

(EIE) ELECTRONICS AND INSTRUMENTATION ENGINEERING
INSTRUCTIONS TO CANDIDATES

1. Candidates should write their Hall Ticket Number only in the space provided at the top left hand corner of this page, on the leaflet attached to this booklet and also in the space provided on the OMR Response Sheet. **BESIDES WRITING, THE CANDIDATE SHOULD ENSURE THAT THE APPROPRIATE CIRCLES PROVIDED FOR THE HALL TICKET NUMBERS ARE SHADED USING H.B. PENCIL ONLY ON THE OMR RESPONSE SHEET. DO NOT WRITE HALL TICKET NUMBER ANY WHERE ELSE.**
2. Immediately on opening this Question Paper Booklet, check:
 - (a) Whether **200** multiple choice questions are printed (**50** questions in Mathematics, **25** questions in Physics, **25** questions in Chemistry and **100** questions in Engineering)
 - (b) In case of any discrepancy immediately exchange the Question paper Booklet of same code by bringing the error to the notice of invigilator.
3. Use of Calculators, Mathematical Tables and Log books is not permitted.
4. **Candidate must ensure that he/she has received the Correct Question Booklet, corresponding to his/her branch of Engineering.**
5. **Candidate should ensure that the booklet Code and the Booklet Serial Number, as it appears on this page is entered at the appropriate place on the OMR Response Sheet by shading the appropriate circles provided therein using H.B. pencil only. Candidate should note that if they fail to enter the Booklet Serial Number and the Booklet Code on the OMR Response Sheet, their Answer Sheet will not be valued.**
6. **Candidate shall shade one of the circles 1, 2, 3 or 4 corresponding question on the OMR Response Sheet using H.B. Pencil only. Candidate should note that their OMR Response Sheet will be invalidated if the circles against the question are shaded using Black / Blue ink pen / Ball pen / any other pencil other than H.B. Pencil or if more than one circle is shaded against any question.**
7. One mark will be awarded for every correct answer. **There are no negative marks.**
8. The OMR Response Sheet will not be valued if the candidate :
 - (a) Writes the Hall Ticket Number in any part of the OMR Response Sheet except in the space provided for the purpose.
 - (b) Writes any irrelevant matter including religious symbols, words, prayers or any communication whatsoever in any part of the OMR Response Sheet.
 - (c) Adopts any other malpractice.
9. Rough work should be done only in the space provided in the Question Paper Booklet.
10. No loose sheets or papers will be allowed in the examination hall.
11. Timings of Test: 10.00 A.M. to 1.00 P.M.
12. Candidate should ensure that he / she enters his / her name and appends signature on the Question paper booklet, leaflet attached to this question paper booklet and also on the OMR Response Sheet in the space provided. Candidate should ensure that the invigilator puts his signature on this question paper booklet, leaflet attached to the question paper booklet and also on the OMR Response Sheet.
13. Before leaving the examination hall candidate should **return both the OMR Response Sheet and the leaflet attached to this question paper booklet** to the invigilator. Failure to return any of the above shall be construed as malpractice in the examination. **Question paper booklet may be retained by the candidate.**
14. This booklet contains a total of **32** pages including Cover page and the pages for Rough Work.

MATHEMATICS

1. If $x = at^2, y = 2at$, then $\frac{dy}{dx} =$

- (1) $\sqrt{\frac{y}{x}}$ (2) $\sqrt{\frac{x}{a}}$ (3) $\sqrt{\frac{a}{x}}$ (4) $\sqrt{\frac{x}{y}}$

2. The derivative of e^x with respect to \sqrt{x} is

- (1) $\frac{2\sqrt{x}}{e^x}$ (2) $2\sqrt{x}e^x$ (3) $\frac{e^x}{2\sqrt{x}}$ (4) $\sqrt{x}.e^x$

3. The equation of the normal to the curve $y = 5x^4$ at the point (1, 5) is

- (1) $x + 20y = 99$ (2) $x + 20y = 101$ (3) $x - 20y = 99$ (4) $x - 20y = 101$

4. The angle between the curves $y^2 = 4x$ and $x^2 + y^2 = 5$ is

- (1) $\frac{\pi}{4}$ (2) $\tan^{-1}(2)$ (3) $\tan^{-1}(3)$ (4) $\tan^{-1}(4)$

5. If $u = x^3y^3$ then $\frac{\partial^3 u}{\partial x^3} + \frac{\partial^3 u}{\partial y^3} =$

- (1) $6(x^3 + y^3)$ (2) $6x^3y^3$ (3) $6x^3$ (4) $6y^3$

6. $\int \operatorname{cosec} x \, dx =$

- (1) $\log(\operatorname{cosec} x + \cot x) + C$ (2) $\log(\cot x/2) + C$
(3) $\log(\tan x/2) + C$ (4) $-\operatorname{cosec} x \cdot \cot x + C$

7. $\int_0^{\pi} \cos^{11} x \, dx =$

- (1) $\frac{256}{693}$ (2) $\frac{256\pi}{693}$ (3) $\frac{\pi}{4}$ (4) $\frac{128}{693}$

8. $\int f^1(x) \cdot [f(x)]^n \, dx =$

- (1) $\frac{[f(x)]^{n-1}}{n-1} + C$ (2) $\frac{[f(x)]^{n+1}}{n+1} + C$ (3) $n[f(x)]^{n-1} + C$ (4) $(n+1)[f(x)]^{n+1} + C$

9. $\int \frac{dx}{(x+7)\sqrt{x+6}} =$

- (1) $\tan^{-1}(\sqrt{x+6}) + C$ (2) $2\tan^{-1}(\sqrt{x+6}) + C$
 (3) $\tan^{-1}(x+7) + C$ (4) $2\tan^{-1}(x+7) + C$

10. $\int \tan^{-1} x \, dx =$

- (1) $x \cdot \tan^{-1} x + \frac{1}{2} \log(1+x^2) + C$ (2) $\frac{1}{1+x^2} + C$
 (3) $x^2 \cdot \tan^{-1} x + C$ (4) $x \cdot \tan^{-1} x - \log \sqrt{1+x^2} + C$

11. $\int \frac{dx}{1+e^{-x}} =$

- (1) $\log(1+e^{-x}) + C$ (2) $\log(1+e^x) + C$
 (3) $e^{-x} + C$ (4) $e^x + C$

12. $\int_{-\frac{\pi}{2}}^{\frac{\pi}{2}} \sin |x| \, dx =$

- (1) 0 (2) 1 (3) 2 (4) -1

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13. Area under the curve $f(x) = \sin x$ in $[0, \pi]$ is
(1) 4 sq. units (2) 2 sq. units (3) 6 sq. units (4) 8 sq. units
14. The order of $x^3 \frac{d^3 y}{dx^3} + 2x^2 \frac{d^2 y}{dx^2} - 3y = x$ is
(1) 1 (2) 4 (3) 3 (4) 2
15. The degree of $\left[\frac{d^2 y}{dx^2} + \left(\frac{dy}{dx} \right)^2 \right]^{\frac{3}{2}} = a \frac{d^2 y}{dx^2}$ is
(1) 4 (2) 2 (3) 1 (4) 3
16. The family of straight lines passing through the origin is represented by the differential equation
(1) $ydx + xdy = 0$ (2) $xdy - ydx = 0$ (3) $xdx + ydy = 0$ (4) $xdx - ydy = 0$
17. The differential equation $\frac{dy}{dx} + \frac{ax + hy + g}{hx + by + f} = 0$ is called
(1) Homogeneous (2) Exact (3) Linear (4) Legendre
18. The solution of differential equation $\frac{dy}{dx} = e^{-x^2} - 2xy$ is
(1) $y.e^{-x^2} = x + c$ (2) $ye^x = x + c$ (3) $ye^{-x^2} = x + c$ (4) $y = x + c$
19. The complementary function of $(D^3 + D^2 + D + 1)y = 10$ is
(1) $C_1 \cos x + C_2 \sin x + C_3 e^{-x}$ (2) $C_1 \cos x + C_2 \sin x + C_3 e^x$
(3) $C_1 + C_2 \cos x + C_3 \sin x$ (4) $(C_1 + C_2 x + C_3 x^2) e^x$
20. Particular Integral of $(D-1)^4 y = e^x$ is
(1) $x^4 e^x$ (2) $\frac{x^4}{24} e^{-x}$ (3) $\frac{x^4}{12} e^x$ (4) $\frac{x^4}{24} e^x$

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21. If $A = \begin{bmatrix} 3 & 0 & 0 \\ 0 & 3 & 0 \\ 0 & 0 & 3 \end{bmatrix}$, then $A^4 =$

- (1) $3I$ (2) $9I$ (3) $27I$ (4) $81I$

22. If $A = \begin{bmatrix} 0 & 2 & 1 \\ -2 & 0 & -2 \\ -1 & x & 0 \end{bmatrix}$ is a skew symmetric matrix, then the value of x is

- (1) 1 (2) 2 (3) 3 (4) 4

23. What is the number of all possible matrices with each entry as 0 or 1 if the order of matrices is 3×3

- (1) 64 (2) 268 (3) 512 (4) 256

24. If $A = \begin{bmatrix} 1 & i & -i \\ i & -i & 1 \\ -i & 1 & i \end{bmatrix}$, then $|A| =$

- (1) 1 (2) 2 (3) 3 (4) 4

25. The solution of a system of linear equations $2x - y + 3z = 9, x + y + z = 6, x - y + z = 2$ is

- (1) $x = -1, y = -2, z = -3$ (2) $x = 3, y = 2, z = 1$
 (3) $x = 2, y = 1, z = 3$ (4) $x = 1, y = 2, z = 3$

26. If $\frac{1}{x^2 + a^2} = \frac{A}{x + ai} + \frac{B}{x - ai}$ then $A =$ _____, $B =$ _____.

- (1) $\frac{1}{2ai}, -\frac{1}{2ai}$ (2) $-\frac{1}{2ai}, \frac{1}{2ai}$ (3) $\frac{1}{ai}, -\frac{1}{ai}$ (4) $-\frac{1}{ai}, \frac{1}{ai}$

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27. If $\frac{2x+4}{(x-1)^3} = \frac{A_1}{(x-1)} + \frac{A_2}{(x-1)^2} + \frac{A_3}{(x-1)^3}$ then $\sum_{i=1}^3 A_i$ is equal to
(1) A_2 (2) $2A_2$ (3) $4A_2$ (4) $4A_1$
28. The period of the function $f(x) = |\sin x|$ is
(1) π (2) 2π (3) 3π (4) 4π
29. If $A+B=45^\circ$, then $(1-\cot A) \cdot (1-\cot B)$ is
(1) 1 (2) 0 (3) 2 (4) -1
30. The value of $\sin 78^\circ + \cos 132^\circ$ is
(1) $\frac{\sqrt{5}+1}{4}$ (2) $\frac{\sqrt{5}+1}{2}$ (3) $\frac{\sqrt{5}-1}{2}$ (4) $\frac{\sqrt{5}-1}{4}$
31. If $A+B+C = \pi$, then $\sin 2A + \sin 2B + \sin 2C =$
(1) $4 \cos A \sin B \cos C$ (2) $4 \sin A \cos B \sin C$
(3) $4 \cos A \cos B \cos C$ (4) $4 \sin A \sin B \sin C$
32. The principal solution of $\tan x = 0$ is
(1) $x = n\pi, n \in \mathbb{Z}$ (2) $x=0$
(3) $x = (2n+1)\pi/2, n \in \mathbb{Z}$ (4) $x = n\pi + \alpha, n \in \mathbb{Z}$
33. The value of $\tan^{-1}(2) + \tan^{-1}(3)$ is
(1) $\frac{\pi}{4}$ (2) $\frac{\pi}{2}$ (3) $\frac{\pi}{3}$ (4) $\frac{3\pi}{4}$
34. If the sides of a right angle triangle are in A.P., then the ratio of its sides is
(1) 1:2:3 (2) 2:3:4 (3) 3:4:5 (4) 4:5:6
35. The value of $r_1 r_2 r_3$ is
(1) Δ^2 (2) Δ^{-2} (3) Δ^{-3} (4) Δ^4

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36. $\frac{1}{r_1} + \frac{1}{r_2} + \frac{1}{r_3} =$

- (1) $\frac{1}{r}$ (2) $\frac{1}{2r}$ (3) $\frac{1}{R}$ (4) $\frac{1}{\Delta}$

37. If $a=6, b=5, c=9$, then the value of angle A is

- (1) $\cos^{-1}(2/9)$ (2) $\cos^{-1}(2/5)$ (3) $\cos^{-1}(7/9)$ (4) $\cos^{-1}(1/3)$

38. The polar form of complex number $1-i$ is

- (1) $\sqrt{2}e^{-i\pi/4}$ (2) $\sqrt{2}e^{i\pi/4}$ (3) $\sqrt{2}e^{i\pi/2}$ (4) $\sqrt{2}e^{-i\pi/2}$

39. If $1, \omega, \omega^2$ be the cube roots of unity, then the value of $2^{\omega^3} \cdot 2^{\omega^5} \cdot 2^{\omega}$ is

- (1) ω (2) ω^2 (3) 1 (4) 0

40. The intercept made on X-axis by the circle $x^2+y^2+2gx+2fy+c=0$ is

- (1) $\sqrt{g^2-c}$ (2) $\sqrt{f^2-c}$ (3) $2\sqrt{g^2-c}$ (4) $2\sqrt{f^2-c}$

41. If one end of the diameter of the circle $x^2+y^2-5x-8y+13=0$ is $(2, 7)$, then the other end of the diameter is

- (1) $(3, 1)$ (2) $(1, 3)$ (3) $(-3, -1)$ (4) $(-1, -3)$

42. The radius of the circle $\sqrt{1+m^2}(x^2+y^2)-2cx-2mcy=0$ is

- (1) $2c$ (2) $4c$ (3) $c/2$ (4) c

43. The parametric equations of the ellipse $\frac{x^2}{a^2} + \frac{y^2}{b^2} = 1$ are

- (1) $x = a \sec\theta, y = b \tan\theta$ (2) $x = b \sin\theta, y = a \cos\theta$
(3) $x = a \cos\theta, y = b \sin\theta$ (4) $x = a \operatorname{cosec}\theta, y = b \cot\theta$

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44. The equation of the directrix of the parabola $2x^2 = -7y$ is
(1) $8y+7=0$ (2) $8y-7=0$ (3) $7y+8=0$ (4) $8x-7=0$
45. The condition for a straight line $y = mx+c$ to be a tangent to the hyperbola $\frac{x^2}{a^2} - \frac{y^2}{b^2} = 1$ is
(1) $c = a/m$ (2) $c^2 = a^2m^2 - b^2$ (3) $c^2 = a^2m^2 + b^2$ (4) $c^2 = a/m$
46. $\lim_{x \rightarrow 1} \frac{\sqrt{5x-4} - \sqrt{x}}{x-1}$ is
(1) 3 (2) 2 (3) 4 (4) 1
47. $\log i =$
(1) $\pi/2$ (2) $\pi/4$ (3) $i\pi/2$ (4) $i\pi/4$
48. $\frac{d}{dx} [\log_7 X] =$
(1) $\frac{1}{x}$ (2) $X \log_7 e$ (3) $\frac{1}{x} \log_7 e$ (4) $\frac{1}{x} \log_7 e$
49. $\frac{d}{dx} [2 \cosh x] =$
(1) $\frac{e^x + e^{-x}}{2}$ (2) $\frac{e^x - e^{-x}}{2}$ (3) $e^x + e^{-x}$ (4) $e^x - e^{-x}$
50. $\frac{d}{dx} \left[\cos^{-1} \left(\frac{1-x^2}{1+x^2} \right) \right] =$
(1) $\frac{1}{1+x^2}$ (2) $\frac{-1}{1+x^2}$ (3) $\frac{2}{1+x^2}$ (4) $\frac{-2}{1+x^2}$

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PHYSICS

51. If a spring has time period T , and is cut into n equal parts, then the time period will be
(1) $T\sqrt{n}$ (2) $\frac{T}{\sqrt{n}}$ (3) nT (4) T
52. When temperature increases, the frequency of a tuning fork
(1) increases
(2) decreases
(3) remains same
(4) increases or decreases depending on the materials
53. If a simple harmonic motion is represented by $\frac{d^2x}{dy^2} + \alpha x = 0$, its time period is
(1) $2\pi\sqrt{\alpha}$ (2) $2\pi\alpha$ (3) $\frac{2\pi}{\sqrt{\alpha}}$ (4) $\frac{2\pi}{\alpha}$
54. A cinema hall has volume of 7500 m^3 . It is required to have reverberation time of 1.5 seconds. The total absorption in the hall should be
(1) 850 w-m^2 (2) 82.50 w-m^2 (3) 8.250 w-m^2 (4) 0.825 w-m^2
55. To absorb the sound in a hall which of the following are used
(1) Glasses, stores (2) Carpets, curtains
(3) Polished surfaces (4) Platforms
56. If N represents avagadro's number, then the number of molecules in 6 gm of hydrogen at NTP is
(1) $2N$ (2) $3N$ (3) N (4) $N/6$
57. The mean translational kinetic energy of a perfect gas molecule at the temperature T K is
(1) $\frac{1}{2}kT$ (2) kT (3) $\frac{3}{2}kT$ (4) $2kT$

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58. The amount of heat given to a body which raises its temperature by 1°C
- (1) water equivalent (2) thermal heat capacity
(3) specific heat (4) temperature gradient
59. During an adiabatic process, the pressure of a gas is found to be proportional to the cube of its absolute temperature. The ratio C_p/C_v for gas is
- (1) $\frac{3}{2}$ (2) $\frac{4}{3}$ (3) 2 (4) $\frac{5}{3}$
60. Cladding in the optical fiber is mainly used to
- (1) to protect the fiber from mechanical stresses
(2) to protect the fiber from corrosion
(3) to protect the fiber from mechanical strength
(4) to protect the fiber from electromagnetic guidance
61. Two quantities A and B are related by the relation $A/B = m$ where m is linear mass density and A is force. The dimensions of B will be
- (1) same as that of latent heat
(2) same as that of pressure
(3) same as that of work
(4) same as that of momentum
62. The dimensional formula of capacitance in terms of M, L, T and I is
- (1) $[\text{ML}^2\text{T}^2\text{I}^2]$ (2) $[\text{ML}^{-2}\text{T}^4\text{I}^2]$ (3) $[\text{M}^{-1}\text{L}^3\text{T}^3\text{I}]$ (4) $[\text{M}^{-1}\text{L}^{-2}\text{T}^4\text{I}^2]$
63. If l , m and n are the direction cosines of a vector, then
- (1) $l + m + n = 1$ (2) $l^2 + m^2 + n^2 = 1$ (3) $\frac{1}{l} + \frac{1}{m} + \frac{1}{n} = 1$ (4) $lmn = 1$
64. The angle between $i+j$ and $j+k$ is
- (1) 0° (2) 90° (3) 45° (4) 60°

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65. A particle is moving eastwards with a velocity of 5 ms^{-1} . In 10 seconds the velocity changes to 5 ms^{-1} northwards. The average acceleration in this time is
- (1) $\frac{1}{\sqrt{2}} \text{ ms}^{-2}$ towards north-west (2) zero
(3) $\frac{1}{2} \text{ ms}^{-2}$ towards north (4) $\frac{1}{\sqrt{2}} \text{ ms}^{-2}$ towards north-east
66. The linear momentum of a particle varies with time t as $p = a + bt + ct^2$ which of the following is correct?
- (1) Force varies with time in a quadratic manner.
(2) Force is time-dependent.
(3) The velocity of the particle is proportional to time.
(4) The displacement of the particle is proportional to t .
67. A shell of mass m moving with a velocity v suddenly explodes into two pieces. One part of mass $m/4$ remains stationary. The velocity of the other part is
- (1) v (2) $2v$ (3) $3v/4$ (4) $4v/3$
68. The velocity of a freely falling body after 2s is
- (1) 9.8 ms^{-1} (2) 10.2 ms^{-1} (3) 18.6 ms^{-1} (4) 19.6 ms^{-1}
69. A large number of bullets are fired in all directions with the same speed u . The maximum area on the ground on which these bullets will spread is
- (1) $\frac{\pi u^2}{g^2}$ (2) $\frac{\pi u^4}{g^2}$ (3) $\frac{\pi u^2}{g^4}$ (4) $\frac{\pi u}{g^4}$
70. The minimum stopping distance for a car of mass m , moving with a speed v along a level road, if the coefficient of friction between the tyres and the road is μ , will be
- (1) $\frac{v^2}{2\mu g}$ (2) $\frac{v^2}{\mu g}$ (3) $\frac{v^2}{4\mu g}$ (4) $\frac{v}{2\mu g}$

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71. When a bicycle is in motion, the force of friction exerted by the ground on the two wheels is such that it acts
- (1) In the backward direction on the front wheel and in the forward direction on the rear wheel
 - (2) In the forward direction on the front wheel and in the backward direction on the rear wheel
 - (3) In the backward direction on both the front and the rear wheels
 - (4) In the forward direction on both the front and the rear wheels
72. In a perfectly inelastic collision, the two bodies
- (1) strike and explode
 - (2) explode without striking
 - (3) implode and explode
 - (4) combine and move together
73. Under the action of a constant force, a particle is experiencing a constant acceleration, then the power is
- (1) zero
 - (2) positive
 - (3) negative
 - (4) increasing uniformly with time
74. Consider the following two statements:
A: Linear momentum of a system of particles is zero.
B: Kinetic energy of a system of particles is zero.
Then
- (1) A implies B & B implies A
 - (2) A does not imply B & B does not imply A
 - (3) A implies B but B does not imply A
 - (4) A does not imply B but B implies A
75. An engine develops 10 kW of power. How much time will it take to lift a mass of 200 kg to a height of 40 m? (Given $g = 10 \text{ ms}^{-2}$)
- (1) 4s
 - (2) 5s
 - (3) 8s
 - (4) 10s

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CHEMISTRY

76. A water sample showed it to contain 1.20 mg/litre of magnesium sulphate. Then, its hardness in terms of calcium carbonate equivalent is
(1) 1.0 ppm (2) 1.20 ppm (3) 0.60 ppm (4) 2.40 ppm
77. Soda used in the L-S process for softening of water is, Chemically.
(1) sodium bicarbonate (2) sodium carbonate decahydrate
(3) sodium carbonate (4) sodium hydroxide (40%)
78. The process of cementation with zinc powder is known as
(1) sherardizing (2) zincing (3) metal cladding (4) electroplating
79. Carrosion of a metal is fastest in
(1) rain-water (2) acidulated water (3) distilled water (4) de-ionised water
80. Which of the following is a thermoset polymer?
(1) Polystyrene (2) PVC
(3) Polythene (4) Urea-formaldehyde resin
81. Chemically, neoprene is
(1) polyvinyl benzene (2) polyacetylene
(3) polychloroprene (4) poly-1,3-butadiene
82. Vulcanization involves heating of raw rubber with
(1) selenium element (2) elemental sulphur
(3) a mixture of Se and elemental sulphur (4) a mixture of selenium and sulphur dioxide
83. Petrol largely contains
(1) a mixture of unsaturated hydrocarbons $C_5 - C_8$
(2) a mixture of benzene, toluene and xylene
(3) a mixture of saturated hydrocarbons $C_{12} - C_{14}$
(4) a mixture of saturated hydrocarbons $C_6 - C_8$

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84. Which of the following gases is largely responsible for acid-rain?
(1) SO_2 & NO_2 (2) CO_2 & water vapour
(3) CO_2 & N_2 (4) N_2 & CO_2
85. BOD stands for
(1) Biogenetic Oxygen Demand (2) Biometric Oxygen Demand
(3) Biological Oxygen Demand (4) Biospecific Oxygen Demand
86. The valency electronic configuration of Phosphorous atom (At.No. 15) is
(1) $3s^2 3p^3$ (2) $3s^1 3p^3 3d^1$ (3) $3s^2 3p^2 3d^1$ (4) $3s^1 3p^2 3d^2$
87. An element 'A' of At.No.12 combines with an element 'B' of At.No.17. The compound formed is
(1) covalent AB (2) ionic AB_2 (3) covalent AB_2 (4) ionic AB
88. The number of neutrons present in the atom of ${}_{56}\text{Ba}^{137}$ is
(1) 56 (2) 137 (3) 193 (4) 81
89. Hydrogen bonding in water molecule is responsible for
(1) decrease in its freezing point (2) increase in its degree of ionization
(3) increase in its boiling point (4) decrease in its boiling point
90. In the HCl molecule, the bonding between hydrogen and chlorine is
(1) purely covalent (2) purely ionic (3) polar covalent (4) complex coordinate
91. Potassium metal and potassium ions
(1) both react with water (2) have the same number of protons
(3) both react with chlorine gas (4) have the same electronic configuration
92. 5.85 gms of sodium chloride were dissolved in water and the solution made upto 100 ml in a standard flask. 10 ml of this solution were pipetted out into another flask and made up with distilled water into 100 ml of solution. The concentration of the sodium chloride solution now is
(1) 0.1 M (2) 1.0 M (3) 0.5 M (4) 0.25 M

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93. Concentration of a 1.0 M solution of phosphoric acid in water is
(1) 0.33 N (2) 1.0 N (3) 2.0 N (4) 3.0 N
94. Which of the following is a Lewis acid?
(1) Ammonia (2) Beryllium chloride
(3) Boron trifluoride (4) Magnesium oxide
95. Which of the following constitutes the components of a buffer solution?
(1) Potassium chloride and potassium hydroxide
(2) Sodium acetate and acetic acid
(3) Magnesium sulphate and sulphuric acid
(4) Calcium chloride and calcium acetate
96. Which of the following is an electrolyte?
(1) Acetic acid (2) Glucose (3) Urea (4) Pyridine
97. Calculate the Standard emf of the cell, $\text{Cd}/\text{Cd}^{2+}/\text{Cu}^{2+}/\text{Cu}$ given that $E^{\circ} \text{Cd}/\text{Cd}^{2+} = 0.44\text{V}$ and $E^{\circ} \text{Cu}/\text{Cu}^{2+} = (-) 0.34\text{V}$.
(1) $(-) 1.0\text{V}$ (2) 1.0V (3) $(-) 0.78\text{V}$ (4) 0.78V
98. A solution of nickel chloride was electrolysed using Platinum electrodes. After electrolysis,
(1) nickel will be deposited on the anode
(2) Cl_2 gas will be liberated at the cathode
(3) H_2 gas will be liberated at the anode
(4) nickel will be deposited on the cathode
99. Which of the following metals will undergo oxidation fastest?
(1) Cu (2) Li (3) Zinc (4) Iron
100. Which of the following cannot be used for the sterilization of drinking water?
(1) Ozone (2) Calcium Oxychloride
(3) Potassium Chloride (4) Chlorine water

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ELECTRONICS AND INSTRUMENTATION ENGINEERING

101. Induction heating may be employed
- (1) for annealing of brass
 - (2) for heating of plastics
 - (3) in a hot plate
 - (4) for heating of wood
102. The solar cell is a type of _____ devices.
- (1) photovoltaic
 - (2) photoconductive
 - (3) photo emissive
 - (4) electromotive
103. Which of the following is false with respect to Root locus
- (1) It is used to determine the stability of the system
 - (2) It is designed to find the damping ratio of the system
 - (3) It is used to calculate the natural frequency of the feedback system
 - (4) It is used to determine the impedance of the system
104. The Routh-Hurwitz Stability criterion is a necessary and sufficient method to establish the stability of _____ control system.
- (1) Multiple-input, single-output, non-linear time invariant
 - (2) Multiple-input, multiple-output, linear time variant
 - (3) A single-input, single-output, linear time invariant
 - (4) A single-input, multiple-output, non-linear time invariant
105. Open loop system
- (1) shows Negative feed back
 - (2) can counter act against disturbances
 - (3) the controlled variable does not fade away
 - (4) cannot become unstable-as long as the controlled object is stable

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106. Which type of impurity is added to form a n-type extrinsic semiconductor
- (1) Aluminum (2) Indium
(3) Gallium (4) Arsenic
107. The penetration depth of the depletion region within a particular side of the pn junction is _____ to the doping concentration
- (1) inversely proportional (2) proportional
(3) independent (4) square root
108. Presence of emitter circuit bypass capacitor adversely affects the
- (1) low frequency response (2) midband response
(3) high frequency response (4) response over the complete frequency range
109. The higher the frequency of the alternating current in the inductance, the eddy current loss is
- (1) less (2) more
(3) medium (4) not change
110. Under reverse bias, zener diode can be used as a
- (1) current regulator (2) voltage regulator
(3) frequency regulator (4) phase regulator
111. Both the junctions of a transistor are in forward bias then it is operated in _____ region..
- (1) cut-off (2) active
(3) saturation (4) cross-over
112. After applying voltage between source and drain terminals of a JFET, the channel becomes
- (1) uniform (2) nonlinear
(3) linear (4) wedge shaped

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113. The number of RC sections required in phase shift oscillator is at least
(1) 1 (2) 2 (3) 5 (4) 6
114. Which of the following oscillator uses both positive and negative feedback
(1) RC phase shift (2) Wein bridge
(3) LC oscillator (4) Crystal
115. Cross-over distortion can be eliminated by biasing the circuit in
(1) Class A (2) Class B (3) Class C (4) Class AB
116. Monostable multivibrator requires _____ type of trigger pulse.
(1) positive spikes (2) negative spikes
(3) zero spike (4) no trigger pulse is required
117. If in a rectifier, the ripple voltage is 100 mV and the dc value is 10V, then the ripple factor is given by
(1) 0.01 (2) 0.02 (3) 0.001 (4) 0.0002
118. The larger the value of the filter capacitor
(1) Larger the peak-to-peak value of the ripple voltage
(2) Larger the peak current in the rectifying diode
(3) Longer the time that the current pulse flows through the diode
(4) Smaller the dc voltage across the load
119. In a UJT, with V_{BB} as the voltage across two base terminals, the emitter potential at peak point is given by
(1) ηV_{BB} (2) ηV_D
(3) $\eta V_{BB} + V_D$ (4) $\eta V_D + V_{BB}$

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120. The output of gate is low if and only if all its inputs are equal
(1) Ex-OR (2) AND (3) OR (4) NOR
121. An n-bit register requires _____ number of Flip-Flops.
(1) $2n$ (2) $n + 1$ (3) 2^n (4) n
122. The counters can be used in the measurement of
(1) voltage (2) time (3) distance (4) length
123. The memory which requires a refresh cycle is
(1) PROM (2) Static RAM
(3) Dynamic RAM (4) Magnetic tape
124. Which of the following is known as half-adder
(1) XOR gate (2) XNOR gate
(3) NAND gate (4) NOR gate
125. If a counter is connected using six flip-flops, then the maximum number of states that the counter can count are
(1) 6 (2) 256 (3) 8 (4) 64
126. The number of flip-flops required for a mod-16 ring counter are
(1) 4 (2) 8 (3) 10 (4) 16
127. The digital operations such as AND, OR, NOT etc., can be performed by using
(1) Amplifiers (2) switches
(3) rectifiers (4) oscillators

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128. The resolution of an A/D converter is determined by

- (1) Start conversion time
- (2) The number of bits in the input word
- (3) The number of bits in the output word
- (4) The type of interfacing

129. The reference and output voltages in the ladder type D/A converter are respectively

- (1) Both are positive
- (2) both are negative
- (3) negative and positive
- (4) positive and negative

130. A medium wave transmitter works in the frequency range of

- (1) 100 Hz to 100 KHz
- (2) 500 KHz to 1600 KHz
- (3) 1500 MHz to 3800 MHz
- (4) 4235 MHz to 5000 MHz

131. A carrier of 1200 KHz is amplitude modulated by an AF signal from 200 HZ to 5 KHz. The upper side band frequencies are

- (1) 1205 KHz to 1200 KHz
- (2) 1200 KHz to 1195 KHz
- (3) 1200.2 KHz to 1205 KHz
- (4) 1202 KHz to 1205 KHz

132. One of the following is a disadvantage of VSB system

- (1) It conserves bandwidth resulting in a saving of 2 MHz per channel over a DSB system
- (2) It overcomes the problem of low video frequency attenuation
- (3) It results in power boost of low video frequencies
- (4) It possess the advantages of both DSB and SSB system

133. The _____ is a network of resistors containing only two values.

- (1) binary divider
- (2) binary ladder
- (3) analog divider
- (4) analog ladder

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134. The voltage gain of the voltage follower circuit using op-amp is
(1) $1 + R_f/R_i$ (2) R_f/R_i (3) R_i/R_f (4) one
135. Which of the following circuit does not use a PLL?
(1) FM demodulating (2) frequency multiplying
(3) frequency synthesis (4) voltage regulation
136. The pulse width of a astable multivibrator is given by
(1) $0.48 RC$ (2) $0.48 R/C$ (3) $1.38 RC$ (4) $1.38 R/C$
137. How many op-amp does it take to construct an instrument amplifier
(1) 2 (2) 3 (3) 4 (4) 6
138. The resolution of a four bit DVM is
(1) 0.1V (2) 0.01 V (3) 0.001 V (4) 0.0001 V
139. Successive approximation DVM is also called
(1) dual slope DVM (2) differential voltmeter
(3) potentiometric DVM (4) ramp type DVM
140. A CRO is generally used to measure
(1) temperature (2) pressure
(3) amplitude (4) all the above
141. When two periodic signals of equal voltages and 180 degrees out of phase with each other are applied to CRT, the waveform observed on CRT is
(1) a straight line (2) circle
(3) ellipse (4) parabola

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142. A spectrum analyser is actually a heterodyne receiver in which the local oscillator is a _____ generator.
(1) pulse (2) sweep (3) square wave (4) sine wave
143. Q-Meter is used to determine _____ of a component.
(1) frequency (2) phase angle (3) quality factor (4) all
144. Which of the following method is used to connect the unknown component to the test terminal of a Q-meter?
(1) direct (2) series (3) parallel (4) all
145. In a digital frequency meter, the assembly consisting of two AND gates and the two flip-flops is known as
(1) decade counter (2) gate control setup
(3) Schmitt trigger (4) read counter
146. In instrumentation the parameter being measured is called _____
(1) error detector (2) source (3) measurand (4) sink
147. The nearest of the indicated value to the true value of the quantity is called
(1) precision (2) error (3) accuracy (4) sensitivity
148. Pirani guage is an example of _____ transducer.
(1) resistive (2) capacitive (3) inductive (4) active
149. The value of impulse signal at $t=0$ is
(1) 0 (2) 1 (3) infinity (4) not defined

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150. Multiturn potentiometer can measure a maximum of _____ degrees.
(1) 30 (2) 300 (3) 360 (4) 3500
151. The Poisson's ratio for all strain gauge material lies between
(1) 0-0.5 (2) 0-1 (3) 0-1.5 (4) 0-2
152. For capacitive transducers the equation for the capacitance of a parallel plate capacitor is given by
(1) $C = d/\epsilon A$ (2) $C = d\epsilon/A$ (3) $C = \epsilon A/d$ (4) $C = \epsilon Ad$
153. Microphone is a _____ type of transducer.
(1) capacitive (2) resistive
(3) inductive (4) mechanical
154. The pH of a solution is proportional to _____
(1) $\log[H^+]$ (2) $-\log[H^+]$ (3) $1/\log[H^+]$ (4) $-\log[H^-]$
155. The pH of blood for a normal human being is
(1) acidic (2) basic
(3) neutral (4) highly acidic
156. In a magnetic flow meter the induced voltage due to flow is given by
(1) $E = BC/LV$ (2) $E = BL/CV$
(3) $E = (B+L+C+V)$ (4) $E = BCLV$
157. Which of the following can be used as piezo electric materials?
(1) Rochelle salt (2) ceramics A&B
(3) lithium sulphate (4) all

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58. _____ particles have neutral charge.

- (1) Alpha (2) Beta
(3) Gamma (4) Positrons

59. _____ is also called a variable area meter.

- (1) Rotameter (2) Mmanometer
(3) Venturimeter (4) Orficemeter

60. _____ is also a unit of temperature.

- (1) Candela (2) Ampere (3) Volt (4) Rankine

161. The Reynolds number for turbulent flow is

- (1) 1000 (2) 2000 (3) 3000 (4) 4000

162. The response of a time constant element for a step change in input is

- (1) Unity (2) Zero
(3) Exponential (4) Infinity

163. Reset action is another name for _____ control mode.

- (1) Two-position (2) Proportional
(3) Derivative (4) Integral

164. A PID control mode has

- (1) Faster response (2) Slower response
(3) More dead time (4) High rise time

165. A P-controller has a gain of 50. Its proportional band is

- (1) 4 (2) 3 (3) 2 (4) 1

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166. Differentiate gap is intentionally incorporated in some processes to prevent _____ effect.

- (1) Excessive cycling (2) Saturation
(3) Clamping (4) Aliasing

167. In process controller which of the following can be used for signals transmission between the controller and the sensor?

- (1) Electric (2) Pneumatic (3) Hydraulic (4) All

168. In pneumatic controllers _____ are used for applying the signals from the sensors.

- (1) Op-Amps (2) Gears (3) Bellows (4) Piston

169. The forces that act on an actuator are

- (1) Inertia forces (2) Static friction forces
(3) Thrust forces (4) All of the above

170. Which of the following disturbances occur in a process control?

- (1) Transient (2) Set-point changes
(3) Load changes (4) All of the above

171. Generally in a cascade control _____ mode is used in a secondary loop.

- (1) P (2) PI (3) PD (4) PID

172. In a ratio control system, the ratio factor 'K' lies between _____ and _____

- (1) 1.3 (2) 0.3,3.0 (3) 3,30 (4) 1,100

173. In distillation columns _____ are separated.

- (1) Two liquids (2) One solid & one liquid
(3) Two gases (4) None

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174. An element used to provide necessary linear rotary motion for a control valve stem is called

- (1) Actuator (2) Plug
(3) Spring (4) Bellows

175. Spectroscopy deals with the study of interaction of _____ with matter.

- (1) Electromagnetic radiations (2) current
(3) frequency (4) density

176. Dueterium lamps are better suited sources in the _____ region.

- (1) UV (2) visible (3) IR (4) microwave

177. In a gas-liquid-chromatography the carrier phase is

- (1) Solid (2) liquid (3) gas (4) all

178. The efficiency of a distillation column is expressed in terms of

- (1) Sample injection (2) detector response
(3) theoretical plates (4) type of sample used

179. The paramagnetic gases are

- (1) Helium (2) Hydrogen
(3) Nitrogen (4) Oxygen

180. Single focusing magnetic sector analyser is _____ degree analyser.

- (1) 90 (2) 180 (3) 270 (4) 360

181. Paper chromatography is also called _____ chromatography.

- (1) partition (2) gas
(3) liquid (4) adsorption

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182. Electromyogram potentials are associated with _____ activity.
(1) brain (2) muscle (3) heart (4) kidney
183. PQRST wave is associated with
(1) EEG (2) ECG (3) EMG (4) EGG
184. The principle ions present in the body fluids are
(1) Sodium (2) Potassium
(3) Chloride (4) All
185. 8051 control has _____ register banks.
(1) One (2) Two
(3) Three (4) Four
186. The following bits in IE register disable all interrupts simultaneously
(1) ETO (2) EA (3) ES (4) ACC
187. Ladder diagram are used in
(1) PLC's (2) Computers
(3) Microprocessor (4) Actuator
188. In microcontroller 8051, the total no. of three byte instructions are
(1) 17 (2) 45 (3) 49 (4) 111
189. _____ called a PPI controller.
(1) 8251 (2) 8255
(3) 8257 (4) 8259

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190. The scratchpad area of RAM of 8051 has _____ bytes.
(1) 20 (2) 40 (3) 80 (4) 100
191. Three equal resistors of $3\ \Omega$ each are star connected. Their equivalent delta connected resistance is
(1) $1\ \Omega$ (2) $12\ \Omega$
(3) $6\ \Omega$ (4) $9\ \Omega$
192. While finding thevenin's resistance, voltage sources if any are set to zero by
(1) short circuiting (2) Open circuiting
(3) connecting in series with load (4) connecting in parallel with load
193. In a self excited degenerator, the initial flux is produced due to
(1) the saturation of core (2) eddy currents
(3) hysteresis (4) residual magnetism
194. Which of the following is a cause for the production of back emf.
(1) generator action (2) motor action
(3) armature reaction (4) eddy currents
195. The effective value of the induced voltage in a transformer winding is represented by
(1) $4.44 fN^2 \phi_m$ (2) $4.44 fN \phi_m$
(3) $4.44 fN B_m$ (4) $4.44 fN \phi_m A$
196. Which of the following statement is true with respect to synchronous motor
(1) it is not self-starting
(2) it is self-starting
(3) it can run at any speed
(4) it can run at a speed close to the synchronous speed

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197. Photodetectors are used in _____ switching circuits.
- (1) magnetic (2) electric
(3) current (4) twilight
198. A LED prepared with $\text{GaAs}_{1-x}\text{P}_x$ with $x=0.4$ gives _____ color.
- (1) blue (2) green
(3) yellow (4) red
199. Photo voltaic cells are two-terminal devices that vary their _____ with exposure to light.
- (1) input voltage (2) input current
(3) output voltage (4) output current
200. The following all are true except one with respect to the advantages of projection welding over spot welding
- (1) More than one weld can be done at a time to obtain more output
(2) The life of electrodes is less because of low current density
(3) The finish is good as the surface remains unindented by electrodes
(4) Welds are automatically located by the position of projections