

**Paper Code No: M32**

Question Booklet No. ....

**ENTRANCE EXAMINATION – 2021 - 22**

**SET – D**

**SSF JAMIA MILLIA ISLAMIA**  
**New Delhi**

Roll No

**Signature of Invigilator**

**Total Marks: 100**

**Time: 1 Hour 30 Minutes**














### **Instructions to Candidates**

1. Do not write your name or put any other mark of identification anywhere in the OMR Response Sheet. IF ANY MARK OF IDENTIFICATIONS IS DISCOVERED ANYWHERE IN OMR RESPONSE SHEET, the OMR sheet will be cancelled, and will not be evaluated.
2. **This Question Booklet contains the cover page and a total of 100 Multiple Choice Questions of 1 mark each.**
3. Space for rough work has been provided at the beginning and end. Available space on each page may also be used for rough work.
4. There is negative marking in Multiple Choice Questions. For each wrong answer, 0.25 marks will be deducted.
5. **USE/POSSESSION OF ELECTRONIC GADGETS LIKE MOBILE PHONE, iPhone, iPad, pager ETC. is strictly PROHIBITED.**
6. Candidate should check the serial order of questions at the beginning of the test. If any question is found missing in the serial order, it should be immediately brought to the notice of the Invigilator. No pages should be torn out from this question booklet.
7. Answers must be marked in the OMR Response sheet which is provided separately. OMR Response sheet must be handed over to the invigilator before you leave the seat.
8. The OMR Response sheet should not be folded or wrinkled. The folded or wrinkled OMR/Response Sheet will not be evaluated.
9. Write your Roll Number in the appropriate space (above) and on the OMR Response Sheet. Any other details, if asked for, should be written only in the space provided.
10. There are four options to each question marked A, B, C and D. Select one of the most appropriate options and fill up the corresponding oval/circle in the OMR Response Sheet provided to you. The correct procedure for filling up the OMR Response Sheet is mentioned below.

### CORRECT METHOD

(A) ● (C) (D)

## WRONG METHODS

WRONG METHODS											
(A)	<del>(B)</del>	(C)	(D)	(A)	<del>(B)</del>	(C)	(D)	(A)		(C)	(D)
(A)		(C)	(D)	(A)		(C)	(D)	(A)		(C)	(D)
(A)		(C)	(D)	(A)		(C)	(D)	(A)		(C)	(D)
(A)		(C)	(D)	(A)		(C)	(D)	(A)		(C)	(D)
(A)		(C)	(D)	(A)		(C)	(D)	(A)		(C)	(D)

1. The large signal bandwidth of an op-amp is limited by its
- a) CMRR
  - b) slew rate
  - c) Gain-bandwidth product
  - d) Input impedance

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2. The slew rate is the change of output voltage of an op-amp when a particular input is applied. What is that input?
- a) sine wave input
  - b) ramp input
  - c) pulse input
  - d) step input
3. A number is expressed in binary two's complement as 10011. Its decimal equivalent value is
- a) 19
  - b) 13
  - c) -19
  - d) ☒ -13
4. What is the Gray code word for the binary 101011 ?
- a) 101011
  - b) 110101
  - c) 011111
  - d) 111110
5. The hexadecimal representation of  $(657)_8$  is
- a) 1AF H
  - b) D78 H
  - c) D71 H
  - d) 23F H

6. An Excess-3 code arithmetic operation is used to perform the

- a) Binary addition
- b) Binary subtraction
- c) BCD addition
- d) BCD subtraction

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7. If the output of a logic gate is '1' when all its inputs are at logic '0', the gate is either

- a) a NAND or NOR
- b) an AND or an EX-NOR
- c) an OR or a NAND
- ☒ d) an EX-OR or an EX-NOR

8. How is inversion achieved using EX-OR gate?

- a) Giving input signal to the two input lines of the gate tied together
- ☒ b) Giving input to one input line and logic zero to the other line
- ☒ c) Giving input to one input line and logic one to the other line
- d) Inversion cannot be achieved using EX-OR gate

9. The output of a NOR gate is

- a) high if all of its inputs are high
- b) low if all of its inputs are low
- ☒ c) high if all of its inputs are low
- d) high if only one of its input is low

$$\overline{a+b}$$

[4]

10. In a negative edge triggered J-K flip-flop, in order to have the output Q state 0, 0 and 1 in the next three successive clock pulses, the J-K input states required would be respectively

- a) 11, 00 and 10
- b) 00, 01 and 11
- c) 00, 10 and 11
- d) 01, 10 and 11

11. A T-flip-flop function is obtained from a JK flip-flop. If the flip-flop belongs to a TTL family, the connection needed at the input must be

- a)  $J = K = 1$
- b)  $J = K = 0$
- c)  $J = 1$  and  $K = 0$
- d)  $J = 0$  and  $K = 1$

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12. A ring counter consisting of five flip-flops will have

- a) 5 states
- b) 10 states
- c) 32 states
- d) infinite states

13. A crystal oscillator is frequently used in digital circuits for timing purposes because of its

- a) low cost
- b) high frequency stability
- c) simple circuitry
- d) ability to set the frequency at the desired value

14. The total number of 1's in a 15-bit shift register is to be counted by clocking into a counter which is preset to 0. The counter must have which one of the following?

- a) 4-bits
- b) 5-bits
- c) 16-bits
- d) 6-bits

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15. Which of the following flip-flop is used as a latch?

- a) J K flip-flop
- b) R S flip-flop
- c) T flip-flop
- d) D flip-flop

16. A p-n junction diode's dynamic conductance is directly proportional to

- a) the applied voltage
- b) the temperature
- ☒ c) its current
- d) the thermal voltage

17. The depletion layer across a  $p^+$ -n junction lies

- a) mostly in  $p^+$  region
- b) mostly in n region
- ☒ c) equal in both the  $p^+$  and n regions
- d) entirely in the  $p^+$  region

18. The reverse current of a silicon diode is

- a) highly bias voltage sensitive
- b) highly temperature sensitive
- ☒ c) both bias voltage and temperature sensitive
- d) independent of bias voltage and temperature

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19. A combination of two diodes connected in parallel when compared to a single diode can withstand

- a) twice the value of peak inverse voltage
- b) twice the value of maximum forward current
- c) a larger leakage current
- d) twice the value of cut-in voltage

20. The depletion region in a semiconductor p-n junction diode has

- ☒ a) electrons and holes
- b) positive and negative ions on either side
- c) neither electrons nor ions
- d) no holes

21. Which one of the following statements is correct? Under small signal operation of a diode

- a) its bulk resistance increases
- b) its junction resistance predominates
- c) it acts like a closed switch
- d) it behaves as a clipper

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22. The 'voltage stability with time' of reference diodes incorporating Zener diodes is comparable to that of which of the following?

- a) Dry cells
- b) Nickel-cadmium cells
- c) Lead-acid accumulator batteries
- d) Conventional standard cells

23. With the increase of reverse bias in a p-n diode, the reverse current

- a) decreases
- b) increases
- c) remains constant
- d) may increase or decrease depending upon doping

24. A heavily doped semiconductor has

- a) a resistivity which decreases exponentially with temperature
- b) a resistivity which rises almost linearly with temperature
- c) a negative temperature coefficient of resistance
- d) a positive temperature coefficient of resistance

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25. In a junction transistor, the collector cut-off current ' $I_{CBO}$ ' reduces considerably by doping the

- a) emitter with high level of impurity
- b) emitter with low level of impurity
- c) collector with high level of impurity
- d) collector with low level of impurity

26. A transistor has a current gain of  $\beta = 0.99$  in CB mode. Its current gain in CC mode is

a) 100      b) 99

c) 1.01      d) 0.99

Handwritten notes:  $\beta = \frac{I_C}{I_B} = \frac{I_C}{I_C - I_C \beta} = \frac{1}{1 - \beta}$

27. At 25°C, the collector-emitter voltage drop of a silicon transistor at saturation is approximately

- a) 0.1 V      b) 0.3 v
- c) 0.5 V      d) 0.7 v

28. For a npn bipolar transistor, what is the main stream of current in the base region?

- a) Drift of holes
- b) Diffusion of holes
- c) Drift of electrons
- ~~b~~ d) Diffusion of electrons

29. The Early effect in bipolar junction transistor is caused by

- a) fast turn-on
- b) fast turn-off
- c) large emitter to base forward bias
- d) large collector to base bias

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30. How is an n-channel JFET operated as an amplifier?

- a) With a forward bias gate-source junction
- b) With a reverse bias gate-source junction
- c) With an open gate-source junction
- d) With a shorted gate-source junction

31. A gate to drain-connected enhancement mode MOSFET is an example of

- a) an active load
- b) a switching device
- c) a three-terminal device
- d) a diode

32. Thermal run-away is not possible in FET because, as the temperature of FET increases

- a) the drain current increases      b) the mobility increases
- c) the mobility decreases      d) the transconductance increases

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33. What is an advantage of MOS transistor structure in integrated circuits?

- a) Faster switching
- b) Less capacitance
- c) Higher component density and lower cost
- d) Lower resistances

34. An LED made using GaAs emits radiation in

- ✓ a) Visible region      b) Ultraviolet region
- c) Infrared region      d) Microwave frequency region

35. LED is a

- a) p-n diode      b) thermistor
- c) gate      ✓ d) transistor

36. Gauss theorem uses which of the following operation?

- a) Gradient
- b) Curl
- ☒ c) Divergence
- d) Laplacian

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37. If  $A = \begin{bmatrix} 3 & x-1 \\ 2x+3 & x+2 \end{bmatrix}$  is a symmetric matrix, then  $x = ?$

- a) 4
- b) 3
- ☒ c) -4
- d) -3

38. The sum of Eigenvalues for the matrix  $A = \begin{bmatrix} 3 & 6 & 7 \\ 5 & 4 & 2 \\ 7 & 9 & 1 \end{bmatrix}$  is

$\Rightarrow A+B+C = 7$

- a) 7
- b) 9
- c) 8
- d) 10

$|A - \lambda I| = \begin{vmatrix} 3-\lambda & 6 & 7 \\ 5 & 4-\lambda & 2 \\ 7 & 9 & 1-\lambda \end{vmatrix}$

39. The Fourier series expansion of an even function contains?

- ☒ a) Only cosine terms
- b) Only sine terms
- c) Only cosine terms and a constant
- d) Both the sine and cosine terms

40. The concept of matter wave was first suggested by

- ☒ a) Heisenberg                      ☒ b) de Broglie  
c) Schrodinger                      d) Laplace

41. The total probability of finding the particle in space must be

- a) zero                      ☒ b) unity  
c) infinity                      d) double

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42. The de-Broglie hypothesis is associated with

- ☒ a) Wave nature of electrons only  
☒ b) Wave nature of alpha-particles only  
☒ c) Wave nature of radiations  
☒ d) Wave nature of all material particles

43. Which of the following is not a fermion ?

- a) Muons                      ☒ b) Electrons  
c) Neutrons                      d) Photon

44. Kinetic energy of emitted electrons depends upon

- ☒ a) frequency  
b) intensity  
☒ c) nature of atmosphere surrounding the electrons  
☒ d) none of these

45. Which of the following can be used for generation of laser pulse?

- a) Ruby laser
- b) Carbon dioxide laser
- c) Helium-neon laser
- d) Nd-YAG laser

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46. Which of the followings is the most beneficial index profile for single mode fibre?

- a) Step-index
- b) Coaxial cable
- c) Graded index
- d) Step and graded index

47. Which of the following can induce a considerable amount of attenuation in optical fibres?

- a) Dispersion
- b) Micro-bending
- c) Radiation exposure
- d) Diffusion of hydrogen

48. If voltage applied on a capacitor is increased from  $V$  to  $2V$ , choose the correct conclusion

- a)  $Q$  remains the same,  $C$  is doubled
- b)  $Q$  is doubled,  $C$  doubled
- c)  $C$  remains same,  $Q$  doubled
- d) Both  $Q$  and  $C$  remain same

49. What is the value of capacitance that must be connected in parallel with 50 pF condenser to make an equivalent capacitance of 150 pF ?

- |           |           |
|-----------|-----------|
| a) 50 pF  | b) 100 pF |
| c) 150 pF | d) 200 pF |

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50. The interval of frequencies outside which the spectrum is zero is called as

- |                           |                          |
|---------------------------|--------------------------|
| a) null to null bandwidth | b) normalized bandwidth  |
| c) absolute bandwidth     | d) none of the mentioned |

51. Synchronization available in digital communication are

- |                            |                          |
|----------------------------|--------------------------|
| a) Symbol synchronization  | b) Frame synchronization |
| c) Carrier synchronization | d) All of the mentioned  |

52. In stimulated absorption, what is the lifetime of atoms ground state?

- |             |             |
|-------------|-------------|
| a) 1 second | b) 1 minute |
| c) 1 hour   | d) Infinity |

53. Which of the following variables controls the physical properties of a perfect gas

- |             |                     |
|-------------|---------------------|
| a) pressure | b) temperature      |
| c) volume   | d) all of the above |

54. Which photon is more energetic

- a) Both b) Red  
c) Violet d) Neither

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55. Identify a good dielectric.

- a) Iron b) Ceramics  
c) Plastic d) Magnesium

56. In an indirect bandgap semiconductor, a transition between conduction band and valance band results in

- a) heat b) light  
c) both d) none of the above

57. What is Eigen value?

- a) A vector obtained from the coordinates  
b) A matrix determined from the algebraic equations  
c) A scalar associated with a given linear transformation  
d) It is the inverse of the transform

58. Divergence and Curl of a vector field are

- a) Scalar & Scalar b) Scalar & Vector  
c) Vector & Vector d) Vector & Scalar

59. What is the level that acts as a reference which separated the vacant and filled states at OK?

- a) Excited level
- b) Ground level
- c) Valance orbit
- d) Fermi energy level

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60. Addition of pentavalent impurity to a semiconductor creates many

- a) Free electrons
- b) Holes
- c) Valence electrons
- d) Bound electrons

61. Examples of digital communication are

- a) ISDN
- b) Modems
- c) Classical telephony
- d) All of the mentioned

62. Pure silicon at 0 K is an

- a) Intrinsic semiconductor
- b) Extrinsic semiconductor
- c) Metal
- d) Insulator

63. Calculate the Zero-point energy for a particle in an infinite potential well for an electron confined to a 1 nm atom.

- a)  $3.9 \times 10^{-29} \text{ J}$
- b)  $4.9 \times 10^{-29} \text{ J}$
- c)  $5.9 \times 10^{-29} \text{ J}$
- d)  $6.9 \times 10^{-29} \text{ J}$

64. What is the minimum Energy possessed by the particle of mass  $m$  in a one-dimensional box of side  $l$ ?

a)  $\frac{\pi^2 h^2}{2ml}$

b)  $\frac{\pi^2 h^2}{2ml^2}$

c)  $\frac{\pi^2 h}{2ml}$

d) Zero

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65. The correct sequence of subsystems in an FM receiver is

- a) mixer, RF amplifier, limiter, IF amplifier, discriminator, audio amplifier
- b) RF amplifier, mixer, IF amplifier, limiter, discriminator, audio amplifier
- c) RF amplifier, mixer, limiter, discriminator, IF amplifier, audio amplifier
- d) mixer, IF amplifier, limiter, audio amplifier, discriminator

66. A 10 kW carrier is sinusoidally modulated by two carriers corresponding to a modulation index of 30% and 40% respectively. The total radiated power is

a) 11.25 kW

b) 12.5 kW

c) 15 kW

d) 17 kW

67. If the modulation index of an AM wave is changed from 0 to 1, what will be the effect on transmitted power?

a) Unchanged

b) Halved

c) Increased by 50%

d) Quadrupled

68. In an SSB transmitter one is most likely to find

- a) Class-C audio amplifier
- b) Tuned modulator
- c) Class-B RF amplifier
- d) Class-AB power amplifier

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69. Why does an FM radio station perform better than an AM station radiating the same total power?

- a) FM is immune to noise
- b) AM has only two sidebands while FM has more
- c) FM uses larger bandwidth for larger modulation depth
- d) Capture effect appears in FM

70. A balanced modulator, is used in the generation of which of the following?

- a) DSB-SC signal
- b) FM signal
- c) PM signal
- d) PAM signal

71. An AM signal with a carrier of 1 kW has 200 W in each side band. The percentage of modulation is

- a) 20%
- b) 89.4%
- c) 49.7%
- d) 40%

72. Amplitude modulation is used for broadcasting because
- a) it is more noise immune than other modulation systems
  - b) compare with other system it requires less transmitting power
  - c) Its use avoids receiver complexity
  - d) no other modulation system can provide the necessary BW for high fidelity

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73. Time division multiplexing requires
- a) constant data transmission
  - b) transmission of data samples
  - c) transmission of data at random
  - d) transmission of data of only one measurand
74. In a PCM system each quantisation level is encoded into 8 bits. The signal to quantisation noise ratio is equal to
- a) 24 dB
  - b) 48 dB
  - c) 64 dB
  - d) 256 dB
75. Which one of the following is correct? In a TDM system each signal is allotted in a frame a unique and fixed
- a) frequency slot
  - b) time slot
  - c) amplitude slot
  - d) phase slot

76. The frequency of the driving network connected between pins 1 and 2 of a 8085 chip must be

- a) equal to desired clock frequency
- b) twice the desired clock frequency
- c) four times the desired clock frequency
- d) eight times the desired clock frequency

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77. The content of accumulator in an 8085 microprocessor are altered after the execution of the instruction ?

- |           |           |
|-----------|-----------|
| a) CMP C  | b) CPI 3A |
| c) ANI 5C | d) ORA A  |

78. An 8085 microprocessor after the execution of XRA A instruction

- a) the Carry flag is set
- b) the accumulator contains  $FF_H$
- c) the content of accumulator is shifted by one
- d) the Zero flag is set

79. The first machine cycle of an instruction is always

- |                        |                         |
|------------------------|-------------------------|
| a) A memory read cycle | b) A fetch cycle        |
| c) An I/O read cycle   | d) A memory erite cycle |

80. Which of the following interrupts is both level and edge sensitive?

- a) RST 7.5
- b) RST 5.5
- c) TRAP
- d) INTR

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81. READY signal in 8085 is useful when the CPU communicates with

- a) A slow peripherals device
- b) A fast peripheral device
- c) A DMA controller chip
- d) A PPI chip

82. In a microprocessor, the register which holds the address of the next instruction to be fetched is

- a) Accumulator
- b) Program counter
- c) Stack pointer
- d) Instruction register

83. In a microprocessor when a CPU is interrupted, it

- a) Stops execution of instructions
- b) Acknowledge interrupt and branches of subroutine
- c) Acknowledge interrupt and continues
- d) Acknowledge interrupt and waits for the next instruction from the interrupting device

84. In an 8086 microprocessor, if the code segment register contains 1FAB and IP register contains 10A1, the effective memory address is

- |          |         |
|----------|---------|
| a) 20B51 | b) 304C |
| c) FBC0  | d) FDB5 |

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85. In the 8086 instruction ADD DX, [BX] [CI], the addressing mode of source operand is

- |                  |                      |
|------------------|----------------------|
| a) Register      | b) Register indirect |
| c) Based indexed | d) Direct            |

86. What is the address space of 8086 CPU?

- |          |           |
|----------|-----------|
| a) 1 MB  | b) 256 KB |
| c) 12 MB | d) 64 KB  |

87. Which of the following control bits of 8086 flag register is used to put the 8086 in single step mode?

- |       |       |
|-------|-------|
| a) DF | b) IF |
| c) TF | d) ZF |

88. For 8086 microprocessor, the jump distance in bytes for short jump range is

- a) Forward 255 and backward 256
- b) Forward 127 and backward 128
- c) Forward 31 and backward 32
- d) Forward 15 and backward 16

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89. Which of the following is used as the interface chip for data transmission between 8086 and a 16-bit ADC?

- a) 8259
- b) 8255
- c) 8253
- d) 8251

90. The 8254 programmable interval timer is set to work in MODE 5. The following would best describe its function

- a) Software triggered strobe
- b) Hardware triggered strobe
- c) Square wave triggered
- d) Interrupt on terminal count

91. In a single-stage differential amplifier, the output offset voltage is basically dependent on the mismatch of

- a)  $V_{BE}$ ,  $I_B$  and  $\beta$
- b)  $V_{BE}$  and  $I_B$
- c)  $I_B$  and  $\beta$
- d)  $V_{BE}$  and  $\beta$

92. An op-amp has open-loop gain 100000 and the open-loop upper cut-off frequency is 20 Hz. The unity-gain frequency of the op-amp is

- a) 2 MHz
- b) 1 MHz
- c) 3 kHz
- d) 2 kHz

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93. In a 741 op-amp, there is 20 dB/decade fall-off starting at a relatively low frequency. This is due to the

- a) applied load
- b) internal compensation
- c) impedance of the source
- d) power dissipation in the chip

94. In a circuit, if the open loop gain is  $10^6$  and output voltage is 10 volts, the differential voltage should be

- a)  $10 \mu\text{V}$
- b) 0.1 v
- c)  $100 \mu\text{V}$
- d)  $1 \mu\text{V}$

95. An op-amp possesses

- ~~a)~~ very large input resistance and very large output resistance
- b) very small input resistance and very small output resistance
- ~~c)~~ very large input resistance and very small output resistance
- d) very small input resistance and very large output resistance

96. A triangular-square wave generator uses

- a) a sine wave oscillation and a comparator
- b) an integrator and a comparator
- c) a differentiator and a comparator
- ☒ d) a sine wave oscillator and a clipper

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97. A differential amplifier has inputs,  $V_1 = 1050 \mu\text{V}$  and  $V_2 = 950 \mu\text{V}$  with  $\text{CMRR} = 1000$ . What is the error in the differential output?

- |         |          |
|---------|----------|
| a) 10%  | b) 1%    |
| c) 0.1% | d) 0.01% |

98. Which of the following causes phase shift through an op-amp?

- a) internal RC circuit
- b) external RC circuit
- c) gain roll off of the internal transistor
- d) negative feedback

99. The main advantage of active filter is that it can be realized without using

- |               |              |
|---------------|--------------|
| a) transistor | b) capacitor |
| c) resistor   | d) inductor  |

100. Most of the linear ICs are based on two-transistor differential amplifiers because of

- a) input voltage-dependent linear transfer characteristics
- b) high voltage gain
- c) high input resistance
- d) shigh CMRR

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