Exam-III/17/30-35/A

**PAPER CODE: 30/31/32/33/34/35**

# EXAMINATION–III

*Duration: 3 Hours*

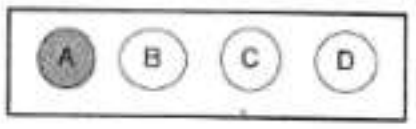
*Maximum Marks : 150*

**Read the following Instructions carefully:**

1. **CHECK THE PAPER CODE OF THE QUESTION PAPER WITH PAPER CODE PRINTED IN YOUR ADMIT CARD. IF IT DOES NOT MATCH, REPORT IT IMMEDIATELY TO THE INVIGILATOR.**
2. This Question Paper contains 130 multiple-choice objective type questions as follows:

| | | | |
|---|---|---|---|
| **Section-A** | Physics | (Q. No. 1 – 25 of 1 mark each) | Section-A is **Compulsory** for all |
| **Section-B** | Chemistry | (Q. No. 26 – 50 of 1 mark each) | Section-B is **Compulsory** for all |
| **Section-C** | Mathematics | (Q. No. 51 – 80 of 1 mark each | Section-C is **Compulsory** for all |
| **Section-D** | Engineering branch (Q. No. 81 – 110 of 1 mark each, and Q. No. 111 – 130 of 2 mark each) This section contains questions from six Engineering branches (Paper Code: 30 - 35) **ONLY ONE** Engineering branch is to be attempted as per **Paper Code** printed on **Admit Card** | | |

3. The page no. of question paper of six Engineering Branches are as follows:
   **AE (16 - 23), CE (24 - 31), CSE (32 - 40), ECE (41 - 48), EE (49 - 55), ME (56 - 63).**
4. Do not attempt the questions paper before the scheduled start.
5. Each Question has four options (A, B, C and D). Choose the correct / most appropriate option **(only one)** for your answer by darkening the bubble with **Blue / Black ball point pen** in the OMR Answer Sheet accordingly.

   For example: 

   if your choice of answer is (A).

   Use of **Pencil** on OMR Sheet is strictly Prohibited.
6. Darkening more than one option bubble in the OMR Answer Sheet against a Question Number shall be **treated as incorrect. For every incorrect answer to a question, 25% (1/4$^{th}$) of the marks carried by that question will be deducted.** No deduction from the total score will be made if **no response** is indicated for an item in the Answer Sheet.
7. All rough works should be done in the space provided in this question paper. Any rough works / calculations done on the OMR Sheet will lead to **Cancellation of Candidature.**
8. No candidate is allowed to carry textual material, printed or written, bits of paper, pager, mobile phone, any other electronic gadgets, etc. except the **Admit Card** in the Examination Hall. However, **calculator (non-programmable) / log table are allowed** in the Examination Hall.
9. Candidates may leave the Examination Hall only after the expiry of one hour of the examination but they will not be allowed to take this Question Paper along with them.
10. This Question Paper contains **64** printed pages. In case of any discrepancy, please report immediately to the Invigilator on duty in the Hall/Room.
11. Adoption of any kind of unfair means/ malpractices in the examination hall will render the candidate liable for cancellation of his/her candidature /admission.
12. Write your Roll No. and Name in the Box provided below:

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Roll Number | | | | | | | |
| Name | | | | | | | |

PAPER CODE: 30 to 35

## SECTION – A (PHYSICS)

[Section – A is **Compulsory** for all al the candidates]

**Question numbers 1 - 25 carry 1 mark each:**

1. The coefficient of linear expansion of brass and steel are $\alpha_1$ and $\alpha_2$ respectively. If we take a brass rod of length $l_1$ and steel rod of length $l_2$ at $0^0$ C, the difference in their length will remain same at all temperatures, if

[A] $\alpha_1 l_1 = \alpha_2 l_2$
[B] $\alpha_1 l_2 = \alpha_2 l_1$
[C] $\alpha_1^2 l_1 = \alpha_2^2 l_2$
[D] $\alpha_1^2 l_2 = \alpha_2^2 l_1$

2. The distances of two planets from the sun are $10^{13}$ and $10^{12}$ m, respectively. The ratio of the time period of these planets is

[A] 100
[B] $10\sqrt{10}$
[C] $\sqrt{10}$
[D] $1/\sqrt{10}$

3. If $I, \alpha$ and $\tau$ are the moment of inertia, angular acceleration and torque respectively of a body rotating about any axis with angular velocity $\omega$, then

[A] $\tau = I\alpha$
[B] $\tau = I\omega$
[C] $I = \tau\omega$
[D] $\alpha = I\omega$

4. A steel wire is 1 m long and 1 $mm^2$ in area of cross-section. If it takes 200 N to stretch this wire by 1 mm, how much force will be required to stretch a wire of the same material and diameter from its normal length to length of 1002 cm?

[A] 100 N
[B] 200 N
[C] 400 N
[D] 2000 N

5. How much time will light take to traverse a glass slab of thickness 10 cm and refractive index 1.5?

[A] $0.5 \times 10^{-9}$ s
[B] $1.5 \times 10^{-9}$ s
[C] $2.0 \times 10^{-8}$ s
[D] $3.0 \times 10^{-8}$ s

6. Eddy currents are

[A] Induced currents due to changing magnetic flux
[B] Induced currents due to high magnetic flux
[C] Induced currents in a homogeneous material
[D] Unstable currents in a conductor

*(Space for rough works)*

7. Two capillary tube A and B are of equal radius and equal length. The rate of flow through either tube under a pressure P is 8 $cm^3$/sec. If the two tubes are connected in series and same pressure is maintained across the combination the flow will be,

[A] 8 $cm^3$/sec
[B] 2 $cm^3$/sec
[C] 4 $cm^3$/sec
[D] 6 $cm^3$/sec

8. The sensitivity of the potentiometer can be increased by

[A] Increasing the e.m.f. of primary cell
[B] Increasing the potential gradient
[C] Increasing the length of potentiometer wire
[D] Decreasing the length of potentiometer wire

9. Fusion reactions take place at high temperature, because

[A] Atoms are ionized at high temperature
[B] Molecules break up at high temperature
[C] Nuclei break up at high temperature
[D] Kinetic energy is high enough to overcome repulsion between nuclei

10. If force (F), velocity (V) and Time (T) are chosen as fundamental units, the dimensions of ass in this system will be represented as

[A] $ML^0T^0$
[B] $FV^{-1}T$
[C] $MLT^{-2}$
[D] $FV^2T^{-1}$

11. The magnitude of resultant of two equal forces is equal to either of the force. The angle between two forces will be

[A] $60^0$
[B] $90^0$
[C] $120^0$
[D] $135^0$

12. The relative permeability of a material is 0.99. It will essentially be,

[A] Paramagnetic substance
[B] Diamagnetic substance
[C] Ferromagnetic substance
[D] None of these

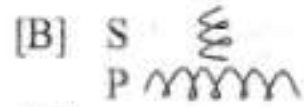
13. A flywheel rolls down an inclined plane. At any instant of time, the ratio of rotational to it kinetic energy is

[A] 1:1
[B] 1:2
[C] 2:1
[D] 1:3

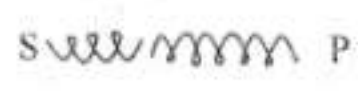
*(Space for rough works)*

14. In which of the following case mutual inductance is maximum

[A] 


[B] 


[C] 


[D] 


15. The thermodynamic process in which no exchange of heat from the system takes place is called

[A] Isothermal
[B] Adiabatic
[C] Isobaric
[D] Isometric

16. N-type germanium is obtained on doping intrinsic germanium by

[A] Phosphorus
[B] Aluminium
[C] Boron
[D] Gold

17. To get three images of a single object, one should have two plane mirror at an angle of

[A] $30^{\circ}$
[B] $60^{\circ}$
[C] $90^{\circ}$
[D] $120^{\circ}$

18. Absorptive power of the perfect blackbody is

[A] 1
[B] -1
[C] 0
[D] Infinity

19. Which of the following is incorrect regarding the first law of thermodynamics

[A] It is the resultant of the principle of conservation of energy
[B] It is not applicable to any cyclic process
[C] It introduces concept of entropy
[D] Both [B] and [C]

20. The electric potential at the surface of an atomic nucleus (Z= 50) of radius $9.0 \times 10^{-15}$ m is

[A] 80 V
[B] $8 \times 10^{6}$ V
[C] 9 V
[D] $9.0 \times 10^{5}$ V

***(Space for rough works)***

21. A curie is a standard unit of radio activity. Its value is

[A] $10^9$ disintegrations/sec
[B] $10^{10}$ disintegrations/sec
[C] $3.7 \times 10^{10}$ disintegrations/sec
[D] 37000 disintegrations/sec

22. The velocity of sound in air is 350 $ms^{-1}$. The frequency of the fundamental note emitted by a tube of length 50 cm open at both ends is

[A] 50 Hz
[B] 175 Hz
[C] 350 Hz
[D] 700 Hz

23. When the light travels from one medium to another, which of the following does not change?

[A] Frequency
[B] Velocity
[C] Wavelength
[D] Refractive index

24. A cylinder of radius r is rigidly fixed at one end. It is twisted through a certain angle. The couple required is proportional to

[A] $r^4$
[B] $r^2$
[C] $\frac{1}{r^4}$
[D] $\frac{1}{r^2}$

25. With high frequencies, capacitive reactance

[A] Remains unchanged
[B] Increases
[C] Decreases
[D] None of these

**------xxx----Physics Paper Ends------xxx-----**

*(Space for rough works)*

## SECTION – B (CHEMISTRY)

[Section B is **Compulsory** for all al the candidates]

**Question numbers 26-50 carry 1 mark each:**

26. The Van't Hoff factor for 0.1M $Ba(NO_3)_2$ solution is 2.74. the degree of dissociation is

[A] 91.3%
[B] 87%
[C] 100%
[D] 74%

27. Colligative properties of solutions are those which depend upon

[A] The nature of the solvent
[B] The nature of the solute
[C] The number of solvent molecules
[D] The number of solute particles

28. The Blue colour of the sky is due to

[A] Brownian movement
[B] The presence of macromolecules
[C] Tyndall effect
[D] Electrophoresis

29. The solubility of AgI in an aqueous solution of NaI is less than that in pure water because

[A] AgI forms complex with NaI
[B] Of common ion effect
[C] Solubility product of AgI is less than of NaI
[D] The temperature of the solution decreases

30. Which of the following has the least Lewis acid character?

[A] $BF_3$
[B] $BCl_3$
[C] $BBr_3$
[D] $BI_3$

31. Azimuthal quantum number determine the

[A] Size of an atomic orbital
[B] Spin of electrons
[C] Orientation of an atomic orbital
[D] Angular momentum of an atomic orbital

32. Among $BeF_2$, $BF_3$, $NH_3$ and $CCl_4$, the molecule with net dipole moment is

[A] $BeF_2$
[B] $BF_3$
[C] $NH_3$
[D] $CCl_4$

*(Space for rough works)*

33. Which metal is common in brass, bronze and german silver?

[A] Copper
[B] Iron
[C] Aluminium
[D] Zinc

34. Carboxylic acids are more acidic than phenol and alcohol because of

[A] Intermolecular hydrogen bonding
[B] Formation of dimmers
[C] Highly acidic hydrogen
[D] Greater resonance stabilization of their conjugate base

35. For an isothermal process, $\Delta S$ is equal to

[A] $q$
[B] $q_{rev}/T$
[C] $q_{rev}$
[D] $Tq_{rev}$

36. Rate constant of a reaction has the same unit as the rate of the reaction. What is the order of this reaction?

[A] First order
[B] Second order
[C] Pseudo first order
[D] Zero order

37. In which direction will the following equilibrium shift if a solution of $CH_3CO_2Na$ is added?

$$CH_3COOH(aq) \rightleftharpoons CH_3CO_2(aq) + H^+(aq)$$

[A] Shift to the right
[B] Shift to the left
[C] No change
[D] None of these

38. The ionic radii of $K^+$, $Ca^{2+}$, $Cl^-$ and $S^{2-}$ ions decrease in the order

[A] $Cl^- > S^{2-} > K^+ > Ca^{2+}$
[B] $K^+ > Ca^{2+} > Cl^- > S^{2-}$
[C] $S^{2-} > Cl^- > K^+ > Ca^{2+}$
[D] $Ca^{2+} > K^+ > Cl^- > S^{2-}$

39. Sulfuric acid is manufactured by

[A] Habers process
[B] Contact Process
[C] Redox Process
[D] Complex Process

40. Which of the following is an aromatic heterocyclic compound?

[A] Pyrrole
[B] Pyrrolidine
[C] Ethylene oxide
[D] Dioxane

*(Space for rough works)*

41. Which of the following is not a mixture of hydrocarbons?

[A] Candle wax
[B] Kerosene
[C] Paraffin oil
[D] Vegetable oil

42. Which of the following compounds reacts with sodium to liberate hydrogen gas?

[A] Ethane
[B] Propylene
[C] Acetylene
[D] Benzene

43. Corrosion is an example of

[A] Electrodeposition
[B] Oxidation
[C] Reduction
[D] Electrolysis

44. A true statement about "Green House Effect" is that it is

[A] Caused by combination of many gases
[B] Caused by $CO_2$
[C] Caused only by $CO_2$, CFC, $CH_4$ & $NO_2$
[D] None of these

45. Amines are basic in character because they have

[A] A lone pair of electrons on the nitrogen atom
[B] A hydroxyl group in the molecule
[C] Replaceable hydrogen atom
[D] Tetrahedral structure

46. Neoprene is a

[A] Monomer
[B] Synthetic Rubber
[C] Polyester
[D] Polyamide

47. Which of the following compounds is most basic?

[A] Cyclohexylamine
[B] Aniline
[C] *p*-methoxyaniline
[D] *p*-nitroaniline

48. Chlorobenzene is formed by reaction of chlorine with benzene in the presence of $AlCl_3$. Which of the following species attacks the benzene ring in this reaction?

[A] $Cl^-$
[B] $Cl^+$
[C] $AlCl_3$
[D] $[AlCl_4]^-$

*(Space for rough works)*

49. The primary alkyl halide would prefer to undergo

[A] $S_N1$ reaction
[B] α-Elimination
[C] $S_N2$ reaction
[D] Racemization

50. The compound that is most reactive towards electrophilic nitration is

[A] Nitrobenzene
[B] Benzene
[C] Benzoic acid
[D] Toluene

**------xxx----Chemistry Paper End------xxx----**


*(Space for rough works)*

## SECTION – C (MATHEMATICS)

[Section C is **Compulsory** for all al the candidates]

**Question numbers 51–80 carry 1 mark each:**

51. The number of solution of the equation $tan^{-1}(x-1)+tan^{-1}x+tan^{-1}(x+1)=tan^{-1}3x$ is

[A] 3 [B] 2
[C] 1 [D] 4

52. The foci of the ellipse $\frac{x^2}{16}+\frac{y^2}{b^2}=1$ and the hyperbola $\frac{x^2}{144}-\frac{y^2}{81}=\frac{1}{25}$ coincide, then the value of $b^2$ is

[A] 1 [B] 5
[C] 9 [D] 7

53. If $F=xy^2i+2x^2yzj-3yz^2k$, then curl $F$ at $(1,-1,1)$ is

[A] $i+2k$ [B] $-i+2k$
[C] $-i-2k$ [D] $-i-2j$

54. Equations of the straight line through the point *(a, b, c)* which is parallel to z-axis is

[A] $\frac{x-a}{1}=\frac{y-b}{0}=\frac{z-c}{0}$ [B] $\frac{x-a}{0}=\frac{y-b}{0}=\frac{z-c}{1}$

[C] $\frac{x-a}{0}=\frac{y-b}{1}=\frac{z-c}{0}$ [D] None of these

55. A purse contains 4 copper, 3 silver coins and the second purse contains 6 copper, 2 silver coins. A coin is taken from any purse, the probability that it is a copper coin be

[A] 4/7 [B] ¾

[C] 3/7 [D] 37/56

56. The events $A$ and $B$ are such that $P(A)=1/4$, $P(A|B)=1/2$ and $P(B|A)=2/3$. Then $P(B)$ is

[A] 1/2 [B] 1/3
[C] 1/6 [D] 2/3

***(Space for rough works)***

57. $\int_0^{\frac{\pi}{2}} \frac{dx}{a^2\cos^2 x + b^2\sin^2 x} =$

[A] $2\pi ab$ [B] $\pi a^2 b^2$

[C] $\frac{\pi}{a^2 b^2}$ [D] $\frac{\pi}{2ab}$

58. If $z = \tan(y + ax) + (y - ax)^{\frac{3}{2}}$, than $\frac{\partial^2 z}{\partial x^2} - a^2\left(\frac{\partial^2 z}{\partial y^2}\right)$ is equal to

[A] 0 [B] 1

[C] $y - ax$ [D] $sec(y + ax)$

59. The function $u = 3x^2 - y^2 + x^3$ is maximum at

[A] (-5, -3) [B] (0, 2)

[C] (-2, 0) [D] (3, 5)

60. The distance between the point(-1, -5, -10) and the point of intersection of the line $\frac{x-2}{3} = \frac{y+1}{4} = \frac{z-2}{12}$ with the plane x-y+z = 5 is

[A] 13 [B] 15

[C] 16 [D] 12

61. If a, b, c and x are real numbers and

$$\Delta = \begin{vmatrix} 1+a & 1+ax & 1+ax^2 \\ 1+b & 1+bx & 1+bx^2 \\ 1+c & 1+cx & 1+cx^2 \end{vmatrix}$$. Then the value of $\Delta$ is

[A] 0 [B] Abcx

[C] abc [D] None of these

62. If sum of the slopes of the lines given by $x^2 - 2axy - 7y^2 = 0$ is four times their product, the value of $a$ is

[A] 1 [B] −1

[C] 2 [D] −2

*(Space for rough works)*

63. If $x>1, y>1, z>1$ are in G.P. then $\frac{1}{1+\log x}, \frac{1}{1+\log y}, \frac{1}{1+\log z}$ are in

[A] A.P.
[B] H.P.
[C] G.P.
[D] None of these

64. The greatest rate of increase of $u = xyz^2$ at the point (1, 0, 3)

[A] 9
[B] 3
[C] -9
[D] 0

65. The linear system of equations $x+y+z=6, x+2y+3z=10, x+2y+\alpha z=\beta$ has unique solution if

[A] $\beta \neq 10$, $\alpha$ may have any value
[B] $\alpha = 3, \beta \neq 10$
[C] $\alpha = 3, \beta = 10$
[D] $\alpha \neq 3$, $\beta$ may have any value

66. The value of an integral is $\int \frac{x^2+1}{x^4+1}\,dx$ is

[A] $(1/\sqrt{2})\,tan^{-1}[(x^2-1)/x\sqrt{2})]$
[B] $(1/\sqrt{2})\,log[(x^2-1)/x\sqrt{2})]$
[C] $(1/\sqrt{2})\,sin^{-1}[(x^2-1)/x\sqrt{2})]$
[D] $(1/\sqrt{2})\,log[(x^2+1)/x\sqrt{2})]$

67. If S is any closed surface, then $\iint_S curl\,\overline{F}.\hat{n}\,dS$

[A] -2
[B] 2
[C] 1
[D] 0

68. The lines $\frac{x-2}{1}=\frac{y-3}{1}=\frac{z-4}{-\alpha}$ and $\frac{x-1}{\alpha}=\frac{y-4}{2}=\frac{z-5}{1}$ are coplanar if

[A] $\alpha = 1$ or $-1$
[B] $\alpha = 0$ or $-3$
[C] $\alpha = 3$ or $-3$
[D] $\alpha = 0$ or $-1$

69. For a binomial variable X if n = 5 and P(X = 1) = 8P(X = 3). Then p is given by

[A] 4/5
[B] 1/3
[C] 1/5
[D] 2/3

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***(Space for rough works)***

70. The area bounded by the curves $y^2 = 4x$ *and* $x^2 = 4y$ is

[A] 32/3 [B] 16/3
[C] 8/3 [D] 0

71. Two linearly independent solutions of the differential equation $4\left(\frac{d^2y}{dx^2}\right) + 4\left(\frac{dy}{dx}\right) + 5y = 0$ are

[A] $e^{x/2}\cos x,\quad e^{-x/2}\ sinx$ [B] $e^{x/2}\cos x,\quad e^{x/2}\ sinx$
[C] $e^{-x/2}\cos x,\quad e^{-x/2}\ sinx$ [D] $e^{-x/2}\cos x,\quad e^{x/2}\ sinx$

72. If a is a real number and if the middle term of $\left(\frac{a}{3}+3\right)^8$ is 1120, then value of a is

[A] $\pm 2$ [B] $\pm 1$
[C] $\pm\sqrt{3}$ [D] $\pm\sqrt{2}$

73. The point on the curve $\sqrt{x}+\sqrt{y}=\sqrt{a}$, the normal at which is parallel to the X-axis is

[A] (0, 0) [B] (0, a)
[C] (a, 0) [D] (a, a)

74. The number of diagonals in a octagon is

[A] 20 [B] 28
[C] 10 [D] 16

75. If the lines $3x + y + 2 = 0$, $2x - y + 3 = 0$ and $x + my - 3 = 0$ are concurrent, then the value of $m$ is

[A] **1** [B] 2
[C] **3** [D] 4

76. If $A$ be an $4 \times 4$ matrix such that determinant of $A$ is 2. Then the determinant of *adj A* is

[A] 8 [B] 16
[C] 2 [D] 4

*(Space for rough works)*

77. The value of line integral $\int_C (3x-5y)dx+(x-6y)dy$ , where C is the ellipse $\frac{x^2}{4}+y^2=1$

[A] 0
[B] $10\pi$
[C] $-12\pi$
[D] $12\pi$

78. Which is the solution of the differential equation: $(x+2y^3)\left(\frac{dy}{dx}\right)=y$

[A] $y/x = x^2 + c$
[B] $xy = (1/2)y^4 + c$
[C] $x/y = y^2 + c$
[D] None of these

79. If $sin^{-1}\left(\frac{x}{5}\right)+cosec^{-1}\left(\frac{5}{4}\right)=\frac{\pi}{2}$, then the value of $x$ is

[A] 1
[B] 3
[C] 4
[D] 5

80. In an ellipse, the distance between its foci is 6 and minor axis is 8, then its eccentricity is

[A] 1/2
[B] $1/\sqrt{5}$
[C] 4/5
[D] 3/5

**------xxx---Mathematics Paper End----xxx-----**

**CANDIDATE HAS TO ATTEMPT QUESTION NUMBERS 81-130 OF SECTION-D FROM APPROPRIATE ENGINEERING BRANCH AS SHOWN IN THE ADMIT CARD OF NEE-2017**

*(Space for rough works)*

# SECTION – D (Civil Engineering)

**[Candidate who has opted for CE (Code-31) in NEE - 2017]**

**Question numbers 81–110 carry 1 mark each:**

81. An element is subjected to two equal and like stresses σ, on two mutually perpendicular planes. The shape of the Mohr's circle will be

[A] A circle of radius 2σ
[B] A circle of radius σ
[C] A circle of radius σ/2
[D] A point

82. The difference between bending moment values at any two sections will be equal to

[A] The area of shear force diagram between those two sections
[B] The difference in slopes of shear force diagram at the same sections
[C] The area of loading diagram between the two sections
[D] The moment of area of diagram between the two sections taken about mid-point between the two sections

83. The neutral axis of the cross-section a beam is that axis at which the bending stress is

[A] Maximum
[B] Average
[C] Minimum
[D] zero

84. The maximum deflection of a fixed beam carrying a central point load lies at

[A] Fixed ends
[B] l/3 from fixed ends
[C] Centre of beam
[D] None of these

85. The ratio of compressive strength to tensile strength of concrete

[A] Increases with age
[B] Decreases with age
[C] Remains constant
[D] None of these

86. The relation between modulus of rupture $f_{cr}$ and characteristics strength of concrete $f_{ck}$ is given by (where $f_{cr}$ and $f_{ck}$ are in $N/mm^2$)

[A] $f_{cr} = 0.35\sqrt{f_{ck}}$
[B] $f_{cr} = 0.5\sqrt{f_{ck}}$
[C] $f_{cr} = 0.7\sqrt{f_{ck}}$
[D] $f_{cr} = 1.2\sqrt{f_{ck}}$

*(Space for rough works)*

**PAPER CODE : 31**

87. Irrigation canal is generally aligned along

[A] Ridge line
[B] Contour line
[C] Valley line
[D] Straight line

88. Reynolds number is the ratio of inertial force and .....

[A] Elasticity
[B] Gravitational force
[C] Surface tension
[D] Viscous force

89. Hydrostatic pressure on dam depends upon, its

[A] Length
[B] Depth
[C] Material
[D] All of these

90. If the dynamic viscosity of a fluid is 0.5 poise and specific gravity is 0.5, then the kinematic viscosity of that fluid in stokes is

[A] 0.25
[B] 0.50
[C] 1.0
[D] None of these

91. The ratio of the volume of voids to the volume of soil solids in a given soil mass, is known as

[A] Porosity
[B] Void ratio
[C] Specific gravity
[D] None of these

92. A vertical triangular area with vertex downward and altitude 'h' has its base lying on the free surface of a liquid. The centre of pressure below the free surface is at a distance of

[A] h/4
[B] h/3
[C] h/2
[D] 2h/3

93. Under-reamed piles are generally

[A] Driven pile
[B] Bored pile
[C] Precast pile
[D] All of these

94. The unit weight of a soil at zero air voids depends on

[A] Specific gravity
[B] Water content
[C] Unit weight of water
[D] All of these

---

*(Space for rough works)*

95. For a given soil sample, $C_c$ = coefficient of gradation, $C_u$ = coefficient of uniformity, $D_{10}$ = effective size, $D_{30}$ = diameter through which 30 per cent of the total soil mass is passing. If $C_c = 1.0$ and $C_u = 4.0$, then the value of $D_{30}/D_{10}$ would be

[A] 2.00 [B] 1.75
[C] 1.50 [D] 1.25

96. Shearing strength of a cohesionless soil depends upon

[A] Dry density [B] Loading rate
[C] Confining pressure [D] Nature of loading

97. In water bound macadam (WBM) roads, binding materials to hold the stones is

[A] Stone dust [B] Sand
[C] Brick dust [D] Cement

98. The convexity provided to the carriageway between the crown and edge of the pavement is known as

[A] Super-elevation [B] Camber
[C] Height of the pavement [D] None of these

99. If the stopping distance and average length of a vehicle are 18 m and 6 m, respectively, then the theoretical maximum capacity of a traffic lane at a speed of 10 m/sec is

[A] 3000 vehicles per hour [B] 2000 vehicles per hour
[C] 2500 vehicles per hour [D] 1500 vehicles per hour

100. The boundary of water of a still lake, represents

[A] Contour line [B] Level line
[C] Contour gradient [D] Contour surface

101. The compensation for curvature on gradient for Meter Gauge is given by

[A] 70/R [B] 52.5/R
[C] 35/R [D] 105/R

102. In a metric leveling staff, value of subdivision is

[A] 3 mm [B] 4 mm
[C] 5 mm [D] 10 mm

*(Space for rough works)*

**PAPER CODE : 31**

103. If the lower clamp screw is tightened and upper clamp screw is loosened, the theodolite may be rotated

[A] On its outer spindle without a relative motion between the vernier and graduated scale of lower plate
[B] On its outer spindle with a relative motion between the vernier and graduated scale of lower plate
[C] On its inner spindle with a relative motion between the vernier and graduated scale of lower plate
[D] On its inner spindle without a relative motion between the vernier and graduated scale of lower plate

104. For steel structure, the most economical section for column is

[A] Rectangular
[B] Solid circular
[C] Tubular section
[D] Hexagonal

105. The detention period in coagulation tanks is usually kept as

[A] 1.0 to 1.5 hours
[B] 2.0 to 6.0 hours
[C] 7 to 9 hours
[D] 8 to 12 hours

106. If the focal length of the object glass is 25 cm and the distance from object glass to the trunnion axis is 15 cm, the additive constant is

[A] 0.1
[B] 0.6
[C] 0.4
[D] 1.33

107. The population of a town in three consecutive years is 5000, 7000 and 8400, respectively. The population of the town in the fourth consecutive year according to geometrical increase method is

[A] 9500
[B] 9800
[C] 10100
[D] 10920

108. The type of valve which is provided on the suction pipe in a tube-well is

[A] Reflux valve
[B] Air-relief valve
[C] Pressure relief valve
[D] Sluice valve

109. For controlling the growth of algae, the chemical generally used is

[A] Alum
[B] Lime
[C] Bleaching powder
[D] Copper sulphate

*(Space for rough works)*

110. Self-cleansing velocity is

[A] The minimum velocity of flow required to maintain a certain amount of solids in the flow

[B] The maximum velocity of flow required to maintain a certain amount of solids in the flow

[C] Such flow velocity as would be sufficient to flush out any deposited solids in the sewer

[D] Such flow velocity as would be sufficient to ensure that sewage does not remain in the sewer

**Question numbers 111–130 carry 2 marks each:**

111. One simply supported beam 'A' carries a point load at its mid span. Another identical beam 'B' carries same load uniformly distributed over the entire span. The ratio of maximum deflection of the beams A and B will be

[A] 5/8
[B] 8/5
[C] 3/5
[D] None of the these

112. The slope of the elastic curve at the free end of a cantilever beam of span L and flexural rigidity EI, subjected to uniformly distributed load of intensity W is

[A] $WL^3/6EI$
[B] $WL^3/3EI$
[C] $WL^4/8EI$
[D] $WL^3/2EI$

113. A drainage basin has axial length and area 100 km and 225 $km^2$, respectively. The form factor of the same basin is

[A] 0.15
[B] 0.20
[C] 0.25
[D] 0.30

114. The reduction coefficient of a reinforced concrete column with an effective length of 4.8 m and size 250x300 mm is

[A] 0.80
[B] 0.95
[C] 0.90
[D] 0.85

115. If the velocities of flow of a stream of 10 m depth recorded by a current meter at depths of 2 m and 8 m are 0.7 m and 0.3 m, respectively, the discharge per unit width of the stream in cubic metres, is

[A] 2.5
[B] 5.0
[C] 10.0
[D] None of these

*(Space for rough works)*

**PAPER CODE : 31**

116. A coarse grained soil sample has void ratio 0.75 and specific gravity 2.75. The critical gradient at which quick sand condition occurs, is

[A] 1.00
[B] 0.50
[C] 0.75
[D] 0.25

117. If one wants to be 90% sure that the design flood in a dam project will not occur during the design life period of 100 years, the recurrence interval for such a flood would be

[A] About 90 years
[B] Equal to 100 years
[C] About 110 years
[D] Roughly 1000 years

118. The intensity of active earth pressure at a depth of 10 m in a dry cohesionless sand with an angle internal friction 30° and weight 18 kN/m$^3$, is

[A] 40 kN/m$^2$
[B] 50 kN/m$^2$
[C] 60 kN/m$^2$
[D] 80 kN/m$^2$

119. A fluid jet discharging from a 4 cm diameter orifice has a diameter 3 cm at its vena contracta. If the coefficient of velocity is 0.98, the coefficient of discharge for the orifice will be

[A] $0.98 \times (0.75)^2$
[B] $(0.75)^2 / 0.98$
[C] $0.98 \times (1.33)^2$
[D] $0.98 / (1.33)^2$

120. A clay strata of 2 m thickness consolidates 80% in 10 years. For 80% consolidation of 8 m thick of same clay layer, required time is

[A] 100 years
[B] 160 years
[C] 140 years
[D] 120 years

121. A vehicle is travelling at a speed of 80 km/hour on concrete pavement. For the coefficient of friction between tyre and pavement surface being 0.35, stopping distance for the vehicle is

[A] 44.44 m
[B] 76.99 m
[C] 116.43 m
[D] 232.86 m

*(Space for rough works)*

**PAPER CODE : 31**

122. Given that Plasticity Index (PI) of local soil = 15 and PI of sand = zero, then for a desired PI of 6, the percentage of sand in the mix should be

[A] 70
[B] 60
[C] 40
[D] 30

123. A soil has a discharge velocity of $6x10^{-7}$ m/s and a void ratio of 0.5. Find its seepage velocity

[A] $18x10^{-7}$ m/s
[B] $12x10^{-7}$ m/s
[C] $6x10^{-7}$ m/s
[D] $3x10^{-7}$ m/s

124. A summit curve is formed at the intersection of a 3% up gradient and 5% down gradient. To provide a stopping distance of 128 m, the length of summit curve needed will be

[A] 271 m
[B] 340 m
[C] 322 m
[D] 298 m

125. An old short column 20 cm x 20 cm in section is reinforced with 4 bars whose area of cross sectional area is 20 sq. cm. If permissible compressive stresses in concrete and steel are 4.0 MPa and 130 MPa, the safe load on the column, should not exceed

[A] 41.2 kN
[B] 412 kN
[C] 412 0 kN
[D] None of these

126. For a sleeper density of (n+5), the number of sleepers required for constructing a broad gauge railway track of length 650 m is

[A] 900
[B] 918
[C] 975
[D] 880

127. The following consecutive readings were taken with a dumpy level and a 3 m staff on a continuously sloping ground.

0.425, 1.035, 1.950, 2.360, 2.950, 0.750, 1.565, 2.450, 0.320, 1.025, 2.165, 2.955.

Which of the following reading are backsights?

[A] 0.425, 2.950, 0.750, 0.320
[B] 0.425, 0.750, 0.320, 2.955
[C] 0.425, 0.750, 0.320
[D] 0.425, 2.360, 0.750, 0.320

***(Space for rough works)***

128. The back staff reading on a bench mark (B. M.) of R. L. 300 m is 2.685 m and fore sight reading on a point is 1.345 m. The reduced level of that point is

[A] 302.685 m
[B] 301.345 m
[C] 304.030 m
[D] 301.340 m

129. A city supply of 15000 cubic metres of water per day is treated with a chlorine dosage of 0.5 ppm. For this purpose, the requirement of 25% bleaching powder per day would be

[A] 300 kg
[B] 75 kg
[C] 30 kg
[D] 7.5 kg

130. In a BOD test, 1.0 ml of raw sewage was diluted to 100 ml and the dissolved oxygen concentration of diluted sample was 6.0 ppm. On incubating the diluted sample for 5 day at 20°C, its BOD was 4.0 ppm. The BOD of raw sewage was

[A] 100 ppm
[B] 200 ppm
[C] 300 ppm
[D] None of these

**-----xxxx….. Civil Engineering (Code – 31) Paper Ends--------xxxx---------**

*(Space for rough works)*

PAPER CODE : 3

## SECTION – D (Computer Science and Engineering)

**[Candidate who has opted for CSE (Code-32) in NEE - 2017]**

**Question numbers 81–110 carry 1 mark each:**

81. What is the octal equivalent of $(A98)_{16}$

[A] $(5124)_8$ [B] $(5230)_8$

[C] $(5424)_8$ [D] $(4424)_8$

82. The number of columns in a state table for a sequential circuit with 'm' flip-flops and 'n input is

[A] m + n [B] m + 2 n

[C] 2 m + n [D] 2 m + 2 n

83. The total number of possible Boolean functions involving 'n' Boolean variables is

[A] $n^{2n}$ [B] $n^2$

[C] $n^n$ [D] None of these

84. The number of processes completed per unit time is known as

[A] Output [B] Throughput

[C] Efficiency [D] Capacity

85. The operation of J-K flip-flop is similar to that of the S-R flip-flop except that the J-K flip-flop

[A] Doesn't have an invalid state [A] Sets to clear when both J = 0 and K =

[C] Does not show transition on change in pulse [C] Does not accept asynchronous inputs

86. Which of the following is a non-preemptive CPU scheduling?

[A] Round Robin [B] First Come First Serve

[C] Multilevel Queue Scheduling [D] None of these

87. A positive edge-triggered flip-flop changes its state when

[A] Enable input ( EN ) is set [B] High-to-low transition of clock

[C] Low-to-high transition of clock [D] Preset input ( PRE ) is set

*(Space for rough works)*

88. System calls are invoked by using

[A] A software interrupt
[B] Polling
[C] In-direct jump
[D] None of these

89. The 3 variable Karnaugh Map (K-Map ) has _____ cells for min or max terms

[A] 4
[B] 8
[C] 12
[D] 16

90. A system has 3 processes sharing 4 resources. If each process needs a maximum of 2 units then, deadlock

[A] Can never occur
[B] May occur
[C] Has to occur
[D] None of these

91. Sparse matrices have

[A] Many non-zero entries
[B] Many zero entries
[C] Higher dimension
[D] None of these

92. The maximum number of comparisons needed to sort 7 items using radix sort is (assume each item is a 4 digit decimal number)

[A] 28
[B] 38
[C] 120
[D] 280

93. Two main measures for the efficiency of an algorithm are

[A] Processor and memory
[B] Complexity and capacity
[C] Time and space
[D] Data and space

94. Given two sorted list of size 'm' and 'n' respectively, the number of comparisons needed in the worst case by the merge sort algorithm will be

[A] $m \times n$
[B] Maximum of m, n
[C] Minimum of m, n
[D] $m + n - 1$

95. Which of the following is essential for converting an infix expression to the postfix form efficiently?

[A] An operator stack
[B] An operand stack
[C] An operator stack and an operand stack
[D] A parse tree

*(Space for rough works)*

96. Match the following

| | |
|---|---|
| (a) Completeness | i) How long does it take to find a solution |
| (b) Time Complexity | ii) How much memory needs to perform the search |
| (c) Space Complexity | iii) Is the strategy guaranteed to find the solution when there is one |

[A] a - iii , b - ii , c – i
[B] a – i , b – ii , c – iii
[C] a – iii , b - i , c – ii
[D] a – i , b – iii , c – ii

97. The sequence of events that happen during a typical fetch operation is

[A] PC→MAR→Memory→MDR→IR
[B] PC→Memory→MDR→IR
[C] PC→Memory→IR
[D] PC→MAR→Memory→IR

98. A micro-programmed control unit

[A] Is faster than a hard-wired control unit
[B] Facilitates easy implementation of new instructions
[C] Is useful when very small programs are to be run
[D] Usually refers to the control unit of a microprocessor

99. On receiving an interrupt from an I/O device, the CPU

[A] Halts for a predetermined time
[B] Hands over control of address bus and data bus to the interrupting device
[C] Branches off to the interrupt service routine immediately
[D] Branches off to the interrupt service routine after completion of the current instruction

100. To achieve parallelism, one needs a minimum of

[A] 2 processors
[B] 3 processors
[C] 4 processors
[D] 1 processor

101. The default values of auto, register and static storage class are

[A] 0, garbage, garbage
[B] garbage, garbage, 0
[C] garbage, 0, 0
[D] 0, 0, garbage

*(Space for rough works)*

102. Choose the correct output for the following code segment

```
while ( 1 )
{
  printf ( "abc" );
}
```

[A] Compile time error
[B] Run time error
[C] Print abc
[D] Print abc for infinite times

103. Which one of the following interrupt is non-maskable?

[A] TRAP
[B] RST 7.5
[C] INTR
[D] RST 6.5

104. What is the output of the following program?

```
# include < iostream.h >
void main ( )
    {
 int a [ ] = { 10, 20, 30 };
cout << * a + 1;
}
```

[A] 20
[B] 10
[C] 11
[D] 21

105. Choose the correct for the following code segment

```
void main ( )
{
 int i = 3;
 printf ( " %d %d %d ", ++i,  i , i++ );
 }
```

[A] 3,4,5
[B] 4,4,5
[C] 3,5,5
[D] 5,4,3

*(Space for rough works)*

106. The purpose of the following code segment

```
a = a + b;
b = a – b;
a = a – b;
```

where 'a' and 'b' are two integers is to

[A] Transfer the content of 'a' to 'b'
[B] Transfer the content of 'b' to 'a'
[C] Exchange the content of 'a' and 'b'
[D] Negate the content of 'a' and 'b'

107. A byte addressable computer has a memory capacity of $2^m$ Kbytes and can perform $2^n$ operations. An instruction involving 3 operands and one operator needs a maximum of

[A] 3m bits
[B] 3m+n+30 bits
[C] m+n bits
[D] 3m+n bits

108. In a paged memory, the page hit ratio is 0.35. The time required to access a page in secondary memory is equal to 100 ns. The time required to access a page in primary memory is 10 ns. The average time required to access a page is

[A] 30.0 ns
[B] 68.0 ns
[C] 68.5 ns
[D] 78.5 ns

109. The values of X and Y, if $(X567)_8 + (2YX5)_8 = (71YX)_8$ is

[A] 4, 3
[B] 3, 3
[C] 4, 4
[D] 4, 5

110. When a subroutine is called, the address of the instruction following the CALL instructions stored in/on the

[A] Stack pointer
[B] Accumulator
[C] Program counter
[D] Stack

**Question numbers 111–130 carry 2 marks each:**

111. A hash function f defined as f ( key ) = key mod 7, with linear probing, is used to insert the keys 37, 38, 72, 48, 98, 11, 56 into a table indexed from 0 to 6. What will be the location of key 11?

[A] 3
[B] 5
[C] 4
[D] 6

*(Space for rough works)*

112. The average successful search time for sequential search on 'n' items is

[A] n / 2 [B] ( n-1 ) / 2
[C] ( n+1 ) / 2 [D] log ( n ) + 1

113. The Boolean expression A B + A $\bar{B}$ + $\bar{A}$ C + A C is unaffected by the value of Boolean variable

[A] A [B] B
[C] C [D] None of these

114. The minimum number of gates required to implement the Boolean expression

A B + A $\bar{B}$ + $\bar{A}$ C is

[A] 1 AND gate and 1 OR gate [B] 2 NAND gates
[C] 3 AND gates and 2 OR gates [D] 1 OR gate

115. Consider the following page reference string

1 2 3 4 2 1 5 6 2 1 2 3 7 6 3 2 1 2 3 6

for LRU page replacement algorithm with 4 frames, the number of page faults is

[A] 10 [B] 14
[C] 8 [D] 11

116. A system has 12 instances of same resource and 3 processes. Consider the following resource allocation table

| Process no. | Maximum need | Current allocation |
|---|---|---|
| P1 | 10 | 5 |
| P2 | 4 | 2 |
| P3 | 9 | 2 |

Which of the following sequence is a safe sequence?

[A] P1 , P2 , P3 [B] P2 , P3 , P1
[C] P2 , P1 , P3 [D] P3 , P1 , P2

117. Disk requests come to disk driver for cylinder in the order 10, 22, 20, 2, 40, 6, 38 at a time when the disk drive is reading from cylinder 20. The seek time is 8 ms per cylinder. The total seek time, if the disk arm scheduling algorithm is first come first serve is

[A] 1576 [B] 1168
[C] 960 [D] 1050

*(Space for rough works)*

118. At a particular time of computation the value of a counting semaphore is 13. It will become 7 after

[A] 6 V operations
[B] 5 P operations
[C] 10 V operations and 2 P operations
[D] 10 P operations and 4 V operations

119. The seek time of a disk is 40 ms. It rotates at the rate of 20 rotations per second. Each track has capacity of 300 words. The average access time is approximately

[A] 65 ms
[B] 60 ms
[C] 45 ms
[D] 50 ms

120. A machine needs a minimum of 100 sec to sort 1000 names using quick sort algorithm. The minimum time needed to sort 100 names will be approximately

[A] 3.4 sec
[B] 6.7 sec
[C] 12.3 sec
[D] 72.6 sec

121. A 3-ary tree is a tree in which every internal node has exactly 3 children. The number of leaf nodes in such a tree with 6 internal nodes will be

[A] 15
[B] 14
[C] 13
[D] 16

122. The seek time of a disk is 30 ms. It rotates at the rate of 30 rotations per second. Each track has capacity of 300 words. The average access time is approximately

[A] 47 ms
[B] 50 ms
[C] 60 ms
[D] 62 ms

123. The average successful search time taken by binary search on a sorted array of 10 items is

[A] 2.6
[B] 2.7
[C] 2.8
[D] 2.9

124. The postfix expression for the infix expression A + B * (C + D) / F + D * E is

[A] AB + CD + * F / D + E *
[B] ABCD + * F / + DE *+
[C] A * B + Cd / F * DE ++
[D] A + * BCD / F * DE ++

125. How many 32K × 1 RAM chips are needed to provide memory capacity of 256 K-Bytes?

[A] 32
[B] 256
[C] 128
[D] 64

126. If the cache needs an access time of 20 ns and the main memory 120 ns, then the average access time of the CPU is (assuming the hit ratio is 80% )

[A] 30 ns
[B] 40 ns
[C] 45 ns
[D] 50 ns

*(Space for rough works)*

127. Choose the correct output for the following code segment

```
# include < iostream.h >
using namespace std;
class Base
   {
     public:
     void f ( )
      {
       cout << "Base\n";
      }
   };
   class Derived: public Base
           {
            public:
            void f ( )
              {
                cout << "Derived\n";
              }
           };
void main ( )
        {
         Base *p = new Derived ( );
         P -> f ( );
        }
```

[A] Base
[B] Derived
[C] Compilation error
[D] None of these

128. Choose the correct output for the following code segment

```
void main ( )
{
    int  i = 5 ;
i = ( + + i ) / ( i + + ) ;
printf( " %d ", i );
}
```

[A] 1
[B] 2
[C] 3
[D] 4

*(Space for rough works)*

129. Choose the correct output for the following code segment

```
int a = 4, b = 6;
printf ( " %d ", a = = b );
```

[A] Error
[B] 1
[C] 0
[D] None of these

130. Choose the correct statement for the following code segment

```
class abc ;
class def ;
    { int x ;                    // statement 1
      protected : int y ;        // statement 2
      public : int z ;           // statement 3
      friend abc ;
    };
    Class abc
     { public :
          void main ( def A )
          { cout << ( A.x = 3 ) ; cout << ( A.y = 4 ) ; cout << ( A.z = 5 ) ;
        } ;
    void main ( )
    {
        def x1 ;
        abc x2 ;
        x2 . main ( x1 ) ;
     }
```

[A] Will compile successfully if statement 1 is removed
[B] Will compile successfully if statement 2 is removed
[C] Will compile successfully if statement 3 is removed
[D] Will run successfully and print 3 4 5

**-----xxx-----Computer Science and Engineering (Code – 32) Paper Ends-------xxx-------**

*(Space for rough works)*

**PAPER CODE : 33**

# SECTION – D (Electronics and Communication Engineering)

**[Candidate who has opted for ECE (Code-33) in NEE - 2017]**

**Question numbers 81–110 carry 1 mark each:**

81. Excess carriers are generated in a sample of N-type semiconductor by shining light at one end. The current flow in the sample will be made up of

[A] Diffusion flow of carriers
[B] Drift flow of carriers
[C] Both diffusion and drift flow of carriers
[D] Neither diffusion nor drift flow of carriers

82. The voltage where avalanche occurs is called the

[A] Barrier potential
[B] Depletion layer
[C] Knee voltage
[D] Breakdown voltage

83. An N-type semiconductor is illuminated by a steady flux of photons with energy greater than the band gap energy. The change in conductivity $\Delta\sigma$ obeys which relation?

[A] $\Delta\sigma=0$
[B] $\Delta\sigma=e(\mu_n+\mu_p)\,\Delta n$
[C] $\Delta\sigma=e\,(\mu_n\Delta n-\mu_p\Delta p)$
[D] $\Delta\sigma=e\,\mu_n\Delta n$

84. Which of the following has a negative-resistance region?

[A] Tunnel diode
[B] Step-recovery diode
[C] Schottky diode
[D] Optocoupler

85. The current gain of a transistor is defined as the ratio of the collector current to the

[A] Supply current
[B] Emitter current
[C] Base current
[D] Collector current

86. To avoid thermal runway in the design of an analog circuit, the operating point of the BJT should be such that it satisfies the condition

[A] $V_{CE} = V_{CC}/3$
[B] $V_{CE} \leq V_{CC}/2$
[C] $V_{CE} > V_{CC}/3$
[D] $V_{CE} \leq 0.78\,V_{CC}$

87. At high frequencies, ordinary diodes don't work properly because of

[A] Forward bias
[B] Reverse bias
[C] Breakdown
[D] Charge storage

*(Space for rough works)*

88. Consider the following statements:
The lower cut-off frequencies for an RC coupled CE amplifier depend on
1. input and output coupling capacitors
2. emitter bypass capacitor
3. junction capacitor
Which of these statements is/are correct?

[A] 1 alone
[B] 2 alone
[C] 1 and 2
[D] 2 and 3

89. In an ac amplifier using an op amp with coupling and bypass capacitors, the output offse voltage is

[A] Zero
[B] Minimum
[C] Maximum
[D] Unchanged

90. The kind of oscillator found in an electronic wristwatch is the

[A] Armstrong
[B] Clapp
[C] Colpitts
[D] Quartz crystal

91. 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=1 and K=0
[B] J=K=0
[C] J=K=1
[D] J=0 and K=1

92. A 4 bit modulo-6 ripple counter uses JK flip-flop. If the propagation delay of each FF is 50 ns, the maximum clock frequency that can be used is equal to

[A] 5 MHz
[B] 10 MHz
[C] 4 MHz
[D] 20 MHz

93. Consider the following statements:
A multiplexer
1. selects one of the several inputs and transmits it to a single output.
2. routes the data from a single input to one of many outputs.
3. converts parallel data into serial data.
4. is a combinational circuit.
Which of these statements are correct?

[A] 1, 2 and 4
[B] 2, 3 and 4
[C] 1, 3 and 4
[D] 1, 2 and 3

*(Space for rough works)*

**PAPER CODE : 33**

94. Consider the following registers:
1. Accumulator and B register
2. B and C registers
3. D and E registers
4. H and L registers

Which of these 8-bit registers of 8085 microprocessor can be paired together to make a 16-bit register?

[A] 1, 3 and 4
[B] 1, 2 and 3
[C] 1 and 2
[D] 2, 3 and 4

95. Consider the following statements:
1. Cache memory is low cost and fast memory.
2. Cache memory is fast but costly memory.
3. Performance of cache during program execution is measured by hit ratio.

Which of the following statements given above are correct?

[A] 1 and 2
[B] 2 and 3
[C] 1 and 3
[D] None of these

96. If the instrument is to have a wide range, the instrument should have

[A] Linear scale
[B] Square-law scale
[C] Exponential scale
[D] Logarithmic scale

97. If the output of a voltage regulator varies from 15 to 14.7 V between the minimum and maximum load current, the load regulation is

[A] 0
[B] 2%
[C] 1%
[D] 5%

98. An ammeter of range 0-25A has a guaranteed accuracy of 1% of full scale reading. The current measured by the ammeter is 5A. the limiting error in the reading is

[A] 2%
[B] 2.5%
[C] 4%
[D] 5%

99. A two-port network is reciprocal, if and only if

[A] $Z_{11}=Z_{22}$
[B] BC-AD= -1
[C] $Y_{12}=Y_{21}$
[D] $h_{12}=h_{21}$

100. In a uniform plane wave, the value of |E|/|H| is

[A] $(\mu/\varepsilon)^{1/2}$
[B] $(\varepsilon/\mu)^{1/2}$
[C] 1
[D] $(\mu\varepsilon)^{1/2}$

*(Space for rough works)*

101. If the height of the waveguide is halved, its cut-off wavelength will

[A] Be halved
[B] Be doubled
[C] Remain unchanged
[D] Be one-fourth of the previous value

102. An antenna is desired to operate on a frequency of 40 MHz whose quality factor is 50. The bandwidth of antenna is

[A] 800 kHz
[B] 5.03 MHz
[C] 127 kHz
[D] None of these

103. In a DSB-SC system with 100% modulation, the power saving is

[A] 50%
[B] 66%
[C] 75%
[D] 100%

104. 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

105. The bandwidth of a 'N' bit binary coded PCM signal for modulating a signal having bandwidth of 'f' Hz is

[A] f/N Hz
[B] $f/N^2$ Hz
[C] Nf Hz
[D] $N^2f$ Hz

106. Which of the following are the advantages of FM over AM?

1. Better noise immunity is provided.
2. Lower bandwidth is required.
3. The transmitted power is more useful.
4. Less modulating power is required.

Select the correct answer using the codes given below:

[A] 1, 2 and 3
[B] 2, 3 and 4
[C] 2 and 4
[D] 1, 3 and 4

107. In phase modulation, the frequency deviation is

[A] directly proportional to the modulating signal frequency
[B] inversely proportional to the modulating signal frequency
[C] independent of the modulating signal frequency
[D] inversely proportional to the square root of the modulating frequency

*(Space for rough works)*

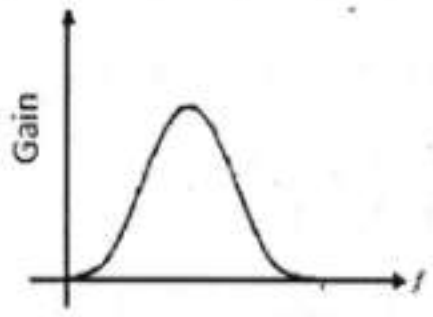
**PAPER CODE : 33**

108. The number of unused states in a 4-bit Johnson counter is

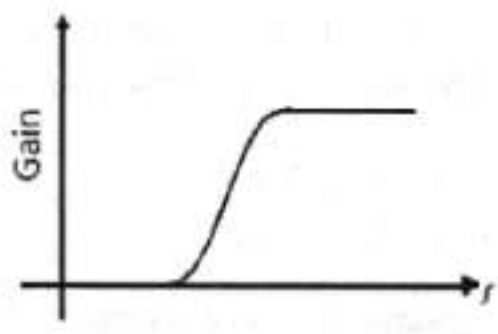
[A] 2 [B] 4
[C] 8 [D] 12

109. Identify the frequency response curve for a band-reject filter.

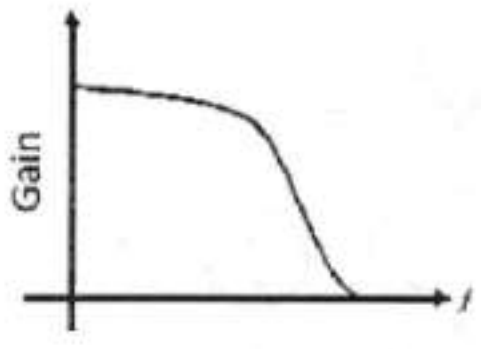
[A]



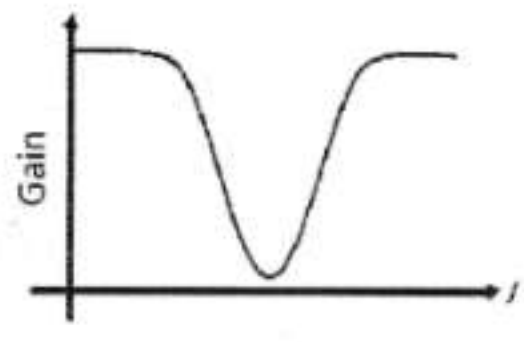

[B]




[C]




[D]




110. Satellite communication systems use the frequency band

[A] 3 to 6 GHz [B] 50 to 70 MHz
[C] 10 to 20 MHz [D] 100 to 120 GHz

**Question numbers 111–130 carry 2 marks each:**

111. The free electron density in a conductor is (1/1.6) x $10^{22}$ $cm^{-3}$. The electron mobility is 10 $cm^2/Vs$. What is the value of its resistivity ?

[A] $10^{-4}$ Ωm [B] $1.6x10^{-2}$ Ωm
[C] $10^{-4}$ Ωcm [D] $10^{4}$ mho $cm^{-1}$

112. The diodes in a bridge rectifier each have a maximum dc current rating of 2 A. This means the dc load current can have a maximum value of

[A] 1 A [B] 2 A
[C] 8 A [D] 4 A

113. Assuming an operating temperature T=300K and corresponding $V_T$ =26mV, what is the change in semiconductor silicon diode forward voltage $V_D$ to produce a 10:1 change in the diode current $I_D$, while operating in the forward bias region (<25mV)?

[A] 60mV [B] 120mV
[C] 180mV [D] 240mV

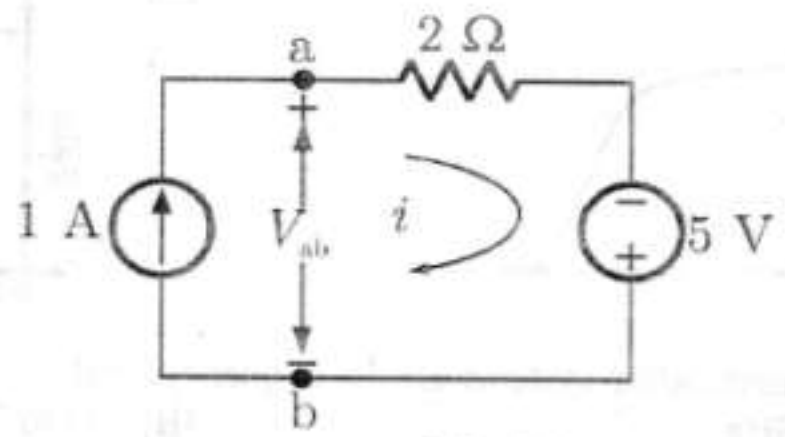
*(Space for rough works)*

114. Consider the following rectifier circuits:
1. Half-wave rectifier without filter.
2. Full-wave rectifier without filter.
3. Full-wave rectifier with series inductance filter.
4. Full-wave rectifier with capacitance filter.

The sequence of these rectifier circuits in decreasing order of their ripple factor is

[A] 1, 2, 3, 4
[B] 3, 4, 1, 2
[C] 1, 4, 3, 2
[D] 3, 2, 1, 4

115. Assuming ideal elements in the circuit shown below, the voltage $V_{ab}$ will be




[A] 3 V
[B] 0 V
[C] −3 V
[D] 5 V

116. If $XY = 0$ then $X \oplus Y$ is equal to:

[A] $X + Y$
[B] $\overline{X} + \overline{Y}$
[C] $XY$
[D] $\overline{XY}$

117. If 8085 adds 87 H and 79 H, then

[A] Both CARRY and ZERO flags will be set to 0
[B] Both CARRY and ZERO flags will be set to 1
[C] CARRY flag will be set to 1, ZERO flag to 0
[D] CARRY flag will be set to 0, ZERO flag to 1

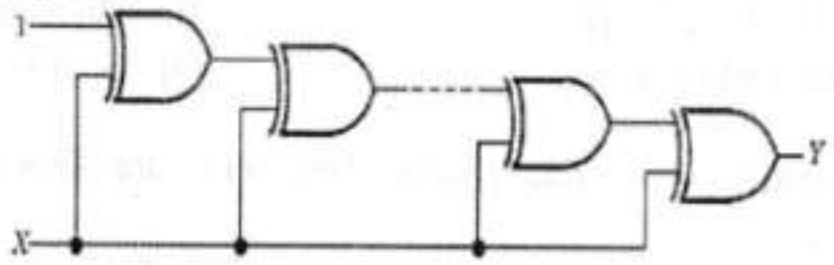
118. **Assertion (A):** Microprocessor 8085 has on-chip oscillator with inbuilt crystal.
**Reason (R):** For frequency stability crystal oscillator is preferred.

[A] Both [A] and [R] are correct and [R] is correct explanation of [A]
[B] Both [A] and [R] are correct but [R] is not correct explanation of [A]
[C] [A] is correct [R] is wrong
[D] [A] is wrong [R] is correct

*(Space for rough works)*

**PAPER CODE : 33**

119. If the input to the digital circuit shown in figure consisting of a cascade of 20 XOR gates is X, then the output Y is equal to




[A] 1
[B] $X$
[C] 0
[D] $\overline{X}$

120. Two coils have self-inductances of 0.09H and 0.01H and a mutual inductance of 0.015H. The coefficient of coupling between the coils is

[A] 0.06
[B] 0.5
[C] 1.0
[D] 0.05

121. In an amplitude modulated system, if the total power is 600W and the power in carrier is 400W, then the modulation index is

[A] 0.5
[B] 0.75
[C] 0.9
[D] 1

122. A super heterodyne receiver is designed to receive transmitted signals between 5 and 10 MHz. High-side tuning is to be used. The tuning range of the local oscillator for IF frequency 500 kHz would be

[A] 4.5 MHz - 9.5 MHz
[B] 4.5 MHz - 10.5 MHz
[C] 5.5 MHz - 10.5 MHz
[D] None of these

123. An amplifier has two identical cascaded stages. Each stage has a bandwidth of 20KHz. The overall bandwidth shall approximately be equal to

[A] 10.3 KHz
[B] 12.9 KHz
[C] 20.9 KHz
[D] 28.3 KHz

124. An 8-bit D/A converter has a full scale output voltage of 20V. the output when the input is 11011011, is

[A] 160mV
[B] 78mV
[C] 20V
[D] 17V

125. Which RAM is created using MOS transistors

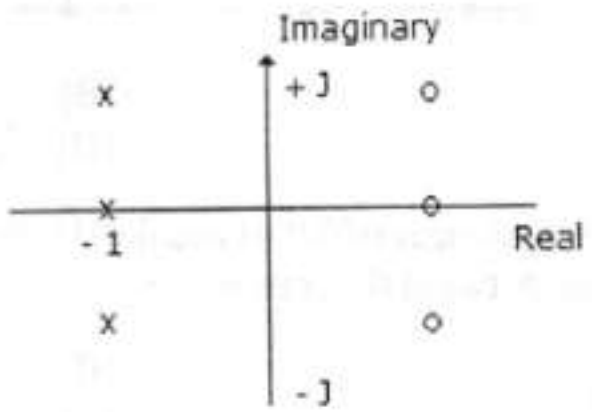
[A] Dynamic RAM
[B] Static RAM
[C] Permanent RAM
[D] SD RAM

*(Space for rough works)*

126. In a differential amplifier, the CMRR is limited mostly by

[A] CMRR of the op amp
[B] Gain-bandwidth product
[C] Tolerance of resistors
[D] Supply voltages

127. A pole zero pattern of a certain filter is shown in figure. This filter must be




[A] LPF
[B] BFP
[C] HPF
[D] APF

128. When VSWR is 3, the magnitude of the reflection coefficient is

[A] ¼
[B] 1/3
[C] ½
[D] 1

129. A band-pass signal has significant frequency components in the range of 1.5MHz to 2MHz. if the signal is to be reconstructed from its sample, the minimum sampling frequency will be

[A] 1MHz
[B] 2MHz
[C] 3MHz
[D] 4MHz

130. On which bands, do the optical fibers operate?
1. Ultra violet band
2. Ultra high frequency band
3. Visible light band
4. Infrared band

[A] 1 only
[B] 1 and 2 only
[C] 1, 2 and only
[D] 1, 3 and 4

**-----xxx-----Electronics and Communication Engineering (Code – 33) Paper Ends.....xxx-----**

*(Space for rough works)*

PAPER CODE : 34

# SECTION – D (Electrical Engineering)

**[Candidate who has opted for EE (Code: 34) in NEE – 2017]**

**Question numbers 81–110 carry 1 mark each:**

81. A network is said to be linear if it satisfies

[A] Superposition condition
[B] Homogeneity condition
[C] Both superposition and homogeneity conditions
[D] Associative condition

82. A capacitor

[A] Offers easy path to AC but block DC
[B] Offers easy path to DC but block AC
[C] Offers easy path to both AC and DC
[D] Blocks AC

83. A star circuit has each element of resistance R/2. The equivalent elements of delta circuit will be

[A] R
[B] 3R
[C] 3R/2
[D] R/6

84. When the relative permeability of material is much greater than 1, it is called as

[A] Ferromagnetic material
[B] Paramagnetic material
[C] Diamagnetic material
[D] None of these

85. If a transformer primary is energized from a triangular wave voltage source, its output voltage will be a

[A] Sine wave
[B] Square wave
[C] Triangular wave
[D] Pulse wave

86. In a three-phase induction motor running at slip $s$, the mechanical power developed in terms of air gap power $P_g$ is

[A] $P_g(s-1)$
[B] $\frac{P_g}{1-s}$
[C] $P_g(1-s)$
[D] $sP_g$

87. The series DC motors have the highest starting torque as compared to shunt and compound DC motors because of its

[A] Lower armature resistance
[B] Stronger series field
[C] Fewer series turns
[D] Larger armature current

*(Space for rough works)*

88. If the input to the prime mover of an alternator is kept constant but the field excitation is changed , then the

[A] Reactive component of the output is changed
[B] Active component of the output is changed
[C] Power factor the load remains constant
[D] Power factor of the load reduces

89. Skin effect is

[A] Proportional to the square of frequency
[B] Proportional to the frequency
[C] Inversely proportional to the frequency
[D] Independent of the frequency

90. Ratio of the maximum demand to the connected load in a power system is known as

[A] Load factor
[B] Diversity factor
[C] Demand factor
[D] Power factor

91. The most severe fault on the power system is

[A] Line to line fault
[B] 3-phase short circuit fault
[C] Double line to ground fault
[D] Line to ground fault

92. For a 8 pole wave wound armature, the number of brushes required will be

[A] 2
[B] 4
[C] 6
[D] 12

93. Buchholz relay is used for the protection of

[A] Generator
[B] Transmission line
[C] Transformer
[D] Bus-bar

94. Which of the circuit breakers has high reliability and negligible maintenance?

[A] Air-blast
[B] Vacuum
[C] Oil
[D] $SF_6$

95. In an electric arc welding, the voltage required to strike AC arc is about

[A] 50-60 V
[B] 80-90 V
[C] 100-200 V
[D] 220 V

*(Space for rough works)*

96. Lumens per watt is the unit of

[A] Luminous efficiency
[B] Brightness
[C] Luminous intensity
[D] Illumination

97. Integrating type measuring instruments are used for the measurement of

[A] Voltage
[B] Current
[C] Phase
[D] Energy

98. Which of the following instruments is the most accurate?

[A] PMMC
[B] Moving iron
[C] Thermo couple
[D] Induction type

99. The number of flip flops required in a decade counter is

[A] 2
[B] 3
[C] 4
[D] 10

100. A fuse is normally a

[A] Current limiting device
[B] Voltage limiting device
[C] Power limiting device
[D] Power factor correcting device

101. The number of comparators needed in a parallel conversion type 8-bit A to D converter is

[A] 256
[B] 8
[C] 16
[D] 255

102. The $\frac{dv}{dt}$ effect in SCR can result in

[A] Low capacitive charging current
[B] False triggering
[C] Increased junction capacitance
[D] High rate of rise of anode voltage

103. The input impedance of an operational amplifier is

[A] Infinite
[B] Zero
[C] Very high but not infinite
[D] Very small

104. Which of the following is not a jump statement in C++?

[A] Break
[B] Goto
[C] Exit
[D] Switch

*(Space for rough works)*

105. Step by step instructions written to solve any problem is called

[A] Pseudo code
[B] Algorithm
[C] Assembler
[D] Class

106. The frequency can be measured by

[A] Anderson bridge
[B] Hays's bridge
[C] Wien bridge
[D] Owen bridge

107. The magnetizing current in a transformer is rich in

[A] $3^{rd}$ harmonic
[B] $5^{th}$ harmonic
[C] $7^{th}$ harmonic
[D] $13^{th}$ harmonic

108. The surge impedance of cables is around

[A] 20 Ω
[B] 100 Ω
[C] 200 Ω
[D] 50 Ω

109. Breaking capacity of a circuit breaker is usually expressed in

[A] MVA
[B] MW
[C] KA
[D] KV

110. Nuclear power plant is invariably used as a/an

[A] Peak load plant
[B] Base load plant
[C] Standby plant
[D] Emergency plant

**Question numbers 111–130 carry 2 marks each:**

111. The electric bulbs rated for the same voltage have powers of 200 W and 100 W. If ther resistances are $R_1$ and $R_2$ respectively, then

[A] $R_1 = 2R_2$
[B] $R_2 = 4R_1$
[C] $R_2 = 2R_1$
[D] $R_1 = 4R_2$

112. The mutual inductance between the two unity coupled-coupled coils of 9 H and 4 H is

[A] 36 H
[B] 13 H
[C] 2.2 H
[D] 6 H

*(Space for rough works)*

113. A DC shunt generator delivers 195 A at a terminal voltage of 250 V. The armature and the shunt field resistance are 0.02 Ω and 50 Ω, respectively. What is the value of generated e.m.f.?

[A] 254 V
[B] 246 V
[C] 270 V
[D] 282 V

114. The copper loss of a certain transformer at half-full load is measured as 400 W. The copper loss at full load will be

[A] 800 W
[B] 200 W
[C] 400 W
[D] 1600 W

115. A voltmeter gives 120 oscillations per minute when connected to the rotor of an induction motor. The stator frequency is 50 Hz. The slip of the motor is

[A] 2 %
[B] 2.5 %
[C] 4 %
[D] 5 %

116. In Boolean algebra, $A+\overline{AB}$ is equal to

[A] $A+B$
[B] $\overline{A}+B$
[C] $A+\overline{B}$
[D] $\overline{A}+\overline{B}$

117. The ratio of the readings of the two wattmeters connected to measure power of a 3-phase balanced load is 5:3 and the load is inductive. The power factor of the load is

[A] 0.917 lead
[B] 0.6 lag
[C] 0.6 lead
[D] 0.917 lag

118. Rotor input to an induction motor is 100 kW. The slip is 10%. Gross mechanical power developed by its rotor is

[A] 10 kW
[B] 90 kW
[C] 99 kW
[D] 80 kW

119. The binary division $11000_2 \div 100_2$ gives

[A] 110
[B] 1100
[C] 11
[D] 101

120. At a certain current, the energy stored in an iron-cored coil is 1000 J and its copper loss is 2000 W. The time constant (in seconds) of the coil is

[A] 0.25
[B] 0.5
[C] 1.0
[D] 2.0

*(Space for rough works)*

121. An 8-bit DA converter has a maximum output voltage of 2 V. If $V_{in}$=1.5 V, the digital output at the end of conversion will be

[A] 00011100
[B] 00100011
[C] 01100000
[D] 11000000

122. In a DC series motor, if the armature current is reduced by 50%, the torque of the motor will be equal to

[A] 100% of the previous value
[B] 50% of the previous value
[C] 25% of the previous value
[D] 10% of the previous value

123. A 1mA ammeter has a resistance of 100 Ω. It is to be converted to a 1 A ammeter. The value of shunt resistance is

[A] 0.001 Ω
[B] 0.1001 Ω
[C] 100000 Ω
[D] 100 Ω

124. A single-phase half-wave controlled rectifier has $400\sin 314t$ as the input voltage and $R$ as the load. For a firing angle of 60° for the SCR, the average output voltage is

[A] $400/\pi$
[B] $200/\pi$
[C] $240/\pi$
[D] $300/\pi$

125. Three identical resistances connected in star consume 4000 W. If the resistances are connected in delta across the same supply, the power consumed will be

[A] 12000 W
[B] 8000 W
[C] 6000 W
[D] 4000 W

126. A 250 V lamp has a total flux of 3000 lumens and takes a current of 0.8 A from 250 V mains. Its luminous efficiency is

[A] 12 lumens/watt
[B] 9.6 lumens/watt
[C] 15 lumens/watt
[D] 240 lumens/watt

127. The active and reactive powers of an inductive circuit are 60 W and 80 VAR, respectively. The power factor of the circuit is

[A] 0.6 lagging
[B] 0.5 lagging
[C] 0. 8 lagging
[D] 0.75 lagging

*(Space for rough works)*

128. When the supply voltage to an induction motor is reduced by 10%, the maximum torque will be reduced by approximately

[A] 5% [B] 10%
[C] 20% [D] 40%

129. A 3-phase induction motor takes a line current of 45 A when started by direct switching. If the star-delta starter is used, the line current will be

[A] 45 A [B] 30 A
[C] 26 A [D] 15 A

130. A meter has a full scale deflection of 90° at a current of 1 A. The response of the meter is square-law. Assuming spring control, the current for a deflection of 45° will be

[A] 0.25 A [B] 0.707 A
[C] 0.67 A [D] 0.5 A

**-----xxxx------ Electrical Engineering (Code – 34) Paper Ends-------xxxx-----**

*(Space for rough works)*

PAPER CODE : 35

## SECTION – D (Mechanical Engineering)

**[Candidate who has opted for ME (Code: 35) in NEE – 2017]**

**Question numbers 81–110 carry 1 mark each:**

81. Which one among the following welding processes uses non-consumable electrode?

[A] Gas metal arc welding
[B] Submerged arc welding
[C] Gas tungsten arc welding
[D] Flux coated arc welding

82. Moment of inertia of a circular section about its diameter ($d$) is

[A] $nd^3/16$
[B] $nd^3/32$
[C] $nd^4/32$
[D] $nd^4/64$

83. The process of reheating the martensitic steel to reduce its brittleness without any significant loss in its hardness is

[A] Normalising
[B] Annealing
[C] Quenching
[D] Tempering

84. The maximum velocity of a vehicle in order to avoid skidding away on a level circular path, is

[A] $\mu gr$
[B] $\frac{1}{2}\mu gr$
[C] $\sqrt{\mu gr}$
[D] $\frac{1}{2}\sqrt{\mu gr}$

85. A measure of Rockwell hardness is the

[A] Depth of penetration of indenter
[B] Surface area of indentation
[C] Projected area of indentation
[D] Height of rebound

86. Ductility of material with work hardening

[A] Increases
[B] Decreases
[C] Remains same
[D] Unpredictable

87. In CNC programming the code GO1 is used for

[A] Circular interpolation clockwise
[B] Circular interpolation counter clockwise
[C] Linear interpolation
[D] Dwell

*(Space for rough works)*

88. According to Gibb's phase rule, the number of degree of freedom of an eutectic point in a binary system is

[A] 1
[B] 2
[C] 0
[D] 3

89. Permeability is poor for

[A] Coarse grains
[B] Medium grains
[C] Fine grains
[D] Rounded grains

90. The crystal structure of austenite is

[A] Body centered cubic
[B] Face centered cubic
[C] Hexagonal closed packed
[D] Body centered tetragonal

91. Corrosion resistance of steel can be increased by addition of which of the following material

[A] Chromium
[B] Tungsten
[C] Nickel
[D] Cobalt

92. In the assembly design of shaft, pulley and key, the weekest member is

[A] Pulley
[B] Key
[C] Shaft
[D] None of these

93. Tool life in the case of grinding wheel is the time taken

[A] Between two successive wheel loading
[B] For the wheel to be balanced
[C] Between two successive wheel dressing
[D] For wear of 1 mm on its diameter

94. Head of the Pelton turbine in meter is of the order of

[A] Below 60
[B] 60-150
[C] 150-250
[D] Above 250

95. SI unit of dynamic viscosity is

[A] $N\text{-}sec/m^2$
[B] $Kg\text{-}m/sec^2$
[C] $Nm^2/Sec$
[D] $Kg\ sec^2/m$

96. Existence of velocity potential implies that

[A] Fluid is continuum
[B] Fluid is irrotational
[C] Fluid is ideal
[D] Fluid is compressible

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*(Space for rough works)*

97. Which one of the following sets of conditions clearly applies to an ideal fluid?

[A] Viscous and compressible
[B] Viscous and incompressible
[C] Non viscous and compressible
[D] Non viscous and incompressible

98. The ratio of area under the bending moment diagram to the flexural rigidity between any two points along a beam gives the change in

[A] Shear force
[B] Bending moment
[C] Slope
[D] Deflection

99. The number of degrees of freedom in a plane mechanism having 'n' links and 'j' simple hinge joints is

[A] 3(n-3) - 2j
[B] 3(n-1) - 2j
[C] 3n - 2j
[D] 2j - 3n + 4

100. The Bernoulli's equation refers to conservation of

[A] Energy
[B] Linear momentum
[C] Angular momentum
[D] Mass

101. The value of poission's ratio of a material is zero. Then material behave as a

[A] Perfectly elastic body
[B] Perfectly plastic body
[C] Ductile material
[D] Rigid body

102. Work done in a free expansion process is

[A] Minimum
[B] Zero
[C] + ve
[D] -ve

103. Aqua ammonia is used as refrigerant in the following type of refrigeration system:

[A] Brayton cycle
[B] Gas cycle
[C] Vapour compression
[D] Vapour absorption

104. The compression ratio for petrol engines is

[A] 3 to 6
[B] 5 to 8
[C] 15 to 20
[D] 20 to 30

105. If a heat engine gives an output of 3 kW when the input is 10,000 J/s, then the thermal efficiency of the engine will be

[A] 20%
[B] 70%
[C] 30%
[D] 76.7%

*(Space for rough works)*

106. Newton's law of viscosity is a relationship between

[A] Shear stress and rate of angular deformation
[B] Shear stress and rate of normal linear rate of deformation
[C] Pressure, velocity and viscosity
[D] Shear stress, pressure and rate of angular distortion

107. The accumulation of soot in a cylinder results in an increase of

[A] Clearance volume
[B] Ignition time
[C] Effective compression ratio
[D] Valve travel time

108. Side rake angle of a single point cutting tool is the angle

[A] by which the face of the tool is inclined towards back
[B] by which the face of the tool is inclined sideways
[C] between the surface of the flank immediately below the point and a plane at right angles to the centre line of the point of the tool
[D] between the surface of the flank immediately below the point and a line drawn from the point perpendicular to the base

109. Tool life is measured by the

[A] Number of pieces machined between tool sharpenings
[B] Time the tool is in contact with the job
[C] Volume of material removed between tool sharpenings
[D] All of these

110. Hot rolling of mild steel is carried out

[A] At recrystallisation temperature
[B] Between 100 °C to 150 °C
[C] Above recrystallisation temperature
[D] Below recrystallisation temperature

**Question numbers 111–130 carry 2 marks each:**

111. If the maximum and minimum resultant forces of two forces acting on a particle are 40kN and 10 kN respectively, then the two forces in question would be

[A] 25kN and 15 kN
[B] 20kN and 20 kN
[C] 20kN and 10 kN
[D] 20kN and 5 kN

*(Space for rough works)*

112. Two mating spur gears have 40 and 120 teeth, respectively. The pinion rotates at 1200 rpm a transmits a torque of 20 Nm. The torque transmitted by the gear is

[A] 6.6 Nm
[B] 20 Nm
[C] 40 Nm
[D] 60 Nm

113. A venturimeter of 20 mm throat diameter is used to measure the velocity of water in horizontal pipe of 40 mm diameter. If the pressure difference between the pipe and the thro sections is found to 30 kPa then, neglecting frictional losses , the flow velocity is

[A] 0.2 m/s
[B] 1.0 m/s
[C] 2.0 m/s
[D] 1.4 m/s

114. A box rests in the rear of a truck moving with a declaration of $2m/s^2$. To prevent the box fro sliding, the approximate value of static coefficient of friction between the box and the bed of t truck should be

[A] 0.1
[B] 0.2
[C] 0.3
[D] 0.4

115. The values of enthalpy at the beginning of compression, at the end of compression and at t end of condensation are 185 kJ/kg, 210 kJ/kg and 85 kJ/kg, respectively. What is the value the COP of the vapour compression refrigeration system?

[A] 4
[B] 5.4
[C] 0.25
[D] 1.35

116. In a strained material , one of the principle stresses is twice the other. The maximum shear stre in the same case is $\tau_{max}$. Then, what is the value of the maximum principal stress?

[A] $\tau_{max}$
[B] $2\tau_{max}$
[C] $4\tau_{max}$
[D] $8\tau_{max}$

117. Dry bulb temperature, Wet bulb temperature and dew point temperature are same for

[A] Dry air
[B] Saturated air
[C] Unsaturated air
[D] None of these

118. In a cotter joint, the width of the cotter at the centre is 50mm and its thickness is 12mm. T load acting on the cotter is 60kN. What is the shearing stress developed in the cotter?

[A] $120\ N/mm^2$
[B] $100\ N/mm^2$
[C] $75\ N/mm^2$
[D] $50\ N/mm^2$

***(Space for rough works)***

119. A hole of 20 mm diameter is to be drilled in a steel block of 40 mm thickness. The drilling is performed at rotational speed of 400 rpm and feed rate of 0.1 mm/rev. The required approach and over run of the drill together is equal to the radius of drill. The drilling time ( in minute) is

[A] 1.00 [B] 1.25
[C] 1.50 [D] 1.75

120. Car moving with speed 'U' can be stopped in minimum distance 'X' when brakes are applied. If the speed becomes 'N' times, the minimum distance over which the car can be stopped would take the value

[A] $N^2X$ [B] NX
[C] X/N [D] $X/N^2$

121. The reading of the pressure gauge fitted on a vessel is 25 bar. The atmospheric pressure is 1.03 bar and the value of g is 9.81 $m/s^2$. The absolute pressure in the vessel is

[A] 23.97 bar [B] 25.00 bar
[C] 26.03 bar [D] 34.84 bar

122. A pipe flow system with flow direction is shown in the below Fig.1. The following table gives the velocities and the corresponding areas

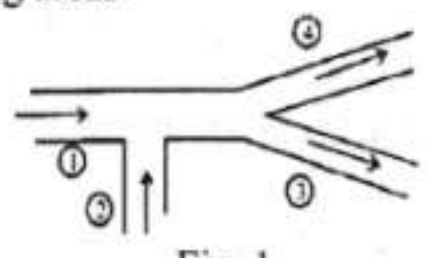


Fig. 1

| Pipe no. | Area ($cm^2$) | Velocity (cm/s) |
|---|---|---|
| 1 | 50 | 10 |
| 2 | 50 | $V_2$ |
| 3 | 80 | 5 |
| 4 | 70 | 5 |

The value of $V_2$ is

[A] 2.5 cm/s [B] 5.0 cm/s
[C] 7.5 cm/s [D] 10.0 cm/s

123. A closed system undergoes a process 1-2 for which the values of $Q_{1-2}$ and $W_{1-2}$ are +20 kJ and +50 kJ, respectively. If the system is returned to state, 1, and $Q_{2-1}$ is -10 kJ. What is the value of the work $W_{2-1}$?

[A] + 20 kJ [B] –80 kJ
[C] –40 kJ [D] +40 kJ

124. A closed system receives 60 kJ heat but its internal energy decreases by 30 kJ. Then the work done by the system is

[A] 90 kJ
[B] 30 kJ
[C] –30 kJ
[D] – 90 kJ

125. Two points, A and B located along the radius of a wheel, as shown in Fig. 2 below, have velocities of 80 and 140 m/s, respectively. The distance between points A and B is 300 mm. The radius of wheel is.....

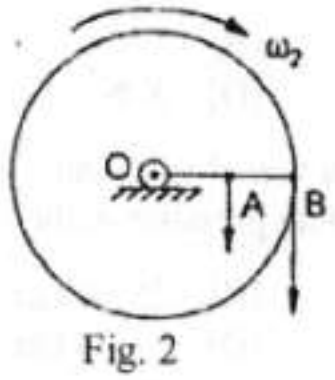


Fig. 2

[A] 400 mm
[B] 500 mm
[C] 600 mm
[D] 700 mm

126. A micrometer screw has pitch of 2 cm and the thimble has scale of 64 divisions. Calculate the least count of the micrometer

[A] 0.313 mm
[B] 0.01 mm
[C] 0.001 mm
[D] 0.031 mm

127. A brass billet is to be extruded from its initial diameter of 100 mm to a final diameter of 50 mm. The working temperature of 700 °C and the extrusion constant id 250 MPa. The force required for extrusion is

[A] 5.44 MN
[B] 2.72 MN
[C] 1.36 MN
[D] 0.36 MN

128. In a blanking operation to produce steel washer, the maximum punch load used in $2\times10^5$N. The plate thickness is 4 mm and percentage penetration is 25. The work done during this shearing operation is

[A] 200 J
[B] 400 J
[C] 600 J
[D] 800 J

*(Space for rough works)*

129. For S.I engine, fuel in order of increasing knocking tendency are

[A] Paraffins, Napthenes, Areomatics
[B] Areomatics, Napthenes, Paraffins
[C] Napthenes, Paraffins, Areomatics
[D] Areomatics, Paraffins, Napthenes

130. In orthogonal cutting, the depth of cut is 0.5mm at a cutting peed of 2 m/s. If the chip thickness is 0.75 mm, the chip velocity is

[A] 1.33 m/s
[B] 2 m/s
[C] 2.5 m/s
[D] 3 m/s

**------xxx-------Mechanical Engineering (Code – 35) Paper Ends------xxxx-------**

***(Space for rough works)***