

**Section-I: General Aptitude**

- $2^{(x-1)} - 2^{(x-4)} = 7(2^{11})$, what is x ?
(A) 9 (B) 11 (C) 13 (D) 15
- Length of a rectangle increases by 20%, while its breadth reduces by 10%. Find the percentage change in its perimeter.
(A) 10% increase (B) 8% increase (C) 5% increase (D) Can't say
- In a group, average weight of the females was 60kgs. The average weight of the entire group was twice as close to the average weight of the men as it was to the average weight of the women. What percentage of the group were women?
(A) 40 (B) 33.33 (C) 50 (D) 66.67
- Govind decided to walk down the escalator of a shopping mall. He found that if he walks down 25 steps, he requires 15 seconds to reach the bottom. However, if he steps down 13 steps, he requires 24 seconds to reach the bottom. Find out the height of the stairway in steps.
(A) 30 (B) 40 (C) 45 (D) 50
- Taps A and B, operating simultaneously, can fill a certain tank in 72 min; Taps A and C, operating simultaneously, can fill the tank in 90 min; and Taps B and C, operating simultaneously, can fill the tank in 2 hours. How many hours does it take Taps A, B, and C, operating simultaneously, to fill the tank?
(A) $\frac{1}{3}$ (B) 1 (C) $\frac{2}{3}$ (D) $\frac{5}{6}$
- A customer at Paradise hotel calculates his tip by adding a constant amount to another sum that is directly proportional to the total bill for the meal. If the total bill for his meal had been 100/- greater, the customer would've calculated a tip of 60/-. If the total bill for his meal had been 150/- less, the customer would've calculated a tip of 40/-. If his total bill for the meal was 600/- what will be the amount of his tip?
(A) 48 (B) 56 (C) 52 (D) 50
- There are five hotels in a line. If 4 men go into a hotel at 11 am, then what will be the probability that each go into a different hotel?
(A) $\frac{124}{125}$ (B) $\frac{24}{125}$ (C) $\frac{42}{125}$ (D) $\frac{48}{625}$
- In a class of 40 students, 12 enrolled for both English & German. 22 enrolled for German. If students of class enrolled at least one of the subjects, then how many students enrolled for only English & not German?
(A) 30 (B) 12 (C) 18 (D) 40



9. Mr. Vikas buys some apples at 8 per rupee from one trader and a similar quantity at 5 per rupee from another trader. He mixes both the varieties and sell the whole at 9 per rupee. What is the profit or loss percentage that he makes?
(A) 31.62 % Profit (B) 31.62 % Loss (C) 46.25 % Profit (D) 46.25 % Loss

10.

Type of program ↓	AGE Group →	15-20	21-30	31+
Daily Serials		6	4	17
Comedy		7	5	5
Singing/dancing		6	12	14
Devotional		1	4	11
News		2	3	15
Sports		9	3	4
Quiz		2	2	2
Total		33	33	68

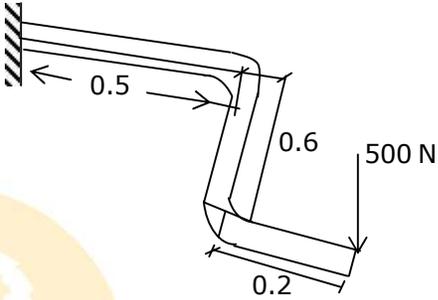
What percentage of respondents aged 21-30 indicated a favourite program other than singing/dancing?

- (A) 36 % (B) 46 % (C) 64 % (D) 60 %
11. **Analogy**
AESTHETICS : BEAUTY ::
(A) ethics: etiquette (B) epistemology : knowledge
(C) theology: morals (D) rhetoric : reasoning
12. Choose the appropriate antonym for the word **ABOMINATE**
(A) loathe (B) despise (C) adore (D) abhor
13. Choose the sentence that is grammatically correct:
(A) The serving bowl or the plates go on that shelf
(B) The serving bowls or the plate go on that shelf
(C) The serving bowl or the plate go on that shelf
(D) The serving bowls or the plates goes on that shelf
14. The management of the company had cordially invited its staff for the 25th Anniversary function.
Choose the best conclusion:
(A) The company is going to wind-up the next year
(B) It is mandatory for all the staff to attend the function
(C) The management of the company is spend-thrift
(D) The company is well-established



15. Find out the error part in the given sentence
Ram is junior / than shyam / and Ram is / older than shyam
(A) (B) (C) (D)
16. Find the proper meaning of the words given in bold letters.
After working for years in the same company, Ramu decided to **Jack it all**.
(A) Continue (B) Change (C) Stop (D) Cheat.
17. Urban services have not expanded fast enough to cope up with urban expansion. Low investment allocations have tended to be underspent. Both public and private infrastructure quality has declined. The impact of the environment in which children live and the supporting services available to them when they fall ill, seem clear. The decline in average food availability and the rise in absolute poverty, point in the same unsatisfactory directions.
Choose the weakest statement related to the above passage
(A) Though adequate provisions of funds were made but they were received under spent
(B) Low cost urban housing is on the priority
(C) There is nothing to boast about urban services
(D) Birth rate is higher in urban areas than in rural areas
18. **Sentence completion**
Data concerning the effects on a small population of high concentrations of a potentially hazardous chemical are frequently used to ----- the effects on a large population of lower amounts of the same chemical.
(A) verify (B) redress (C) predict (D) realize
19. **Select the best alternative for the underlined part:**
Currently 93,250,000 billion barrels a year, world consumption of oil is rising at a rate of 3 percent annually.
(A) world consumption of oil is rising at a rate of
(B) the world is consuming oil at an increasing rate of
(C) the world's oil is being consumed at the increasing rate of
(D) the rise in the rate of the world's oil consumption is
20. False currency is being supplied to India through buses that run between India and Pakistan.
Find out the course of action to be taken.
(A) The govt. should ban the buses
(B) The govt. should change the currency
(C) The govt. should strengthen the vigilance
(D) Indian govt. should warn the Pakistan govt.

**Section-II: Technical**

1. If an activity has its optimistic, most likely and pessimistic times as 2, 3 and 7 respectively, then its expected time and variance are respectively
(A) 3.5 and 5/6 (B) 5 and 25/36
(C) 3.5 and 25/36 (D) 4 and 5/6
2. A load perpendicular to plane of handle is applied at free end as shown in figure. Value of shear force, bending moment, and torque at the fixed ends respectively are
(A) 500 N, 350 N – m, 300 N – m
(B) 500 N, 300 N – m, 350 N – m
(C) 500 N, 350 N, 300 N
(D) None of these
- 
3. What would be expectation of number of failures preceding the first success in an infinite series of independent trials with constant probability of success p ?
(A) $\frac{1}{p}$ (B) $\frac{1}{q}$ (C) $\frac{q}{p}$ (D) None of these
4. A rectangular beam is 200mm wide and 400mm deep upto the centre of reinforcement. Find the minimum reinforcement required, if it has to resist a moment of 40kN-m. Assume M-20 grade of concrete and Fe 415 grade steel.
(A) 473mm² (B) 571mm² (C) 603mm² (D) 701mm²
5. A circular column of 500mm diameter is subjected to an axial load of 1600 KN under service load and live load. It has unsupported length of 3m effectively held in position at both ends but not restrained against rotation. Using M20 concrete and Fe415 steel area of longitudinal steel required will be
(A) 2423.4mm² (B) 2516.7mm² (C) 2647.3mm² (D) 2728.5mm²
6. A bed of sand consists of three horizontal layers of equal thickness. The value of permeability 'k' for the upper and lower layers is 1×10^{-2} cm/sec and that for the middle layer is 10^{-1} cm/sec. The ratio of permeabilities in the horizontal direction to that in the vertical direction is?
(A) 1.4 (B) 2.8 (C) 1.8 (D) 2.4
7. A test plate 30 cm square, settles by 12 mm under a load of 4.5 kN in a sandy soil. By how much will a footing $2\text{m} \times 2\text{m}$ subjected to a load of 200 kN settle?
(A) 36.3 mm (B) 20.87 mm (C) 75.75 mm (D) 18.15 mm



8. If acceleration due to gravity is given by 'g' & viscosity as ' μ ', then the ratio between Reynolds Number (Re) and Froude Number (F_r) will be
- (A) $\rho L^2 \sqrt{\frac{g}{\mu}}$ (B) $\rho L^{3/2} \sqrt{\frac{g}{\mu}}$ (C) $\rho L^{3/2} \frac{\sqrt{g}}{\mu}$ (D) $\rho L^2 \left(\frac{g}{\mu}\right)^{3/2}$
9. Evaluate $\iint xy(x+y) dx dy$ taken over the area between $y = x^2$ and $y = x$.
- (A) 0 (B) 2/56 (C) 1/56 (D) 3/56
10. The peak of flood hydrograph due to 3-h duration isolated storm is $320 \text{ m}^3 / \text{s}$. The total depth of rainfall is 5.6 cm and average infiltration loss is 0.2 cm/hour. The area of catchment is given as 500 Km^2 and hydrograph due to 1 cm, and DR may be approximated as triangle. (Assume constant base flow of $20 \text{ m}^3 / \text{s}$). Peak of 3-h unit hydrograph is (in m^3 / s)
- (A) $42 \text{ m}^3 / \text{s}$ (B) $50 \text{ m}^3 / \text{s}$ (C) $55 \text{ m}^3 / \text{s}$ (D) $60 \text{ m}^3 / \text{s}$
11. Consider the following data:
- Field capacity of soil = 27%
 - Permanent wilting soil = 14%
 - Density of soil = 1.5 g/cm^3
 - Effective depth of root zone = 75cm
 - Daily consumptive use of water for the given crop = 11mm.
 - Assume readily available moisture be 80%.
- Find the depth of water available for evapo-transpiration.
- (A) 19.7 cm (B) 15.2 cm (C) 11.7 cm (D) 9.2 cm
12. The following observations were made on a 4% dilution of wastewater.
- D.O. of the aerated water used for dilution = 3mg/l
(D.O.) of the diluted sample after 5 days incubation = 0.8 mg/l
D.O. of original sample = 0.6mg/l
- Assuming that the de-oxygenation co-efficient at test temperature is 20°C , the BOD of 5 days of the sample will be
- (A) 45.3mg/l (B) 64.2mg/l (C) 52.6mg/l (D) 34.7mg/l
13. On a hilly road of single lane, curve has to be set out using ruling radius with $e=0.07$ and $f=0.15$. For design speed of 60km/hr, the value of extra widening required at the curve is. [Assume length of wheel base of longest vehicle is 6m]
- (A) 0.613 m (B) 0.696 m (C) 0.718 m (D) 0.732 m
14. The iterative root of $f(x) = 3x^2 + 2x + 1$ using Newton Raphson method is
- (A) $x_{n+1} = \frac{3x_n^2 + 1}{6x_n + 2}$ (B) $x_{n+1} = \frac{9x_n^2 + 4x_n + 1}{6x_n + 2}$
(C) $x_{n+1} = \frac{3x_n^2 - 1}{6x_n + 2}$ (D) $x_{n+1} = \frac{9x_n^2 - 4x_n - 1}{6x_n + 2}$



15. The following notes refer to reciprocal levels taken with one level:

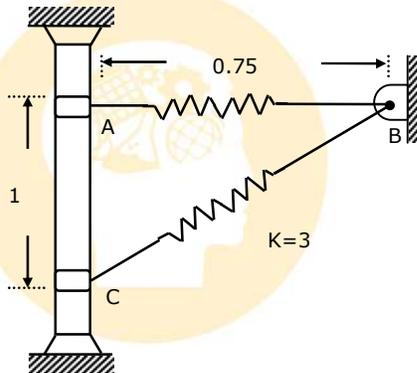
Inst at	Staff reading on	
	P	Q
P	1.884	2.826
Q	0.848	1.624

Distance between P and Q = 1200 m

Reduced level of P = 130.428

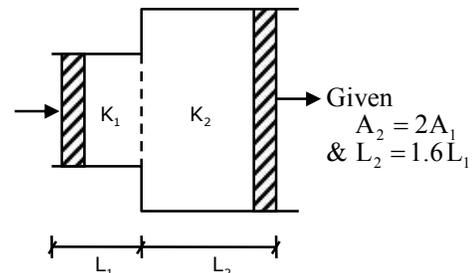
The difference in elevation between P and Q will be

- (A) 0.863m (B) 0.859m (C) 0.745m (D) 0.789m
16. A smooth 2 kg collar C shown in figure is attached to a spring having a stiffness $k = 3 \text{ N/m}$ and an un-stretched length of 0.75 m. If the collar is released from rest at A, then the normal force of the rod on the collar at the instant $y = 1 \text{ m}$ is



- (A) 0.9 N (B) 2.5 N (C) 7.8 N (D) 5.3 N
17. In a continuous flow of settling tank 3 m deep and 60 m long, what flow velocity of water would you recommend for effective removal of 0.025 mm particles at 25°C ? The specific gravity of particles is 2.65, and kinematic viscosity for water may be taken as $0.01 \text{ cm}^2/\text{sec}$.
- (A) Flow velocity should not be less than 0.0562 cm/sec
 (B) Flow velocity should not be more than 0.0562 cm/sec
 (C) Flow velocity should not be less than 1.35 cm/sec
 (D) Flow velocity should not be more than 1.35 cm/sec

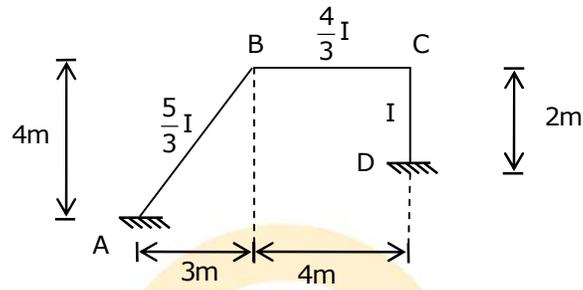
18. What is the ratio of K_1 to K_2 for flow occurring through two different soil media shown in the figure below when the head loss across L_1 is 25% of that across L_2 .



- (A) 4
 (B) 5
 (C) 6
 (D) 7



19. General solution of $\frac{xdy}{dx} = 2 - 4x^3$ is
- (A) $y = 2 \ln x - \frac{4x^3}{3} + c$ (B) $y = \ln x - \frac{4x^3}{3} + c$
- (C) $y = 2 \ln x + \frac{4x^3}{3} + c$ (D) $y = x^2 - \frac{4 \ln x^3}{3} + c$
20. A frame ABCD is shown in figure:



- If the final moment at B is 100 kN m, then the moment developed at end A is
- (A) 23KN-m (B) 24KN-m (C) 25KN-m (D) 26KN-m
21. A stressed block gave the following results:
Major principal strain, $e_1 = 3.24 \times 10^{-4}$
Minor principal strain, $e_2 = 1.28 \times 10^{-4}$
Poisson's ratio, $\mu = 0.25$
Modulus of elasticity $E = 2 \times 10^{11} \text{ N/m}^2$
The respective principal stresses are:
- (A) 75.95 MN/m² & 44.59 MN/m² (B) 120.22 MN/m² & 91.80 MN/m²
- (C) 88.25 MN/m² & 70.19 MN/m² (D) 60.10 MN/m² & 35.0 MN/m²
22. A jet of water of diameter 5 cm strikes a curved plate at its centre with a velocity of 25 m/s. The curved plate is moving with velocity of 10 m/s in the direction of jet. The jet is deflected through an angle of 160°. Find the power of jet in kW.
- (A) 13.5 (B) 6.75 (C) 17.2 (D) 8.55
23. A reinforced concrete pile weighing 50kN is driven by drop hammer weighing 100kN and having effective fall of 0.75 m. The average set per blow is 1.6cm. Total temporary elastic settlement is 1.5 cm. For coefficient of restitution of collision to be 0.25, then the ultimate bearing capacity of pile will be (By Hiley formula)
- (A) 2500 KN (B) 2400 KN (C) 2300 KN (D) 2200 KN
24. A rectangular channel of base width 5m is carrying discharge of 15 m³ / s at a depth of 3m. The flow is stopped suddenly due to complete closure of gate at the downstream. The height in meters of surge produced is
- (A) 0.35m (B) 3.4m (C) 0.26m (D) 0.57m



25. $\int_0^{\infty} \int_y^{\infty} x e^{-\frac{x^2}{y}} dx dy = \underline{\hspace{2cm}}$.
- (A) 0.5 (B) 1 (C) 1.5 (D) 2
26. A old survey map plotted to scale of 100 m to 1 cm has shrunk so that the line originally 30 cm long is now 29.5 cm. A planimeter measures the area of the map as 200 cm², the true area of the field is
- (A) 2.068 Km² (B) 2.456 Km² (C) 2.310 Km² (D) 2.215 Km²
27. A pump delivers water from a tank P, water surface elevation is 100.00 m, to a tank Q water surface elevation = 180.00 m. The function pipe is 100 m long and 50 cm diameter, $f = 0.025$. The delivery pipe is 1000 m long and 30 cm diameter, $f = 0.020$. If the head discharge relationship for the pump is given by $H_p = 120 - 1200 Q^2$ then what is the discharge in the pipeline?
- (A) 0.08 m³/s (B) 0.14 m³/s (C) 0.32 m³/s (D) 0.74 m³/s
28. An RCC beam of breadth 250mm mm and effective depth 450mm is subjected to factored shear force of 150kN and a factored torque of value 10KNm. The design shear strength as per IS 456:200 is 0.4MPa. The shear force to be taken by stirrup is
- (A) 214 KN (B) 200 KN (C) 135 KN (D) 169 KN
29. A slow sand filter consisting of sand bed, having sand particles size 0.45 mm diameter and specific gravity 2.70, porosity 0.50 and depth 65 cm is subjected to back wash so that expansion will be 60%. Compute the back wash water rate.
Assume, ($v = 1.3 \times 10^{-2}$ cm² / sec)
- (A) 2.5cm / sec (B) 2.67 cm / sec (C) 3 cm / sec (D) None of these
30. The speed density relationship for a particular road was found to be $U = 72.63 - 0.42 K$ where U is the speed in kmph and 'K' is the density of vehicles per Km. what is the density of road (vehicles/Km), at which traffic volume will be maximum?
- (A) 86.46 (B) 114.58 (C) 162.34 (D) 172.93