## Section-I: General Aptitude

1. The values of x which satisfy $(x-1)(x)(x+1) \leq 0$ is / are

   i. $x \leq 0$;   ii. $x \leq -1$ iii. $0 \leq x \leq 1$

   (A) Only I   (B) Both ii and iii   (C) Both i and ii   (D) Both i and iii

2. A company awarded annual bonuses to its employees. Of the employees at the company, 70% received bonuses of at least 10,000, 40% received bonuses of at least 50,000, and 20% received bonuses of at least 1,00,000. If 60 employees received bonuses of less than 10,000, how many employees received bonuses of at lest 50,000 but less than 1,00,000?

   (A) 80   (B) 50   (C) 48   (D) 40

3. A sum of money compounded annually amounts to thrice itself in 10 years. In how many years, will it become 9 times itself?

   (A) 6   (B) 8   (C) 10   (D) 12

4. Babita was asked to calculate the arithmetic mean of ten positivetwo digit integers. By mistake, she interchanged the two digits, say t and u, in one of these ten integers. As a result, her answer for the arithmetic mean was 1.8 more than what it should have been. Then u - t equals

   (A) 1   (B) 2   (C) 3   (D) 4

5. Operating alone, Tap A takes twice as long as Tap B takes to fill an empty tank. Operating together at their respective constant rates, the taps can fill the tank in 6 hours. How many hours would it take the Tap A to fill the tank operating alone?

   (A) 18   (B) 9   (C) 12   (D) 15

6. A shopkeeper sells two items at the price of Rs.160. If one of them is sold at 10% profit and another sold at 10% loss, then find the profit/loss?

   (A) 3.23   (B) 5.75   (C) 2.5   (D) 6.9

7. The sum of ages of 5 children born at interval of 3 years each is 50 years. What is the age of youngest child?

   (A) 10   (B) 2   (C) 7   (D) 4

8. The cost of the components x, y, z of a machine worth Rs.45,000 in 1996 is given as a pie chart ? In the following year, the cost of the components x, y, z increased by 10%, 30%, and 20% respectively. What is the cost of the machine in 1997?
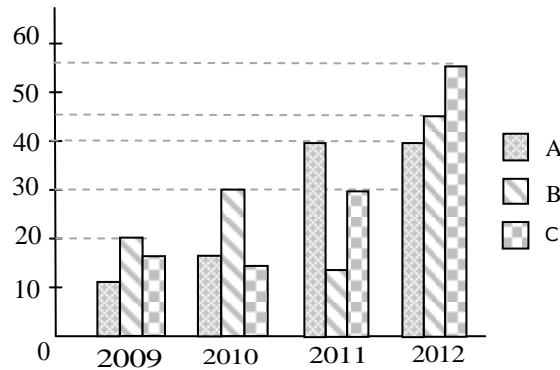
   (A) 54375

   (B) 52375

   (C) 54475

   (D) 54365
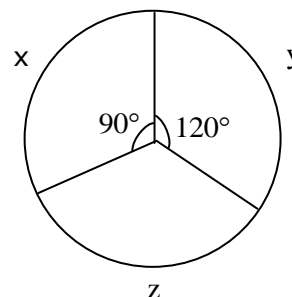
9.   What is the 2777th digit in the sequence 1 2 3 4 5 6 7 8 9 10 11 12 13 14…..?
        (A) 9   (B) 3   (C) 7   (D) 6

10.   Production of sugar (in thousand tons) by three sugar mills over the year

        Which of the statement is true ?
        i.   Ratio between the production of B in 2011 to C in 2012 is 3 :11
        ii.   Average production of A in four years is 20
        iii.   Percentage increase in C in 2011 from the previous year is 100%
        (A) i & ii only   (B) ii & iii only
        (C) i & iii only   (D) i, ii & iii

11.   "Students who hired a hack to write their projects were punished"
        Choose the best assumption for the given statement:
        (A) Students have become mischievous
        (B) Hack's are intelligent
        (C) Hiring a hack is inexpensive
        (D) Students have projects to be done

12.   Find out the error part in the given sentence
        Rajesh is/ smarter enough/ to get selected for his post/ without any recommendations

            (A)   (B)   (C)   (D)

13.   Arrange the given parts of the sentence in correct order:
        and recognize / all of us must / the machine tool industry / in the Country/
        [1]   [2]   [3]   [4]

        strategic and vital / have a deep introspection / the fact that /
         [5]   [6]   [7]

        has a very special place / from the point / interests of the nation.
         [8]   [9]   [10]
        (A) 2,4,7,8,6,9,1,10,3,5   (B) 2,6,5,8,4,3,1,7,10,9
        (C) 2,3,8,9,6,7,10,4,1,5   (D) 2,6,1,7,3,8,4,9,5,10

14.   Choose the appropriate word which gives the meaning of the sentence given:
        A critical situation in which no progress can be made:
        (A) Hullabaloo   (B) Aggression   (C) Histrionic   (D) impasse

15. There was once a newspaper vendor who had a rude customer. Every morning the customer throws the money at the vendor. The vendor would pick up the money, smile politely and say, "Thank you sir". The vendor's assistant asked him "why are you always polite with him when he is so rude to you". The vendor replied "He can't help being rude and I can't help being polite".

    What is vendor's conclusion?

    (A) Strive for excellence   (B) Work is worship

    (C) Rebels do not realize   (D) Keep faith in our own ideas

16. In 1991, produce growers began using a new, inexpensive pesticide, provoking many objections that they would damage both the environment and the produce they were growing. However, the fears have proven unfounded as, though 1996, produce prices had dropped and no ill effects had been reported.

    Which of the following, if true, would be the strongest objection to the argument above?

    (A) Consumption of the produce declined from 1991 to 1993, but rose sharply from 1994 to 1996.

    (B) Several areas in which use of the pesticide was forbidden have also experienced a drop in produce prices.

    (C) The amount of produce grown in 1991 was larger than that of 1996.

    (D) The time since the beginning of the use of the pesticide has been too short to allow some of the predicted effects to occur.

17. Choose the appropriate antonym for the bold word **Linger**

    (A) Sojourn   (B) Fiery   (C) Condone   (D) Quilt

18. Find the proper meaning of the word given in bold letters

    APP won the election **fair and square.**

    (A) Honestly   (B) Falsely   (C) Corruptedly   (D) Unexpectedly

19. None but the rich can afford air travel. Some of those who travel by air become sick. Some of those who become sick require treatment.

    Choose the best conclusion:

    (A) All the rich travel by air

    (B) All the persons who travel by air become sick

    (C) All sick persons travel by air

    (D) Only rich can travel by air

20. **Sentence completion**

    According to Maslow's theory of need hierarchy, material is the _____ demand of human beings, in that it provides the founding floor from which the other demands are generated.

    (A) essential   (B) basic   (C) final   (D) emotional

Section-II: Technical

1. A bag contains 3 green and 2 red balls. A man draws 2 balls at random from the bag. If he is to receive 20paise for every green ball he draws and 10paise for every red one, what is his expectation (in paisa)?
    (A) 32   (B) 42   (C) 52   (D) 65

2. The contents of a four-bit register are initially 1011. The register is shifted six times to the right the serial input being 101111.

    shift Register

    (101111) serial input ⟶ | 1 | 0 | 1 | 1 |
    clock ⟶
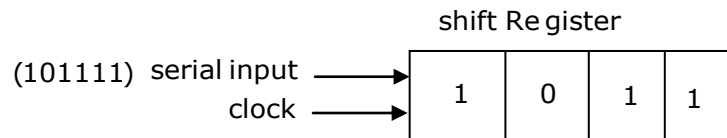
    What are the contents of the register after six clock pulses?
    (A) 1110   (B) 0111   (C) 1111   (D) 1011

3. Find out the maximum sine wave output voltage at 2MHz frequency, if the op-Amp slew rate is $10 \text{ V}/\mu s$.

    (A) 0.8V   (B) $\dfrac{2}{\pi}\text{V}$ (C) $\dfrac{10}{2\pi}\text{V}$ (D) 0.4V

4. In the following circuit, the output f is
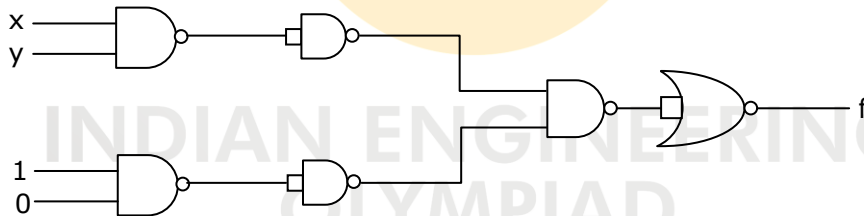
    (A) xy   (B) 0   (C) 1   (D) None of these

5. If $f = x^n + y^n + z^n$, then $\nabla f \cdot r =$
    (A) nf   (B) f   (C) n   (D) 0

6   The rotor resistance and standstill reactance of a 3-phase induction motor are respectively 0.018Ω and 0.08Ω per phase, normal slip at full load is 4%. Find the percentage reduction in stator voltage to develop full-load torque at half of full-load speed.
    (A) 31.2%   (B) 41.2%   (C) 51.2%   (D) 21.2%

7. If the above decoder is used only to display the numbers from 0 to 7(consider x, y, z as input variables) then what is the simplified Boolean expression (minimal sop) for the output line 'a'?
    (A) y+xz+x'z'   (B) y+x'z+xz'   (C) x+yz+y'z'   (D) x+y'z+yz'
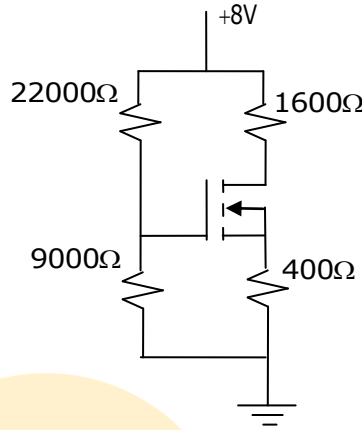
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8. A 4-pole series motor, when has its two field coils connected in parallel, runs at 1000 rpm. If the field coils are now connected in series keeping the supply voltage same and load torque same, the speed will

   (A) remain same   (B) halved   (C) doubled   (D) $\frac{1}{\sqrt{2}}$ times

9. The slope in Ampere/Volt of the I_D-V_{DS} load-line for the circuit shown below is

   (A) $\frac{-1}{400}$

   (B) $\frac{-1}{1600}$

   (C) $\frac{-1}{2000}$

   (D) $\frac{-1}{31000}$

10. In CB's (circuit breakers), the peak value of restriking voltage is ___ and time taken to reach peak value is____.

    (A) $V_m, \frac{\pi}{2}\sqrt{LC}$ (B) $V_m, \pi\sqrt{LC}$,   (C) $2V_m, \frac{\pi}{2}\sqrt{LC}$ (D) $2V_m, \pi\sqrt{LC}$

11. A generating station has got maximum demand of 40000 kW. What will be the cost per kWh delivered, if the capital cost is Rs. 95×10^5 annual cost of fuel & oil is Rs. 9×10^5 and taxes, wages & salaries percentage Rs. 6×10^5 and the rate of interest & depreciation is 10%. Annual load factor is 50%.

    (A) 1.39 paise   (B) 13.9 paise
    (C) 3.19 paise   (D) 0.139 paise

12. $\underset{x\to\infty}{Lt}\left[\frac{x^2+5x+3}{x^2+x+2}\right]^x =$

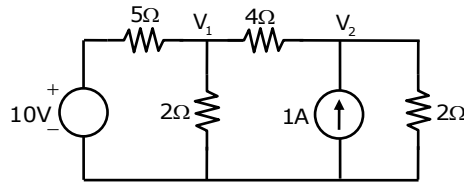   (A) e^4 (B) e^3 (C) e^2 (D) e

13. The conductors of a three phase, 50Hz, 125 km long transmission line are as shown in figure. The diameter of each conductor is 0.6cm. What is the value of reactance per phase?
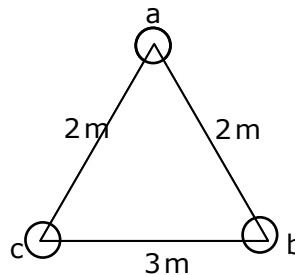

    (A) 54.19Ω (B) 64.19Ω (C) 44.19Ω (D) 74.19Ω

14. Find the voltages V_1 and V_2 for the circuit shown below.

(A) 0.6 V, 2.75 V (B) 2.7 V, 2.23 V (C) 5 V, 4 V (D) 0.2 V, 0.8 V

15. A synchronous machine is on infinite bus bar. When the prime mover is decoupled, how it will act as for excitation ON and OFF respectively?
    (A) Alternator; Induction Generator
    (B) Alternator; Induction Motor
    (C) Synchronous Motor; Induction Generator
    (D) Synchronous Motor; Induction Motor

16. $\oint_c \left(xy + y^2 \right) dx + x^2 dy = $ _____ where C is the closed curve of the region bounded by $y=x$ and $y=x^2$
    (A) 1/20 (B) -1/20 (C) 1/40 (D) -1/40

17. Consider a P.S Network as shown in the figure
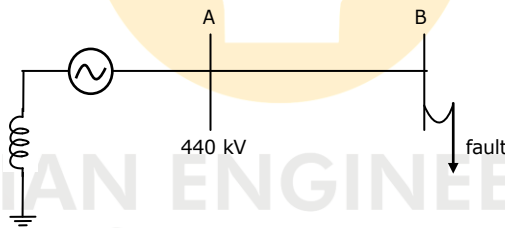
The P.U. equivalent of positive, negative, zero of the above Network is j0.2, j0.2, j0.34 and L-L-G fault occurred at bus 'B', the neutral voltage in kV in fault condition is ____, neutral reactance is j0.05.
    (A) 10 kV (B) 75 kV (C) 440 kV (D) 750 kV

18. Here as you can see the measured length ends before the mark of 231 cm. What can we say about the measured length with absolute confidence?


(centimeter)
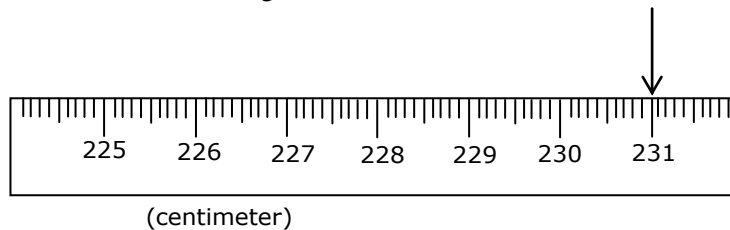
(A) $231 cm \pm 0.1 cm$ (B) $230.9 cm \pm 0.1 cm$
(C) $230 cm \pm 0.2 cm$ (D) $231.1 cm \pm 0.1 cm$

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19. Power in a $1-\phi$ circuit is measured using an electrodynamometer wattmeter. The resistance and inductance of wattmeter voltage circuit are 2500Ω and $20\,\text{mH}$. At a frequency of 50 Hz and at a power factor of 0.3, the load voltage and load current are 120V and 10A respectively. The current coil has negligible inductance and a minimal resistance of $0.2\,\Omega$. What will be the % error in wattmeter reading when pressure coil is connected on the load side?

(A) 0.797%   (B) 2.397%   (C) 0.790%   (D) 2.341%

20. The solution for contour integral $\oint_{|z|=1} e^{1/z} \sin\frac{1}{z}\,dz$ is

(A) $2\pi i$ (B) πi (C) 0   (D) $5\pi i$

21. A Power Transformer (T/F) having 66/33 kV having $\curlyvee/\Delta$ connection is protected by a percentage differential protection. The CT ratio on L.V (Low voltage) side of the Transformer 400/1. What is the CT ratio on HV (High Voltage) side.

(A) $\dfrac{200}{3}$ (B) $200\sqrt{3}$ (C) $\dfrac{400}{3}$ (D) $\dfrac{400}{\sqrt{3}}$

22. An Ayrton shunt is designed to give the ammeter a current range of 1A,5A and 10A. If the internal resistance of PMMC is 50Ω and full scale deflection current is 1mA. Find the values of the resistances in milli ohms?

(A) 5,5,39.9   (B) 6,6,49.9
(C) 9.5,8.5,50   (D) 10.5,15,65.5

23. In the bridge shown here, the bridge elements are:

$R_1 = 4.5\,\text{K}\Omega;\quad c_1 = 1\mu\text{F}$
$R_3 = 650\,\Omega\quad R_2 = 6.5\,\text{K}\Omega$
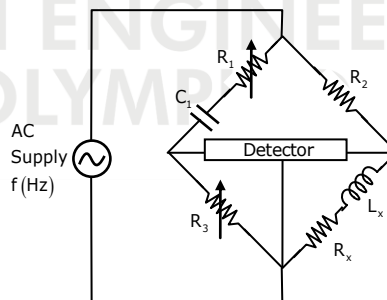
When the bridge is at balance condition for an supply angular frequency of 1000 rad/sec, The unknown resistance (in ohms) is

(A) 894   (B) 452   (C) 529   (D) 650

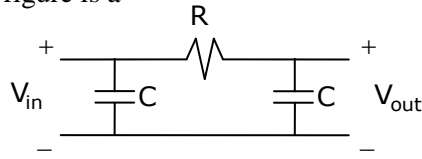24. Calculate the effective inductance of the following circuit.
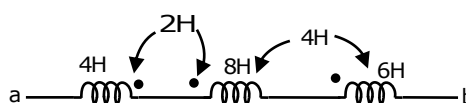
(A) 24H   (B) 22H   (C) 18H   (D) 10H

25. The circuit shown in the following figure is a
   (A) LPF
     (B) HPF
     (C) BPF
     (D) APF

26   A $2000/200$ V,50 Hz, $1-$phase transformer has an exciting current of 6A with core-loss of 250 W when LV side is excited with rated voltage. The no-load power factor and magnetizing component of current are
     (A) 0.208, 5.87A   (B) 0.77, 6A
     (C) 0.14, 4.28A   (D) 0, 1.25A

27. A network diagram for a $K-G$ flip flop is shown below. The next state equation is
     (A) $Q(t+1) = KG + KQ'$
     (B) $Q(t+1) = KG + K'Q$
     (C) $Q(t+1) = K'G + KQ'$
     (D) $Q(t+1) = (G'+Q')k$
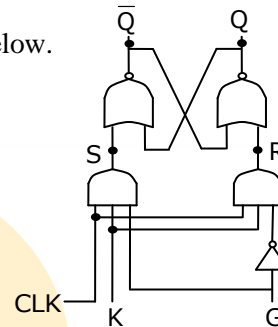
28. Two 6600/400V, 3-phase transformers X and Y having 250 KVA and 500 KVA respectively have the following particulars per phase when referred to the secondary side
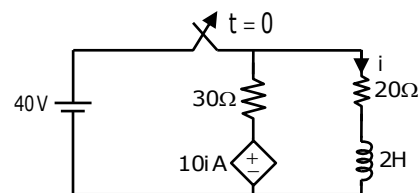   X :R = 0.009 ; X=$0.04\,\Omega$
     Y: R = 0.004 ; X=$0.02\,\Omega$
     what will be the sharing of load of 600 KVA at 0.85 Pf lagging by x and y?
     (A) X:199KVA, p.f=0.84(lag); Y:401KVA ; p.f=0.845 (lag)
     (B) X:201KVA, p.f=0.81(lag); Y:399 KVA ; p.f=0.84 (lag)
     (C) X:199KVA, p.f=0.85(lag); Y:401KVA ; p.f=0.84 (lag)
     (D) X:201KVA, p.f=0.84(lag); Y:399 KVA ; p.f=0.84 (lag)

29. In the circuit shown below, find the current i(t) for $t \geq 0$ when the switch is opened at $t = 0$
     (A) $5e^{20t}A$
     (B) $2e^{-40t}A$
     (C) $5e^{-10t}A$
     (D) $2e^{-20t}A$

30. The circuit shown is based on ideal operational amplifier. It acts as a
     (A) Substractor
     (B) Adder
     (C) Buffer
     (D) Divider