethernet
    b) TCP
    c) HTTP
    d) ISP

26. The PPP of the OSI model operates at ----------
    a) Physical layer
    b) Data link layer
    c) Network layer
    d) Transport layer

27. Which of the following is a type of routing algorithm used in the network layer?
    a) Link-state routing
    b) Distance-vector routing
    c) Path-vector routing
    d) All of the above.

28. Which protocol is responsible for error detection and correction at the transport layer?
    a) TCP
    b) UDP
    c) ICMP
    d) ARP

29. Which application layer protocol is used for sending and receiving emails?
    a) HTTP
    b) FTP
    c) SMTP
    d) POP

30. Which of the following is not a common type of firewall?
    a) Packet-filtering firewall
    b) Stateful inspection firewall
    c) Proxy firewall
    d) Encryption firewall

31. The Poisson equation is a partial differential equation that describes ……
    a) Distribution of electric charge in space
    b) Propagation of electromagnetic waves
    c) Flow of heat in a material

d) Relationship between pressure and velocity in a fluid

32. What is the shape of the magnetic field around a current-carrying loop?
    a) Spherical
    b) Cylindrical
    c) Toroidal
    d) Conical

33. What is the wave equation for a one-dimensional wave traveling in the positive x-direction with speed v?
    a) $\partial^2u/\partial x^2 = v^2\partial^2u/\partial t^2$
    b) $\partial^2u/\partial x^2 + v^2\partial^2u/\partial t^2 = 0$
    c) $\partial u/\partial x = v^2\partial u/\partial t$
    d) $\partial u/\partial x + v^2\partial u/\partial t = 0$

34. Which of the following is a measure of the efficiency of an antenna?
    a) Directivity
    b) Gain
    c) Radiation resistance
    d) Bandwidth

35. Factors that affect the radiation pattern of an omnidirectional antenna is ……..
    a) Length and shape of the antenna
    b) Area of the antenna
    c) Materials used to make the antenna
    d) Height of the antenna

36. Which of the following frequency ranges is used for Bluetooth communication?
    a) 2.4 GHz to 5 GHz
    b) 700 MHz to 800 MHz
    c) 1.8 GHz to 1.9 GHz
    d) 2.6 GHz to 2.7 GHz

37. Which of the following techniques is used to improve the performance of a channel encoder in the presence of burst errors?
    a) Convolutional coding
    b) Interleaving
    c) Hamming coding
    d) Differential coding

38. What is the minimum bandwidth required for a signal with a data rate of 10 Mbps using binary phase shift keying (BPSK)?
    a) 5 MHz
    b) 10 MHz
    c) 20 MHz
    d) 40 MHz

39. What is the modulation index of an AM signal with a carrier amplitude of 10 V and a modulating signal with a peak-to-peak amplitude of 2 V?
    a) 0.2
    b) 0.4
    c) 0.6
    d) 0.8

40. Source coding is a technique ……..
    a) To encode the information in a communication system
    b) To reduce the number of bits required to represent a source signal
    c) To reduce the noise in a communication channel
    d) To increase the bandwidth of a communication channel

41. Which of the following is not a type of error correction code?
    a) Hamming Code
    b) Convolutional Code
    c) Reed-Solomon Code
    d) Checksum

42. What is the power spectral density of a random process?
    a) The Fourier transform of the autocorrelation function
    b) The Fourier transform of the probability density function
    c) The cross-correlation between the process and a delayed version of itself
    d) The mean value of the process

43. What is the bandwidth of the sinc function?
    a) 1 Hz
    b) 2 Hz
    c) $1/\pi$ Hz
    d) π Hz

44. What is the transfer function of an LTI system?
    a) The Laplace transform of the impulse response
    b) The Fourier transform of the impulse response
    c) The Laplace transform of the step response
    d) The Fourier transform of the step response

45. What is the time complexity of the FFT algorithm?
    a) O(N log(N))
    b) O(N^2)
    c) O(log(N))
    d) O(N)

46. Which of the following is a common method used to minimize truncation error in a digital signal processing system?

a) Increase the number of bits used for representation
b) Reduce the number of bits used for representation
c) Increase the sampling rate of the system
d) Use a low-pass filter to remove high frequency noise

47. The ideal impulse response of a low-pass FIR filter is ……
a) Delta function
b) Sinc function
c) Gaussian function
d) rectangular function

48. Which of the following is an advantage of the FFT algorithm over the DFT algorithm?
a) FFT algorithm requires less memory
b) FFT algorithm is more accurate
c) FFT algorithm can be computed faster
d) FFT algorithm is less accurate

49. Which type of noise is caused by sudden, sharp disturbances in the transmission medium?
a) Thermal noise
b) Impulse noise
c) Cross-talk
d) White noise

50. Which of the following is not a type of cell in a cellular network?
a) Microcell
b) Macrocell
c) Nanocell
d) Picocell

51. Which of the following is a characteristic of spread spectrum signals?
a) They are narrowband signals
b) They have a high-power density
c) They have a low signal-to-noise ratio
d) They are easy to intercept and jam

52. Which of the following is not a type of digital switching?
a) Time-division switching (TDS)
b) Circuit switching
c) Packet switching
d) Frequency-division switching (FDS)

53. Which of the following is not a type of CCS?
a) Signalling System 7 (SS7)
b) Integrated Services Digital Network (ISDN)
c) Digital Subscriber Line (DSL)

d) Common Channel Interoffice Signalling (CCIS)

54. Which of the following ITU sectors is responsible for the development of standards for radio communication
    a) ITU-R
    b) ITU-T
    c) ITU-D
    d) ITU-RSG

55. Standard dimensions (mm x mm) of A3 drawing sheet is
    a) 11.69 × 16.54
    b) 29.7 × 42
    c) 297 × 420
    d) 420 × 280

56. Which of the following methods of charging depreciation of an asset has increased amount of depreciation as the age of asset increases
    a) sum-of-year digit
    b) sinking fund
    c) diminishing balance
    d) straight line

57. The process of optimizing the project's limited resources without extending the project duration is known as
    a) project crashing
    b) resource levelling
    c) resource smoothing
    d) networking

58. The process of composing/raising the required fund from different sources such as equity, preferred stock, bond and debenture is known as
    a) capital structure planning
    b) project financing
    c) capital budgeting decision
    d) deducing earning per share

59. In which of the following society, people used to seek their existence on growing plants for their cattle and domestic animals
    a) pastoral society
    b) tribal society
    c) horticultural society
    d) agricultural society

60. According to Nepal Engineering Council Act, 2055 (Revised, 2079), all engineering academic institutions shall be..... in the Council.

a) affiliated
b) united
c) recognized
d) associated

61. A **.....** oscillator generates electrical oscillation of constant frequency based on the piezoelectric effect.
a) Hartley
b) RC Phase Shift
c) Crystal
d) Colpitts

62. When a sinusoidal voltage is applied across RL parallel circuit so that $R=X_L$ the phase angle will be l
(a) 45º lagging
(b) 45º leading
(c) 90º lagging
(d) 90º lagging

63. What would be the nature of 'Z_L' if 'Z_{eq}' reactance is inductive according to maximum power transfer theorem?
a) Inductive
b) Capacitive
c) Resistive
d) Reactive

64. For an n-channel E-MOSFET, V_{th}=5V, what is the condition to turn on the device?
a) V_{DS}>5V
b) V_{GS}<5V
c) V_{GS}>5V
d) V_{DS} = 5V

65. The INTR interrupt may be masked using the flag
a) Direction flag
b) Overflow flag
c) Sign flag
d) Interrupt flag

66. Which statement describes the BEST operation of a negative-edge-triggered D flip-flop?
a) The logic level at the D input is transferred to Q on NGT of CLK
b) The Q output is ALWAYS identical to the CLK input if the D input is high
c) The Q output is ALWAYS identical to the D input when CLK= PGT.
d) The Q output is ALWAYS identical to the D input

67. What does each cell in a Karnaugh Map (K-map) represent?
(a) A variable
(b) A minterm (a combination of variables)
(c) A logic gate
(d) A Boolean equation

68. Which method of Combination Circuit implementation is widely adopted with maximum output functions and minimum requirement of Ics?
    a) Multiplexer Method
    b) Decoder Method
    c) Encoder Method
    d) Parity Generator Method

69. Which of the following is not true about address bus?
    a) It consists of control PIN 21 to 28
    b) It is a bidirectional bus
    c) It is 16 bits in length
    d) Lower address bus lines (AD_0-AD_7) are called line numbers.

70. Allocation of memory to objects at the time of their construction is known as …. of objects.
    a) Run Time Construction
    b) Static Construction
    c) Initial Construction
    d) Dynamic Construction

71. Which header file in C is required to use the malloc() function for dynamic memory allocation?
    (a) <stdio.h>
    (b) <stdlib.h>
    (c) <string.h>
    (d) <math.h>

72. Constant function in C++ can be declared as
    a) Void display() const
    b) Const Void display()
    c) Void const display()
    d) Void display()

73. By default, what a program does when it detects an exception?
    a) Continue Running
    b) Calls other function of program
    c) Removes the exception and tells the programmer about exception
    d) Results in the termination of the program

74. How does Booth's Algorithm optimize the multiplication process?
    a) By reducing the number of multiplication steps
    b) By reducing the number of addition steps
    c) By analyzing adjacent bits in the multiplier
    d) By using parallel processing

75. Which of the following is the best example of a closed-loop control system?
    (a) Electric kettle with a timer
    (b) Room heater without a thermostat
    (c) Automatic room temperature control using a thermostat
    (d) Hair dryer with manual heat setting

76. Which of the following cache levels is the smallest and fastest, but also closest to the CPU core?
    (a) L1 Cache
    (b) L2 Cache
    (c) L3 Cache
    (d) Virtual Cache

77. What is multitasking in an operating system?
    (a) Using multiple computers for one task
    (b) Executing multiple tasks by multiple users at the same time
    (c) Executing multiple tasks or processes by a single CPU
    (d) Using multiple CPUs to execute a single task

78. Suppose a CSMA/CD Local Area Network of 1 Gbps is there over a 1 km cable. If the signal speed in the cable is 2×10^5 km/sec, what will be the minimum frame size?
    (a) 1200
    (b) 4000
    (c) 5000
    (d) 10000

79. Which BGP routers will become peers and share routing information?
    a) BGP routers that are configured with the same peer command
    b) BGP routers that are configured with the same network command
    c) BGP routers that are configured with the neighbor command
    d) BGP routers that share routing information with all routers in the same AS by default

80. Which of the following best describes the main purpose of a Virtual Private Network (VPN)?
    (a) To increase download speed over the internet
    (b) To create a secure, encrypted connection over a public network
    (c) To block websites at the router level
    (d) To provide faster access to local files

81. …… is a supplementary protocol that allows non- ASCII data to be sent through email.
    a) SMTP
    b) POP
    c) MPEG
    d) MIME

82. Poisson's and Laplace equations can be easily derived from
    a) Faraday's law
    b) Gauss Law
    c) Coulomb’s Law
    d) Ampere's law

83. Which of the following cannot be computed using the Biot Savart law?
    a) Permeability
    b) Magnetic flux density
    c) Electric field intensity
    d) Magnetic field intensity

84. In lossy dielectric the phase difference between electric filed E and magnetic field H is
    a) 0
    b) 180
    c) 45
    d) 90

85. What is the nature of radiation pattern of an isotropic antenna?
    (a) Spherical
    (b) Dough-nut
    (c) Hyperbolic
    (d) Elliptical

86. What does the radiation pattern of an antenna represent?
    (a) The physical size of the antenna
    (b) The variation of the power radiated by the antenna as a function of direction
    (c) The frequency range of the antenna
    (d) The electrical resistance of the antenna

87. How many frequencies are used in PSK?
    (a) 4
    (b) 2
    (c) 1
    (d) 0

88. What is the effect of the Hilbert Transform on a sinusoidal signal?
    (a) Shifts the phase by +90° or -90°
    (b) Doubles the amplitude
    (c) Converts it to a square wave
    (d) Eliminates the signal

89. Which band is the Yagi-Uda antenna most commonly used in?
    (a) VHF and UHF bands
    (b) Microwave band
    (c) ELF band
    (d) Infrared band

90. The white noise spectral density
    (a) Changes with frequency
    (b) Changes with amplitude
    (c) Changes with bandwidth
    (d) Remains constant

91. All pass filters are used when
    (a) Maximally flat passband is needed
    (b) Phase shift is important
    (c) High Roll off is needed
    (d) Rippled stop band is important

92. The Fourier Transform of a conjugate symmetric function is always
    (a) Imaginary
    (b) Real
    (c) Conjugate symmetric
    (d) Conjugate anti-symmetric

93. Soft handover is a feature used in:
    (a) GSM
    (b) TDMA
    (c) FDMA
    (d) CDMA

94. Which of the following is an advantage of using FIR filters over IIR filters?
    (a) FIR filters require fewer coefficients
    (b) FIR filters can be easily implemented with feedback loops
    (c) FIR filters are more computationally efficient
    (d) FIR filters have linear phase response

95. In the process of ideal sampling, which condition must be satisfied to avoid aliasing and allow perfect reconstruction of the original signal?
    (a) Sampling frequency must be equal to the signal frequency
    (b) Sampling frequency must be greater than twice the highest frequency of the signal
    (c) Sampling frequency must be lower than the average signal frequency
    (d) Sampling must be performed only at zero-crossings of the signal

96. Which of the following uses Bluetooth as wireless technology
    (a) LAN
    (b) WAN
    (c) MAN
    (d) PAN

97. A spread spectrum signal occupies 3 MHz bandwidth with a data rate of 12 kbps. The processing gain is:
    (a) 20 dB
    (b) 21dB
    (c) 24 dB
    (d) 27 dB

98. Multiplexing is used in
    (a) Packet Switching
    (b) Circuit Switching
    (c) Data Switching
    (d) Node Switching

99. Which of the following characteristics of a cellular system guarantees that the call is neither interrupted nor dropped when the user switches between cells?
    (a) Roaming
    (b) Sectorization
    (c) Multiple access schemes
    (d) Handoff

100. Which of the following authority provides license to telecommunication service in Nepal
    (a) NTC
    (b) NTA
    (c) ISPs
    (d) NTV