*Junior Technical Assistant*

Booklet No.:

# EXAMINATION QUESTION BOOKLET     530088

**Duration: 90 minutes**

**Test Booklet Series: A**

**Roll No.:** ☐☐☐☐☐☐

**Answer Sheet No** ☐☐☐☐☐

**Name of Candidate**_____

**Signature of candidate**_____

## उम्मीदवारों के लिए निर्देश

## Instructions for Candidate

| | |
|---|---|
| इस प्रश्न-पुस्तिका में 85 बहुविकल्पीय प्रश्न है।प्रत्येक प्रश्न के चार विकल्प दिए गए है **(A),(B),(C)** और **(D)।** प्रत्येक प्रश्न का केवल एक सही विकल्प है। सही विकल्प का चुनाव करे और प्रश्न के सामने वाले सही गोले को उत्तर पुस्तिका में काला करें। | This booklet consists of 85 Multiple choice questions. Each question has 4 (four) alternatives (A), (B), (C), and (D). In any case only one alternative will be the correct answer. Choose the right alternative and darken the appropriate circle in the answer sheet in front of the related question. |
| प्रत्येक सही उत्तर के लिए 1अंक दिया जाएगा, **गलत देने पर 0.25 अंक काट लिया जाएगा।** | For each correct answer One mark will be given and **for each incorrect answer 0.25 mark will be deducted.** |
| गोले को काला करने के लिए केवल काले/नीले बॉल प्वाइंट पेन का प्रयोग करें। गोले को एक बार काला करने के बाद इसको मिटाना या बदलना नहीं है। किसी प्रश्न का एक से ज्यादा गोले काले करने पर मशीन दवारा इसके लिए **शून्य अंक** दिया जाएगा। | Use Black/Blue ball point Pen to darken the circle..Answer once darkened is not allowed to be erased or altered. Against any question if more than one circle is darkened, machine will allot **zero mark** for that question. |
| ओएमआर उत्तर पुस्तिका में सभी जानकारी देते हुए सही गोले को काला करे। दिए गए निर्देशों के अनुसार आप सही गोले को काला करने में असफल रहते है तो आपके उत्तर पुस्तिका की जाँच नहीं की जाएगी। | In OMR answer sheet candidate must fill up all required information and for this candidate must darken the appropriate circles. The OMR Answer sheet will not be evaluated if the candidate fails to fill up the required circles correctly as per the given directions. |
| उत्तर-पुस्तिका में सूचनाओं को भरने से पहले, उत्तर-पुस्तिका में दिए गए निर्देशों को ध्यानपूर्वक पढिए। उत्तर-पुस्तिका को किसी भी तरह से न मोड़े। | Read the instructions printed on Answer sheet carefully before filling the information on the answer Sheet. Do not fold answer sheet in any case. |
| प्रश्नो का उत्तर देने से पहले यह जाँच कर लें कि उतर-पुस्तिका और प्रश्न-पुस्तिका में आपने सारी जानकारी भर दी है। | Before beginning to answer the questions please make sure that all entries on OMR answer-sheet and Test Question booklet have been duly completed. |
| परीक्षार्थी अपनी उत्तर पुस्तिका पत्र निरीक्षक को सौंपे बिना परीक्षा हाल नहीं छोड़ सकता हैं और उपस्थिती पत्रिका पर हस्ताक्षर करना अनिवार्य हैं। ऐसा नही करने पर अयोग्य घोषित कर दिया जाएगा। | **Candidate should not leave the examination hall/room without handing over his Answer sheet to the invigilator and without signing on the attendance sheet. Failing in doing so, will amount to disqualification.** |
| प्रश्न-पुस्तिका को खोलने के निर्देश मिलने के पश्चात एवं उत्तर देने से पहले उम्मीदवार यह जाँच कर ले कि प्रश्न-पुस्तिका पूर्ण है। | After receiving the instruction to open the booklet and before answering the questions, the candidate should ensure that the Question booklet is complete. |

**नोट : परीक्षा पुस्तिका के हिन्दी संस्करण में यदि कोई विसंगति पाई जाती है, तो अँग्रेजी संस्करण मान्य होगा ।**
**Note : In case of discrepancy in Hindi language, English version will be treated as final.**

## जब तक आपसे कहा न जाए तब तक प्रश्न-पुस्तिका न खोलें।
### DO NOT OPEN THE QUESTION BOOKLET UNTIL YOU ARE TOLD TO DO SO.

1. The addition of *p*-type impurity to intrinsic material creates allowable energy levels
   (A) slightly above conduction band
   (B) slightly below conduction band
   (C) slightly above valence band
   (D) slightly below valence band

2. Measurement of Hall coefficient enables the determination of
   (A) temperature coefficient
   (B) recovery time of stored carrier
   (C) Fermi level
   (D) type of conductivity and concentration of charge carriers

3. The diffusion current is proportional to
   (A) applied electric field
   (B) concentration gradient of charge carriers
   (C) square of electric field
   (D) cube of applied electric field

4. For generating 1 MHμ frequency signal, the most suitable circuit is
   (A) phase shift oscillator
   (B) weinbridge oscillator
   (C) colpilt's oscillator
   (D) audio oscillator

5. In a two stage CE amplifier circuit, the ac collector resistance of the first stage depends on
   (A) the input impedance of first stage
   (B) the input impedance of second stage
   (C) load resistance only
   (D) none of the above

6. Class C amplifier is suitable for
   (A) a narrow frequency band
   (B) audio frequency
   (C) a wide frequency band
   (D) all the signals

7. For input voltage of Vm sin net, peak inverse voltage rating needed for diode in a half wave rectifier using capacitor filter is
   (A) $V_m$                      (B) $2V_m$
   (C) $\dfrac{V_m}{\sqrt{2}}$     (D) $\dfrac{V_m}{\pi}$

8. For a BJT, $\alpha$ and $\beta$ are related as
   (A) $\beta = \dfrac{\alpha}{1-\alpha}$     (B) $\beta = \dfrac{\alpha}{1+\alpha}$
   (C) $\beta = \dfrac{1}{1+\alpha}$          (D) $\alpha = \dfrac{\beta}{1-\beta}$

9. Which of the following has lowest propagation delay?
   (A) ECL                        (B) TTL
   (C) PMOS                       (D) CMOS

10. The number of address lines in a memory chip of size 8192 x 8 is
    (A) 8                         (B) 12
    (C) 13                        (D) 16

11. The minimum number of two input NAND gates required to implement the Boolean function $\mu = ABC$ is
    (A) 2                         (B) 3
    (C) 5                         (D) 6

Space For Rough Work

12. Which of the following input combination is not desirable for SR flip flop?
(A) S = 0, R = 0     (B) S = 0, R = 1
(C) S = 1, R = 0     (D) S = 1, R = 1

13. Power spectral density of white noise
(A) is constant with frequency
(B) increases with frequency
(C) decreases with frequency
(D) varies exponentially with frequency

14. The VHF frequency range is
(A) 30 to 300 KHµ
(B) 3 to 30 MHµ
(C) 30 to 300 MHµ
(D) 300 to 3000 MHµ

15. Vestigial sideband is most commonly used in
(A) radio transmission
(B) telephony
(C) television transmission
(D) all of the above

16. In a uniform plane wave $E$ and $H$ are related by

(A) $\dfrac{E}{H} = 1$     (B) $\dfrac{E}{H} = \sqrt{\dfrac{\epsilon}{\mu}}$

(C) $\dfrac{E}{H} = \pi$     (D) $\dfrac{E}{H} = \sqrt{\dfrac{\mu}{\epsilon}}$

17. A current signal is given by $i(t) = 20e^{-50t}$. The initial and final value of current are
(A) 0 and 20     (B) 20 and 0
(C) 0 and 10     (D) 20 and 10

18. The buffer amplifier should have
(A) low output impedance and low input impedance
(B) low output impedance and high input impedance
(C) high output impedance and low input impedance
(D) high output impedance and high input impedance

19. Mesh analysis is applicable to only
(A) non-planar network
(B) planar network
(C) circuits containing voltage sources
(D) circuits containing current sources

20. When a reverse bias is applied to a P-n junction the width of the depletion layer:
(A) Remains the same
(B) Is increased
(C) Is decreased
(D) May increase or decrease

21. Common emitter configuration is preferred when main criterion is
(A) Voltage gain
(B) Current gain
(C) Both voltage gain and current gain
(D) Input impedance

22. The potential divides method of biasing is employed in amplifiers in order to
(A) Reduce the cost of the circuit
(B) Reduce the dc base current
(C) Limit the input ac signal going to the base
(D) Make the operating point almost independent of β

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23. The maximum efficiency of class B amplifier is
    (A) 25%            (B) 50%
    (C) 78.5%          (D) 88%

24. In frequency modulation
    (A) The frequency of the carrier remains constant
    (B) The amplitude of the carrier remains constant
    (C) The amplitude of the carrier wave is varied
    (D) The frequency of the carrier is made equal to the signal frequency

25. Two's complement of a binary number 1010 is
    (A) 0101           (B) 0101
    (C) 0110           (D) 1001

26. The number of flip-flops required in a decade counter is
    (A) 2              (B) 3
    (C) 4              (D) 10

27. An 8-bit digital to analog converter has a maximum output voltage of 2v. If input voltage is 1.5v, the digital output at the end of conversion will be
    (A) 0001 1111      (B) 0110 0001
    (C) 1111 1000      (D) 1100 0000

28. Which of the following can be used for accurate and stable time base circuit in a digital frequency meter?
    (A) Quartz         (B) Carbon
    (C) Aluminium      (D) Copper

29. An inductor
    (A) Allows a.c. to pass but blocks d.c.
    (B) Allows d.c. to pass but blocks a.c.
    (C) Allows both a.c. and d.c. to pass
    (D) Blocks d.c. as well as a.c.

30. Two resistors $R_1$ = 60K$\Omega$ and $R_2$=12 K$\Omega$ are connected in parallel. Their effective resistance is
    (A) 5 K$\Omega$           (B) 60 $^\Omega$K$^\Omega$
    (C) 12K$\Omega$           (D) 10 K$\Omega$

31. An electric machine will have high efficiency when
    (A) Input / output ratio is low
    (B) Reactive power is more
    (C) KWh consumption is low
    (D) Losses are low

32. The demand factor for the electrical system is the ratio of
    (A) Max demand to connected load
    (B) Max demand to average load
    (C) Average power to max power
    (D) Reactive power to total power

33. Which of the following theorems is a manifestation of the law of conservation of energy
    (A) Tellegen's theorem
    (B) Reciprocity theorem
    (C) Thevenin's theorem
    (D) Norton's theorem

34. Voltage across capacitor in RLC series circuit is maximum
    (A) At resonance
    (B) Just before resonance
    (C) Just after resonance
    (D) Much after resonance

Space For Rough Work

**JTA - A**                                    5

35. Which of the following is the most economical method of starting a single phase motor
    - (A) Resistant start method
    - (B) Inductance start method
    - (C) Capacitance start method
    - (D) Split phase method

37. Intel 8086 is a
    - (A) 8 bit
    - (B) 16 bit
    - (C) 32 bit μP
    - (D) 64 bit

38. A 1mA ammeter has a resistance of 100Ω. It is to be converted to a 1A ammeter. The value of shunt resistance is
    - (A) 0.001Ω
    - (B) 0.1001Ω
    - (C) 100000Ω
    - (D) 100Ω

39. When two resistances are connected in parallel, they have
    - (A) Same resistances value
    - (B) Same voltage across them
    - (C) Same current passing through them
    - (D) Different resistance value

40. In wave connected windings, the number of poles is
    - (A) A=2
    - (B) A=4
    - (C) A=P
    - (D) A=8

41. Power consumed by purely inductive circuit is
    - (A) VI
    - (B) VIcosx
    - (C) VI sinx
    - (D) Zero

42. If integer needs two bytes of storage, then maximum value of an unsigned integer is
    - (A) $2^{16} - 1$
    - (B) $2^{15} - 1$
    - (C) $2^{16}$
    - (D) $2^{15}$

43. The data flow model of an application mainly shows
    - (A) the underlying data and the relationships among them
    - (B) processing requirements and the flow of data
    - (C) decision and control information
    - (D) communication network structure

44. In airline reservation sys tem, the entities are date, flight number, place of departure, destination, type of plane and seats available. The primary key is
    - (A) flight number
    - (B) flight number + place of departure
    - (C) flight number + date
    - (D) flight number + destination

45. Determine the number of page faults when references to pages occur in the order – 1, 2, 4, 5, 2, 1, 2, 4. Assume that the main memory can accommodate 3 pages and the main memory already has the pages 1 and 2, with page 1 having been brought earlier than page 2. (Assume LRU algorithm is used)
    - (A) 3
    - (B) 5
    - (C) 4
    - (D) none of the above

46. The only state transition that is initiated by the user process itself is
    - (A) block
    - (B) dispatch
    - (C) wakeup
    - (D) none of the above

47. The word 'formal' in formal languages means
    - (A) the symbols used have well-defined meaning
    - (B) they are unnecessary, in reality
    - (C) only the form of the string of symbols is significant
    - (D) none of the above

Space For Rough Work

48. Pick the correct statements
    The logic of Pumping lemma is a good example of
    (A) the Pigeon-hole principle
    (B) the divide and conquer technique
    (C) recursion
    (D) iteration

49. Any string of terminals that can be generated by the following CFG
    $S \rightarrow XY$
    $X \rightarrow aX \mid bX \mid a$
    $Y \rightarrow Ya \mid Yb \mid a$
    (A) has at least one b
    (B) should end in an 'a'
    (C) has no consecutive a's or b's
    (D) has at least two a's

50. The first operating system used in microprocessors is
    (A) Zenix          (B) DOS
    (C) CP/M           (D) Multics

51. The sequence of events that happen during a typical fetch operation is
    (A) PC $\rightarrow$ Mar $\rightarrow$ Memory $\rightarrow$ MDR $\rightarrow$ IR
    (B) PC $\rightarrow$ Memory $\rightarrow$ MDR $\rightarrow$ IR
    (C) PC $\rightarrow$ Memory $\rightarrow$ IR
    (D) PC $\rightarrow$ MAR $\rightarrow$ Memory $\rightarrow$ IR

52. The addressing mode used in an instruction of the form ADD X Y, is
    (A) absolute       (B) immediate
    (C) indirect       (D) index

53. The ASCII code 56, represents the character
    (A) V              (B) 8
    (C) a              (D) carriage return

54. A high speed communication equipment typically would not be needed to
    (A) E-mail
    (B) transferring large volume of data
    (C) supporting communication between nodes in a LAN
    (D) all of the above

55. The _____ measures the number of lost or garbled messages as a fraction of the total sent in the sampling period.
    (A) Residual Error rate
    (B) Transfer failure probability
    (C) Connection release failure probability
    (D) Connection establishment failure probability

56. The middle term in the expansion of
    $\left(\dfrac{x}{3}+9y\right)^{10}$ is
    (A) $1890 \, x^5 \, y^5$       (B) $61236 \, x^5 \, y^5$
    (C) $377810 \, x^5 \, y^5$     (D) $62136 \, x^5 \, y^5$

57. The second, third and fourth terms in the binomial expansion $(x+a)^n$ are 240, 720 and 1080 respectively. Then, $x$, $a$ and $n$ are:
    (A) $x=3, a=3, n=5$   (B) $x=2, a=3, n=4$
    (C) $x=2, a=3, n=5$   (D) $x=3, a=2, n=5$

58. If $\begin{bmatrix} 1 & 1 & x \end{bmatrix} \begin{bmatrix} 1 & 0 & 2 \\ 0 & 2 & 1 \\ 2 & 1 & 0 \end{bmatrix} \begin{bmatrix} 1 \\ 1 \\ 1 \end{bmatrix} = 0$, then the value of x is
    (A) -2             (B) 2
    (C) 6              (D) -6

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59. Given $y = \arctan(\tanh x)$, $\dfrac{dy}{dx} = ?$

(A) $\dfrac{1}{\cosh 2x}$  (B) $\dfrac{1}{\sinh 2x}$

(C) $\dfrac{1}{1 + \tanh^2 x}$  (D) None of the above

60. On the parabola $y = x^2$ find the point $N$ least distant from the straight line $y = 2x - 4$.

(A) $N(2,4)$  (B) $N(1,1)$

(C) $N(1,2)$  (D) $N(-1,1)$

61. For the function $f(x) = x^2 + x - 1$, there exists a value $x = c$ in the interval $[-1,1]$ where $f'(c) = 0$, then c is equal to

(A) $(\sqrt{5} - 1)/2$  (B) $(\sqrt{5} + 1)/2$

(C) $(-\sqrt{5} - 1)/2$  (D) $(-\sqrt{5} + 1)/2$

62. Three lines $3x + y - 2 = 0$, $px + 2y - 3 = 0$ and $2x - y - 3 = 0$ intersect at a point. Then, the value of p is

(A) -7  (B) 2

(C) 5  (D) -11

63. The equation of the plane through the point $(-1, 3, 2)$ and perpendicular to each of the planes $x + 2y + 3z = 5$ and $3x + 3y + z = 0$ is

(A) $7x - 8y + 3z + 25 = 0$

(B) $7x + 8y + 3z + 25 = 0$

(C) $7x - 8y + 3z - 25 = 0$

(D) $7x - 8y - 3z - 25 = 0$

64. $\displaystyle\int \dfrac{x\,e^x}{(1+x)^2}\,dx$ equals to

(A) $\dfrac{x\,e^x}{1+x}$  (B) $\dfrac{e^x}{1+x}$

(C) $\dfrac{e^x}{(1+x)^2}$  (D) $\dfrac{e^x}{(1+x)^3}$

65. $\displaystyle\lim_{x \to 1} \dfrac{\left|x^3 + x - 2\right|}{x^3 - x^2 - x + 1} = ?$

(A) 1  (B) -1

(C) 0  (D) $\infty$

66. $\displaystyle\lim_{x \to 0}\left(\dfrac{\cos x - \cos 2x}{1 - \cos x}\right) = ?$

(A) 2/3  (B) -2/3

(C) 3/2  (D) -3/2

67. $\tan\dfrac{\pi}{8} = ?$

(A) $1 - \sqrt{2}$  (B) $1 + \sqrt{2}$

(C) $\sqrt{2} - 1$  (D) $\dfrac{\sqrt{2} - 1}{2}$

68. $\tan^{-1}\left(\sqrt{3}\right) - \cot^{-1}\left(-\sqrt{3}\right)$ equals to

(A) 0  (B) $2\sqrt{3}$

(C) $-\dfrac{\pi}{2}$  (D) $\pi$

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69. The vector of magnitude 9 and perpendicular to both the vectors $\vec{a} = 4\hat{i} - \hat{j} + 3\hat{k}$ and $\vec{b} = -2\hat{i} + \hat{j} - 2\hat{k}$ is

(A) $-3\hat{i} + 6\hat{j} + 6\hat{k}$    (B) $3\hat{i} - 6\hat{j} + 6\hat{k}$

(C) $-3\hat{i} - 6\hat{j} + 6\hat{k}$    (D) $3\hat{i} + 6\hat{j} - 6\hat{k}$

70. If $a$ is a real number and $n$ is a positive integer then $\begin{pmatrix} a & 1 \\ 0 & a \end{pmatrix}^n = ?$

(A) $\begin{pmatrix} a^n & 1 \\ 0 & a^n \end{pmatrix}$

(B) $\begin{pmatrix} a^n & n \\ 0 & a^n \end{pmatrix}$

(C) $\begin{pmatrix} a^n & (n-1)a^{n-1} \\ 0 & a^n \end{pmatrix}$

(D) $\begin{pmatrix} a^n & na^{n-1} \\ 0 & a^n \end{pmatrix}$

71. Solution of the differential equation $x\dfrac{dy}{dx} + y = y^2$ is given by

(A) $y - 1 = c\,x\,y$    (2) $y = c\,x\,y - 1$

(3) $x\,y = 1 + c\,x$    (4) $y + 1 = c\,x\,y$

72. For the curve $y = x\,e^x$ the point

(A) $x = -1$ is a minimum

(2) $x = 0$ is a minimum

(C) $x = -1$ is a maximum

(4) $x = 0$ is a maximum

73.    (A) spoon        (B) tongs
       (C) chopsticks    (D) fork
       (A) चम्मच        (B) चिमटे
       (C) चीनी कांटा    (D) कांटा

74.    (A) start        (B) finish
       (C) over        (D) complete
       (A) शुरू        (B) खत्म
       (C) समाप्त        (D) पूरा

75.    (A) QNPO        (B) YVXW
       (C) LHKJ        (D) URTS

76.    (A) CEAF        (B) HJFL
       (C) RTPU        (D) LNJO

77.    (A) asibu        (B) oarse
       (C) oinak        (D) zamol

78.    (A) DAG        (B) GJM
       (C) NKQ        (D) VSY

79.    (A) ira        (B) aam
       (C) kas        (D) btd

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80. (A) yxz       (B) cbd

    (C) nmo      (D) pqo

81. (A) AiiR      (B) MooX

    (C) VxxZ      (D) DecY

***Directions for Q.82 to Q.83: Select the related letter/word/number/figure from the given alternatives.***

निर्देष : प्रश्न (82–83) प्रदत्त विकल्पों में से संबंधित अक्षर / शब्द / संख्या / चित्र, चुनें।

82. BJNT : CIOS :: DHPV : ?

    (A) EGQU      (B) EIQW

    (C) ELPV      (D) EIOU

83. KIJM : QOPS :: MKLO : ?

    (A) LMOR      (B) OMNS

    (C) KMOQ      (D) SQRU

***Directions for Q.84 and Q.85 : Choose the most appropriate option.***

84. If DELHI is coded as 73541 and CALCUTTA as 82589662, how can CALICUT be coded?

    अगर DELHI का कोड 73541 और CALCUTTA का 82589662 है, तो CALICUT का कोड क्या होगा?

    (A) 5279431      (B) 5978213

    (C) 8251896      (D) 8543691

85. If in a code language PRINCIPAL is written as MBOQSOMVW and TEACHER is written as FDVSZDB, how is CAPITAL written in that code?

    कोड की भाषा में अगर PRINCIPAL को MBOQSOMVW लिखा जा सकता है और TEACHER को FDVSZDB के रूप में तो CAPITAL को कैसे लिखेंगे?

    (A) SVMOFVW      (B) SVMODVW

    (C) BVMODVW      (D) SVMIDVW

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