

25) In the solution of the following set of linear equations by Gauss elimination using partial pivoting  $5x + y + 2z = 34$ ;  $4y - 3z = 12$ ; and  $10x - 2y + z = -4$ ; the pivots for elimination of  $x$  and  $y$  are

- a) 10 and 4
- b) 10 and 2
- c) 5 and 4
- d) 5 and -4

26) The standard normal probability function can be approximated as

$$F(x_N) = \frac{1}{1 + \exp(-1.7255x_N|x_N|^{0.12})}$$

where  $x_N$  = standard normal deviate. If mean and standard deviation of annual precipitation are  $102\text{cm}$  and  $27\text{cm}$  respectively, the probability that the annual precipitation will be between  $90\text{cm}$  and  $102\text{cm}$  is

- a) 66.7 %
- b) 50.0 %
- c) 33.3 %
- d) 16.7 %

27) Consider the following statements:

- I. On a principal plane, only normal stress acts.
- II. On a principal plane, both normal and shear stresses act.
- III. On a principal plane, only shear stress acts.
- IV. Isotropic state of stress is independent of frame of reference.

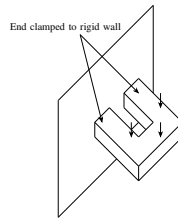
The TRUE statements are

- a) I and IV
- b) II
- c) II and IV
- d) II and III

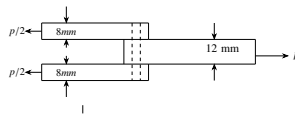
28) The degree of static indeterminacy of a rigidly jointed frame in a horizontal plane and subjected to vertical loads only, as shown in figure below, is

- a) 6
- b) 4
- c) 3
- d) 1

29) A  $12\text{mm}$  thick plate is connected to two  $8\text{mm}$  thick plates, on either side through a  $16\text{mm}$  diameter power driven field rivet as shown in the figure below. Assuming

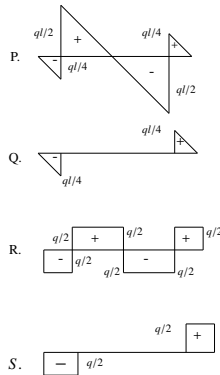


permissible shear stress as  $90\text{MPa}$  and permissible bearing stress as  $270\text{MPa}$  in the rivet, the rivet value of the joint is

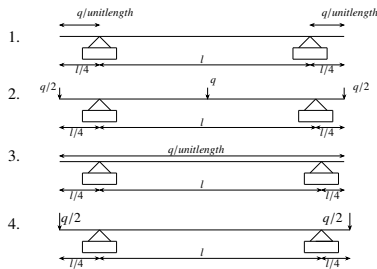


- $56.70\text{kN}$
  - $43.29\text{kN}$
  - $36.19\text{kN}$
  - $21.65\text{kN}$
- 30) A hollow circular shaft has an outer diameter of  $100\text{mm}$  and a wall thickness of  $25\text{mm}$ . The allowable shear stress in the shaft is  $125\text{MPa}$ . The maximum torque the shaft can transmit is
- $46\text{kNm}$
  - $24.5\text{kNm}$
  - $23\text{kNm}$
  - $11.5\text{kNm}$
- 31) Consider the following statements for a compression member:
- The elastic critical stress in compression increases with decrease in slenderness ratio.
  - The effective length depends on the boundary conditions at its ends.
  - The elastic critical stress in compression is independent of the slenderness ratio.
  - The ratio of the effective length to its radius of gyration is called as slenderness ratio.
- The TRUE statements are
- II and III
  - III and IV
  - II, III and IV
  - I, II and IV
- 32) Group I gives the shear force diagrams and Group II gives the diagrams of beams with supports and loading. Match the Group I with Group II.
- P-3, Q-1, R-2, S-4
  - P-3, Q-4, R-2, S-1

## Group I



## Group II



c) P-2, Q-1, R-4, S-3

d) P-2, Q-4, R-3, S-4

33) A rectangular concrete beam of width  $120\text{mm}$  and depth  $200\text{mm}$  is prestressed by pretensioning to a force of  $150\text{kN}$  at an eccentricity of  $20\text{mm}$ . The cross sectional area of the prestressing steel is  $187.5\text{mm}^2$ . Take modulus of elasticity of steel and concrete as  $2.1 \times 10^5\text{MPa}$  and  $3.0 \times 10^4\text{MPa}$  respectively. The percentage loss of stress in the prestressing steel due to elastic deformation of concrete is

a) 8.75

b) 6.125

c) 4.81

d) 2.19

34) Column I gives a list of test methods for evaluating properties of concrete and Column II gives the list of properties.

Column I	Column II
P. Resonant frequency test	1. Tensile strength
Q. Rebound hammer test	2. Dynamic modulus of elasticity
R. Split cylinder test	3. Workability
S. Compacting factor test	4. Compressive strength

TABLE 34

The correct match of the test with the property is

- a) P-2, Q-4, R-1, S-3
- b) P-2, Q-1, R-4, S-3
- c) P-2, Q-4, R-3, S-1
- d) P-4, Q-3, R-1, S-2

35) The laboratory test results of a soil sample are given below:

Percentage finer than $4.75mm$	= 60
Percentage finer than $0.075mm$	= 30
Liquid Limit	= 35%
Plastic Limit	= 27%

The soil classification is

- a)  $GM$
- b)  $SM$
- c)  $GC$
- d)  $ML - MI$

36) A plate load test is carried out on a  $300mm \times 300mm$  plate placed at  $2m$  below the ground level to determine the bearing capacity of a  $2m \times 2m$  footing placed at same depth of  $2m$  on a homogeneous sand deposit extending  $10m$  below ground. The ground water table is  $3m$  below the ground level. Which of the following factors does not require a correction to the bearing capacity determined based on the load test?

- a) Absence of the overburden pressure during the test
- b) Size of the plate is much smaller than the footing size
- c) Influence of the ground water table
- d) Settlement is recorded only over a limited period of one or two days