Nepal Engineering Council Registration Examination
Model Question for <u>Electronics and Communication Engineering (AExE)</u>

Section A (60*1 = 60)

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

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) $\partial^2 u/\partial x^2 = v^2 \partial^2 u/\partial t^2$
    b) $\partial^2 u/\partial x^2 + v^2 \partial^2 u/\partial t^2 = 0$
    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

Section-B (20*2 = 40)

61. A 10 µH inductor, $\frac{40}{\pi^2}$ pF capacitor and a 628 Ω resistor are connected to form a series RLC circuit. Calculate Q-factor of this circuit at resonant frequency.
a) 1.0142×10^{-6}
b) 2.50
c) 1.0142×10^{-9}
d) 2.50×10^{-3}

62. A 400 mH coil of negligible resistance is connected to an AC circuit in which an effective current of 6 mA is flowing. Find out the voltage across the coil if the frequency is 1000 Hz.
a) 15.07V
b) 15079.67 V
c) 150.79 V
d) 15079 V

63. Convert $(312)_8$ into decimal:
a) $(200)_{10}$
b) $(202)_{10}$
c) $(204)_{10}$
d) $(206)_{10}$

64. A microcontroller is running a program with a clock frequency of 8 MHz. The microcontroller receives an interrupt request from an external device that requires 20 cycles to service. What is the time required to service the interrupt?
a) 2.5 µs
b) 20 ns
c) 40 ns
d) 160 ns

65. Output of the program below will be -------------

```
#include <iostream>
  class Encapsulation {
     private:   int data;

     public:  Encapsulation() : data(0) {}

     void setData(int value) {
                 data = value;
```

```
            }
        int getData() {
                    return data;
                    }
        };

int main() {
        Encapsulation obj;
        std::cout << obj.getData() << std::endl;
         return 0;
        }
```

   a) 0
   b) Garbage value
   c) Compilation error
   d) Runtime error

66. What is the output of the following C code?
     int x = 10, y = 20;
     int *p = &x, *q = &y;
     *p = *q;
    *q = 30;
     a) x = 10, y = 20
     b) x = 20, y = 30
     c) x = 30, y = 20
     d) x = 30, y = 30

67. What is the result of the (0x5A3D - 0x28F1) + 0xABCD in hexadecimal notation?
     a) 0x8D7F
     b) 0x8E7E
     c) 0x8F7D
     d) 0x907C

68. What is the output of the y <= (a and b) xor (not b and c); VHDL code?
     a) AND gate
     b) OR gate
     c) XOR gate
     d) NAND gate

69. What is the data rate required to transmit signal with max frequency component of
     10KHz for 8 bit per symbol?
     a) 80 KBPs
     b) 160 KBPs
     c) < 160 KBPs
     d) < 80 KBPs

70. A data packet of size 1500 bytes is to be transmitted over a network crossing 2 routers in between. Each network layer adds a header of 20 bytes. The packet is then encapsulated by a data link layer that adds a header of 30 bytes and a trailer of 10 bytes. What is the total size of the packet, including all headers and the data payload?
a) 1550 bytes
b) 1560 bytes
c) 1620 bytes
d) 1680 bytes

71. A charge of +5 µC is located at the origin of a coordinate system. What is the electric field strength at a point (3,4,0) meters away from the origin, in N/C?
a) 0.5 N/C
b) 1 N/C
c) 1.5 N/C
d) 2 N/C

72. A radio station is transmitting at a frequency of 101.5 MHz. What is the wavelength of the radio waves being transmitted?
a) 0.00296 meters
b) 2.96 meters
c) 29.6 meters
d) 296 meters

73. A digital communication system has a bit rate of 1 Mbps and uses quadrature phase shift keying (QPSK) modulation. What is the baud rate of the system?
a) 1 million baud
b) 500,000 baud
c) 250,000 baud
d) 125,000 baud

74. A signal with a power of 2 W is added to a noise source with a power of 1 W. What is the signal-to-noise ratio (SNR) in decibels (dB)?
a) 3 dB
b) 6 dB
c) 9 dB
d) 12 dB

75. A signal with 256 samples is processed using the DFT algorithm. What is the frequency resolution of the resulting spectrum in Hz?
a) 0.5 Hz
b) 1 Hz
c) 2 Hz
d) 4 Hz

76. Consider a system with impulse response $h(t) = 2e^{-t} u(t)$. If the input to the system is $x(t) = u(t)$, what is the output $y(t)$?
a) $y(t) = e^{-t} u(t)$

b) y(t) = 2(1 - e^(-t)) u(t)
c) y(t) = 2(e^(-t) - e^(-2t)) u(t)
d) y(t) = 2(1 - e^(-2t)) u(t)

77. A cellular network operates in a frequency band from 900 MHz to 960 MHz. If the carrier frequency spacing is 200 kHz, how many frequency channels are available for the network?
a) 280
b) 290
c) 300
d) 310

78. A spread spectrum system uses a chip rate of 1.25 Mbps and a spreading factor of 10. What is the data rate of the system in kbps?
a) 125
b) 250
c) 500
d) 1000

79. Effective monthly interest rate will be …………., if nominal interest rate of 10% accounted for continuous compounding
a) 1%
b) 0.84%
c) 1.2%
d) 2%

80. By considering following activities of a project, the project duration will be

Activity	A	B	C	D	E
Immediate predecessors	-	-	-	C	A, B, D
Duration (days)	4	5	3	7	5

a) 9 days

b) 10 days

c) 15 days

d) 24 days