BYJU'S EXAM PREP

GATE 2022

Civil Engineering

Shift-2

Questions & Answers (Memory Based)

(MEMORY BASED)

1. Match the following

(i)	C_3S	(P)	Early age strength
(ii)	C_2S	(Q)	Later age strength
(ii)	C_3A	(R)	Flash setting
		(S)	Highest heat of hydration
		(T)	lowest heat of hydration

Calculate the total float time.

[MCQ: 1 Mark]

A. (i) Q & T, (ii) P & S, (iii) R

B. (i) P, (ii) Q & T, (iii) R & S

C. (i) T, (ii) S, (iii) P & Q

D. (i)P, (ii) Q & R, (iii) T

Ans. B

2.

Activity	Duration	Depend
A	10	-
B	12	-
C	5	A
D	14	B
E	10	B, C

Calculate the total float time for activity E.

[NAT: 2 Marks]

Ans. Total float time for activity E = 1.

3. Let y be a non-zero vector of size 2022 × 1. Which of the following are true:

[MSQ: 1 Mark]

A. yy^T is invertible

B. y^Ty is eigen value of yyT

C. yy^T has a rank of 2022

D. yy^T is a symmetric matrix

Ans. B, D

4. A Pair of six- faced dice is rolled thrice. The probability that sum of the outcomes in each roll equals 4 in exactly two of the three attempts is _____ (Round of to three decimal places)

[NAT: 1 Mark]

Ans. 0.019

5. The component of pure shear strain in a sheared material are given in the matrix

$\varepsilon = \begin{bmatrix} 1 & 1 \\ 1 & -1 \end{bmatrix}$ here, Trace (ε) = 0, Given P = Trace (ε^8) and Q = Trace (ε^{11})

Numerical value (P+Q) is equal to……..

[NAT: 1 Mark]

Ans. 32

6. P & Q are two square matrices of the equal order. Which of the following are correct

[MSQ: 1 Mark]

A. If P & Q are not invertible, then $[PQ]^{-1} = Q^{-1}P^{-1}$

B. If P & Q are invertible, then $[QP]^{-1} = P^{-1}Q^{-1}$

C. If P & Q are invertible, then $[PQ]^{-1} = P^{-1}Q^{-1}$

D. If P & Q are invertible, then $[PQ]^{-1} = Q^{-1}P^{-1}$

Ans. B, D

7. Consider the polynomial

$f(x) = x^3 - 6x^2 + 11x - 6$ on the domain given by $1 \leq x < 3$.

1. The given polynomial is zero at the boundary point x = 1 & x = 3
2. There exists one local maximum of f(x) within the domain

3. The 2nd derivative f" (x) > 0 throughout the domain
4. There exists one local minima of f(x) within the domain

[MCQ: 1 Mark]

A. Only statement I, II & III are correct
B. Only statement I, & IV are correct
C. Only statement I, II & IV are correct
D. Only statement II, & IV are correct

Ans. C

8. $\int\left(x-\frac{x^2}{2}+\frac{x^3}{3}-\frac{x^4}{4}....\right)dx$ is equal to

[MCQ: 1 Mark]

A. $\frac{1}{1+x}+c$ B. $\frac{-1}{1-x^2}+c$

C. $\frac{-1}{1-x}+c$ D. $\frac{1}{1+x}+c$

Ans. MTA

9. The function b (x, y) Satisfies the Laplace equation Δ^2 (x, y) = 0 on a circular domain of radius r = 1, with As centre at point p with coordinate x = 0, y = 0. The value of this function on the circular boundary of this domain is equal to 3. The numerical value of b (0, 0) is

[MCQ: 2 Marks]

A. 2 B. 0
C. 3 D. 1

Ans. C

10. A hydraulic jump takes place in 6 m wide Rectangular Channel at point where upstream depth is 0.5 m (just before jump). If the discharge in the channel is 30 m^3/s, energy loss in the jump 1.6 m. Froude number at the jump is (g = 10 m/s^2)

[NAT: 2 Marks]

Ans. 0.315

11. What is the dimension of dynamic viscosity

[MCQ: 1 Mark]

A. MLT^{-1}
B. $ML^{-1}T^{-1}$
C. $ML^{0}T^{-1}$
D. $ML^{-2}T^{-2}$

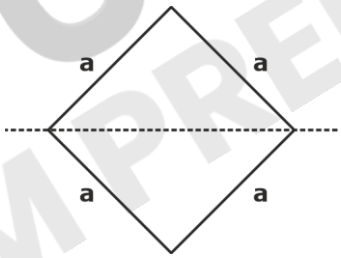
Ans. B

12. The length of the runway at mean sea level is 1500 m. What will be the length of runway at the 300 m above the mean sea level in m _____ (nearest integer)

[NAT: 1 Mark]

Ans. 1605

13. Given f_y = 250 N/m^2 and a = 100 mm
Determine shape factor and M_p = ?



[MCQ: 2 Marks]

Ans. 2 & 58.93 kNm

14. If magnetic bearing of sun at place at noon is S2°E, the magnetic declination (in degrees).

[MCQ: 1 Mark]

A. 4°E
B. 4°W
C. 2°W
D. 2°E

Ans. D

15. If error in measuring the radius of 5 cm circular rod was 0.2%. If the cross sectional area of the rod was calculated using this measurement, then the resulting absolute percentage error in the computed area is _____.

[NAT: 1 Mark]

Ans. 0.4%

16. Determine power of a pump required whose efficiency is 80%. Given delta of crop 144 cm and Area to be irrigated 108 ha and base period 120 days and water application efficiency is 80%. Lowest level of water below ground level is 10 m. [1 hp = 746 watt]

[NAT: 2 Marks]

Ans. 30.82

17. On a single lane road, the density of traffic is 40 veh/km. The time mean speed and space mean speed are 40kmph and 30 kmph respectively. What will be the average headway in (sec) between the vehicle.

A. 2.25 B. 6.25×10^{-4}

C. 8.33×10^{-4} D. 3.00

[MCQ: 1 Mark]

Ans. D

18. For a traffic stream V is space mean speed, k is the density, q is the flow, V_f, k_j jam density. Speed decreases linearly with flow, which of following is correct.

[MCQ: 1 Mark]

A. $q = v_f v - \left(\frac{v_f}{k_j}\right)k^2$ B. $q = k_j k - \left(\frac{k_j}{v_f}\right)k^2$

C. $q = v_f v - \left(\frac{k_f}{v_j}\right)v^2$ D. $q = v_j v - \left(\frac{k_j}{v_f}\right)v^2$

Ans. A

19. The tensioned member have span 15m, Area = 450 × 450 mm is prestressed with three steel tenders, each of 200 mm2, straight and located 125 mm from bottom. the tendons are tensioned one after another to a stress of 1500 Mpa. Assume prestress to be same in all tender and modular ratio is 6. The average loss of prestress due to elastic deformation of concrete, considering all three tendon is

[MCQ: 2 Marks]

A. 28.32 Mpa

B. 42.48 Mpa

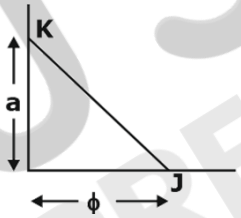
C. 14.16 Mpa

D. 7.08 Mpa

Ans. C

20. A uniform rod KJ of weight W shown in the figure rests against a frictionless vertical wall at the plant K and rough horizontal surface at point J. It is given w = 10 kN, a = 4 m, b = 3m. The minimum coefficient of static friction at J required for equilibrium

[NAT: 2 Marks]



Ans. 0.375

21. If mass is halved 'k' is double then effect on 'w' and 'T'

[MCQ: 1 Mark]

Ans. 'w' will get twice and 'T' will get half

22. A 100 mg of HNO_3 is added to water, bringing final volume to 1 literature. Atomic weight H, N, O as 1 g/mol, 14 gm/mol and 16 g/mol. The final pH. (Ignore dissociation of H_2O)

[MCQ: 1 Mark]

A. 6.5

B. 3.8

C. 8.5

D. 2.8

Ans. D

23. At a municipal waste handling facility, 30 metric ton mixture of food waste, yard waste and paper waste. The moisture content of mix was found to be 10%. The ideal moisture content for the composition of the mixture is 50%. The amount of water added at this mix.

[NAT: 2 Marks]

Ans. 24 ton

24. A sample of air analysed at 25°C and 1 atm pressure is reported to contain 0.04 ppm of SO_2. The equivalent SO_2 concentration (in ug/m^3) will be?

[NAT: 1 Mark]

Ans. 104.70

25. A process equipment emits 5 kg/h of volatile organic compounds (VOCs). It hold placed over the process equipment capacity 95% of VOCs. Then the fugitive emission in kg/h

[MCQ: 2 Marks]

A. 0.48
B. 2.5
C. 0.25
D. 4.75

Ans. C

26. What is the relation between E, G & μ

[MCQ: 1 Mark]

Ans. $G = \frac{E}{2(1+\mu)}$

27. Consider two linear elastic rods HI & IJ, each of length b as shown

α = coefficient of thermal expansion

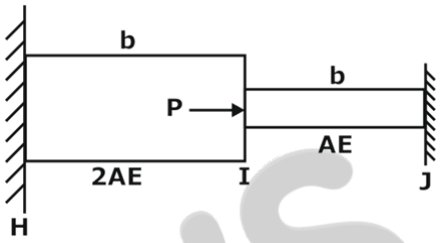
Temp of IJ is raised by ΔT and no temp. change for HI.

$\alpha = 10^{-6}/°C$ & $\Delta T = 50°C$

b = 2m

$AE = 10^6$ N

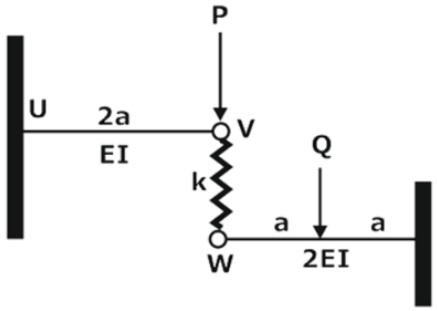
To net axial force in rod HI = 0 the value d P (N) ____.



[NAT: 2 Marks]

Ans. 50 N

28. The linearly elastic planer structure shown in the figure is acted upon by two vertical concentrated forced. The horizontal beams UV and WX are connected with the help of the vertical linears spring with spring constant k = 20 kN/m. The fixed supports are provided at U and X. It is given that flexural rigidity EI = 10^5 kN-m^2, P = 100 kN and a = 5 m. Force Q is applied at the centre of beam WX such that the force in the spring VW zero.



[NAT: 2 Marks]

Ans. 640 kN

29. Which of the following statements is/are correct?

A. If a linearly elastic structure is subjected to a set of load, then the partial derivative of total strain energy with respect to the load at the any point is equal to the deflection at that point

B. The shear force in a conjugate beam loaded by the M/EI diagram of real beam is equal to corresponding deflection of the real beam

C. The partial derivative of total strain energy w.r.t deflection gives load

D. It a structure is acted by the force system P_a & P_b in equilibrium, the internal virtual work done by a system of force P_b during deformation caused by another system of forces P_a is equal to the external virtual work done by the P_a system during the displacement caused by Pb system

[MSQ: 2 Marks]

Ans. A, C, D

30. The flood control structure having an expected life of n years is designed by considering a flood of return period T years. When T = n & n → ∞ , the structures hydrologic risk of failure in percentage is _____.

Consider a baseflow of 10 m^3.

The peak flow ordinate of 1 hour unit hydrograph is _____.

[NAT: 1 Mark]

Ans. 0.632

31. A group pile of total 16 piles are arranged in a square format. The c/c dis. 3m. d = 1m, l = 20m. The design capacity of each pile is 1000 kN. The pile group efficiency (η_g) is given

$$\eta_g = 1 - \frac{\theta}{90}\left[\frac{(n-1)m + (m-1)n}{mn}\right] \quad \theta = \tan^{-1}\left(\frac{d}{s}\right)$$

m,n are no. of rows & column in plan. The design value of pile group capacity (in kN)

[NAT: 2 Marks]

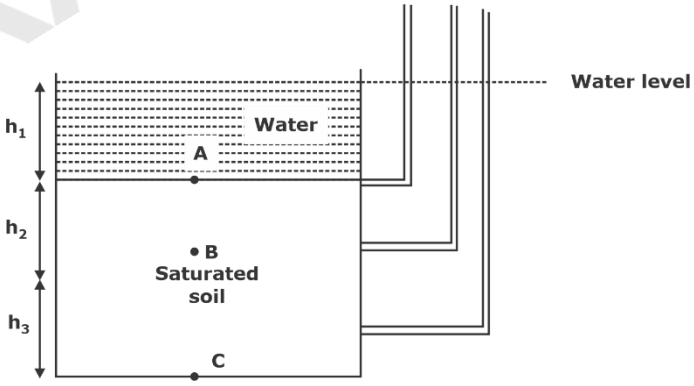
Ans. 11085.33

32. In triaxial unconsolidated undrained (uu) test on a saturated clay sample, the cell pressure was 100 kpa. If the deviatoric stress at failure was 150 kpa. Then undrained shear strength of soil _____ kpa.

[NAT: 1 Mark]

Ans. 75

33. A soil sample water column of height h, The vertical effective stress at point A, B, C are σ'_A, σ'_B, σ'_C respectively γ_{sat} γ' be saturated and submerged unit weight. γ_w is the unit weight of water. Which expression correctly represent ($\sigma'_A + \sigma'_B + \sigma'_C$) ?



[MCQ: 1 Mark]

A. $(h_1+h_2+h_3)\ \gamma'$

B. $(h_2+h_3)(\gamma_{sat}-\gamma_w)$

C. $(h_1+h_2+h_3)\gamma_{sat}$

D. $(2h_2+h_3)\gamma'$

Ans. D

34. A saturated compressed. Clay of thickness h in sandwiched b/w turn sand layer. Total vertical stress and pure water pressure at P located at mid depth of the clay layer 150 kPm 125 kPa construction of building caused an additional total vertical stress 100 kPa at P. when the effective stress at P is 175 kPa, the percentage of consolidation in clay layer

[NAT: 2 Marks]

Ans. 50%

35. A survey of 450 students about their subject of interest result in the following outcome.

- 150 students are interested in Maths.
- 200 students are interested in Physics.
- 175 students are interested in Chemistry.
- 50 students are interested in Maths and Physics.
- 60 students are interested in physics and Chemistry
- 40 students are interested in Maths and Chemistry
- 30 students are interested in Maths, Physics and Chemistry

Remaining students are interested in Humanities

Based on the above information, the number of students in humanities is

[MCQ: 1 Mark]

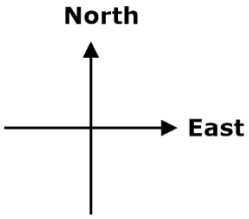
A. 10 B. 45
C. 30 D. 40

Ans. B

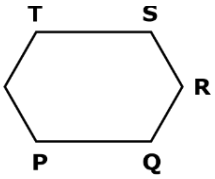
36. An ant walks in a straight line on a plane leaving behind a trace of its movement. The initial position of the ant is at point P facing east. The ant first turns 72° anticlockwise at P, and then does the following two steps in sequence exactly five times before halting.

1. moves forward for 10 cm.
2. turn 144° clockwise.

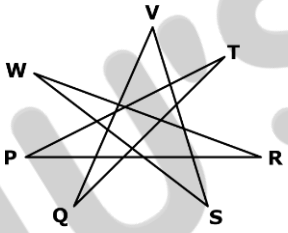
The pattern made by the trace left behind by the ant is .



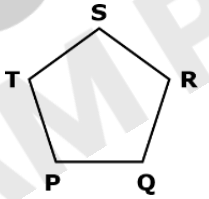
[MCQ: 2 Marks]

A.


PQ = QR = RS = ST = TU = UP = 10 cm

B.


SW = WR = RP = PT = TQ = QU = US = 10 cm

C.


PQ = QR = RS = ST = TP = 10 cm

D.


SQ = QT = TR = RP = PS = 10 cm

Ans. D

37. Consider the following equation of straight lines:

Line L1 : 2x – 3y = 5

Line L2 : 3x + 2y = 8

Line L3 : 4x – 6y = 5

Line L4 : 6x – 9y = 6

Which one among the following is the correct statement?

[MCQ: 2 Marks]

A. L2 is parallel to L4 and L2 is perpendicular to L1.
B. L1 is parallel to L2 and L1 is perpendicular to L3.
C. L3 is perpendicular to L4 and L3 is parallel to L2.
D. L4 is perpendicular to L2 and L4 is parallel to L3.

Ans. D

38. $x : y : z = \frac{1}{2} : \frac{1}{3} : \frac{1}{4}$

What is the value of $\frac{x + z - y}{y} = ?$

[MCQ: 1 Mark]

A. 1.25
B. 3.25
C. 0.75
D. 2.25

Ans. A

39. In a partnership business the monthly investment by three friends for the first six months is in the ratio 3 : 4 : 5. After six months, they had to increase their monthly investments by 10%, 15% and 20% respectively, of their initial monthly investment. The new investment ratio was kept constant for the next six months.

What is the ratio of their shares in the total profit (in the same order) at the end of the year such that the share is proportional to their individual total investment over the year?

[MCQ: 2 Marks]

A. 22 : 23 : 24
B. 63 : 86 : 110
C. 22 : 33 : 50
D. 33 : 46 : 60

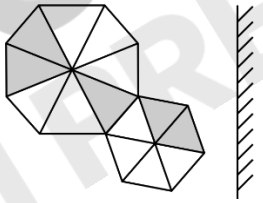
Ans. B

40. Given below are two statements and four conclusion drawn based on the statements
Statement 1 : Some soaps are clean.
Statements 2 : All clean objects are wet.
Conclusion I : Some clear objects are soaps.
Conclusion II : No clean objects is a soap.
Conclusion III : Some wet objects are soaps.
Conclusion IV : All wet objects are soaps.
Which one of the following options can be logically inferred.

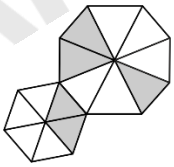
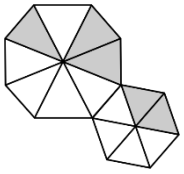
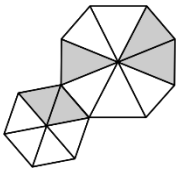
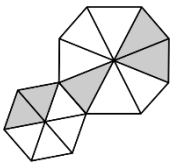
[MCQ: 1 Mark]

Ans. Conclusion I & III are true

41. For the picture shown above, which one of the following is the correct picture representing reflection with respect to the mirror shown as the dotted line?



[MCQ: 1 Mark]

A. 
B. 
C. 
D. 

Ans. D

42. The movie was funny and I _____ ?

[MCQ: 1 Mark]

A. could helped laughed
B. could help laughing
C. couldn't help laughing
D. couldn't help laughed

Ans. C

43. In the last few years, several new shopping malls were opened in the city total number of visitors in malls is impressive, however, the total revenue generated through sales in the shops in these malls in generally low.

Which one of the following is the correct logical inference based on the information in the above passage?

[MCQ: 2 Marks]

A. Fewer people are waiting the malls but spending more.

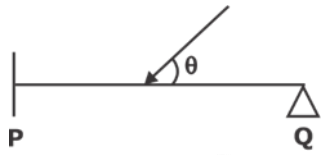
B. Fewer people are waiting the malls and not spending enough.

C. More people are visiting the malls and spending more.

D. More people are visiting the malls but not spending enough.

Ans. D

44. Calculate static and kinematic indeterminacy



[MCQ: 2 Marks]

A. 1, 2

B. 2, 0

C. 2, 2

D. 2, 1

Ans. D

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