

## Question Bank

**Q.1)** Respond to the following statements with true or false, and correct the underlined word(s) if they are wrong. Write correct answer in the brackets.

- 1- Gash fractures originate as tension fractures that are parallel to the  $\sigma_1$ , and perpendicular to the  $\sigma_2$ . ( )
- 2- The teeth (sharp end) of tectonic stylolite aligned oblique to the  $\sigma_1$ . ( )
- 3- The fault planes of En echelon faults are curved at depth (concave upwards). ( )
- 4- The antitaxial veins lack a median line, unlike stretched veins. ( )
- 5- On a scissors fault, the amount of hade changes along strike. ( )

**Q.2)** Respond to the following statements with true or false, and correct the underlined word(s) if they are wrong. Write correct answer in the brackets.

- 1- Dip fault strikes parallel to the true thickness of the bed. ( )
- 2- Longitudinal fault strikes perpendicularly or diagonally to the strike of major fold. ( )
- 3- Parallel faults are the faults have the same slip. ( )
- 4- Lineations found on slickensides, providing information about the direction of deposition on faults. ( )
- 5- The traces of the sedimentary layers on the fault plane is the cut off lines. ( )

**Q.3)** Respond to the following statements with true or false, and correct the underlined word(s) if they are wrong. Write correct answer in the brackets.

- 1- Drag folds develop in the hanging wall/block of a normal fault. ( )
- 2- Forethrust is the direction towards which the hanging wall of the thrust has moved relative to the footwall. ( )
- 3- Autochthon is the dominant direction in which thrust sheets of a thrust belt moved during faulting. ( )
- 4- The area in front of the thrusts toward which the thrust sheet moved is the Backthrust. ( )
- 5- Ramp characteristically are parallel to bedding and occur along weak layers in the stratigraphy. ( )

**Q.4)** Respond to the following statements with true or false, and correct the underlined word(s) if they are wrong. Write correct answer in the brackets.

- 1- In both imbricate fans and duplexes, the faults comprising a thrust system do not all initiate at the same time. ( )
- 2- Imbricate fan is an array of thrust horses bounded by a floor thrust at the base and by a roof thrust at the top. ( )
- 3- Modes I and IV occur along different parts of the same shear fracture. ( )
- 4- In axial compressive stress or pure shear fractures the state of stress equals  $\sigma_1 > \sigma_2 > \sigma_3$ . ( )
- 5- The difference between the ( $\sigma_n$ ) and ( $\sigma_s$ ) stresses is the diameter of the Mohr circle. ( )

**Q.5)** Respond to the following statements with true or false, and correct the underlined word(s) if they are wrong. Write correct answer in the brackets.

1. The tension fracture envelope is a line parallel to the  $\sigma_s$  axis at  $T_0$ . ( )
2. The fracture plane angle  $\alpha_f$ , is the angle between the  $\sigma_2$  and the fracture. ( )
3. The Equation ( $\sigma_m^* = C$ ), represents tension fracture envelope. ( )
4. Joint spacing refers to the number of joint traces cutting a traverse line per unit length of traverse line. ( )
5. If the two joint sets in a system are mutually perpendicular, we call the pair a non- systematic joints. ( )

**Q.6)** Respond to the following statements with true or false, and correct the underlined word(s) if they are wrong. Write correct answer in the brackets.

1. If the shear stress acting on the fracture continues to exceed the frictional resistance to sliding, the fracture grows. ( )
2. s-joint and z-joint are two types of barbs.( )
3. The matrix of the longitudinal fractures equals  $\begin{bmatrix} a & 0 & 0 \\ 0 & b & 0 \\ 0 & 0 & c \end{bmatrix}$  .( )
4. The direction of movement on the antithetic fault is reversed with the bending direction of movement. ( )
5. The amplitude of the stylolite waveform is a measure of the amount of deposition across the stylolite surface. ( )

**Q.7)** Respond to the following statements with true or false, and correct the underlined word(s) if they are wrong. Write correct answer in the brackets.

1. Joint bearing both plumose markings and Fringe zones are either extension or typical shear joints. ( )
2. I shapes of joints develop when the differential stress is small and  $\sigma_3$  is uniformly oriented normal to the extension joint set. ( )
3. Shear fractures are initiated in laboratory rock cylinders at a typical angle of about 30° to  $\sigma_1$  under conditions of confining pressure ( $\sigma_1 > \sigma_2 > \sigma_3 > 0$ ). ( )
4. The planes of the okl/b subsystem form an angle ( $\approx 60^\circ$ ) with bedding planes. ( )
5. Gash fractures originate as tension fractures that are parallel to the major stress orientation,  $\sigma_1$ , and perpendicular to the minimum compressive stress,  $\sigma_3$ . ( )

**Q.8)** Respond to the following statements with true or false, and correct the underlined word(s) if they are wrong. Write correct answer in the brackets.

1. Combinations of shear (Mode II or III) fractures and tension (Mode I) fractures are called extension cracks or fractures.( )
2. In Pure shear stress or pure shear fractures the state of stress equals  $\sigma_1 > \sigma_2 > \sigma_3$ . ( )
3. The Mohr circle describes the normal and shear stress acting on planes of all possible orientations through a point in the rock. ( )
4. On a Mohr diagram, the boundary between stable and unstable states of tensile stress is called the tension fracture envelope.( )
- 5.The fracture angle  $\theta_f$  which is the angle between the maximum principal stress  $\sigma_1$  and the fracture.

**Q.9)** Respond to the following statements with true or false, and correct the underlined word(s) if they are wrong. Write correct answer in the brackets.

1. The Equation (  $\sigma_s = C + \mu \sigma_n$  ), also known as Mohr's failure criterion.( )
2. Joints which are curved, conchoidal and non-parallel are non-systematic joints.( )
3. If the two joint sets intersect with a dihedral angle significantly less than 90°, we call the pair a orthogonal system. ( )
4. The joints were divided genetically into set and system joints . ( )
5. Fringe zone consists of s-joint and z-joint .( )

**Q.10)** Respond to the following statements with true or false, and correct the underlined word(s) if they are wrong. Write correct answer in the brackets.

1. The matrix of the extension fractures equals  $\begin{bmatrix} a & 0 & 0 \\ 0 & 0 & 0 \\ 0 & 0 & 0 \end{bmatrix}$  .( )
2. The direction of movement on the synthetic fault direction of movement. ( ) is in accordance with the bending
3. Fissures are extension fractures that are more open than stylolites. ( )
4. Joint bearing plumose marking and unaccompanied by a fringe zone are likely hybird fracture. ( )
5. Orthogonal joint systems are generally regarded as extension joints. ( )

**Q.11) Complete these sentence with the correct structural word(s)**

- 1- Joints which are curved, conchoidal and non-parallel are ..... joints.
- 2- Fissures are extension fractures that are more open than .....
- 3- The state of stress for longitudinal fracture equals.....
- 4- The joints were divided genetically into .....and ..... joints.
- 5- Stylolite is an example for Mode..... of the fractures.

**Q.12) Are these sentences right (/) or wrong (X)? Correct the underlined word(s) in these sentences, if they are wrong.**

- 1- Joint bearing plumose marking and unaccompanied by a fringe zone are likely pure shear fracture.
- 2- The fracture angle  $\theta$  which is the angle between the maximum principal stress  $\sigma_1$  and the fracture.
- 3- Conjugate Joint Systems are generally regarded as extension joints.
- 4- Experimental rock deformation has shown that the mean of the shear fractures occur at about 45° to the  $\sigma_3$ .
- 5- Scarps are physiographic criteria for vein.
- 6- The Equation (  $\sigma_n = S + \mu\sigma_s$  ), also known as Coulomb's failure criterion.

**Q.13) Select the correct answer for each of following:**

- 1- bc joint also described as ..... joint.  
A- dip                      B- cross                      C- strike                      D- bedding plane
- 2- The fracture plane angle af which is the angle between the ..... and the fracture.  
A-  $\sigma_2$                       B-  $\sigma_3$                       C-  $\sigma_1$                       D- normal
- 3- If the two joint sets in a system are perpendicular (i.e., the dihedral angle is  $\sim 90^\circ$ ), we call the pair a ..... system.  
A- conjugate    B- orthogonal    C- shear    D- hybrid
- 4- ab joint also described as ..... joint.  
A- dip    B- strike    C- longitudinal    D- none of them
- 5- Shallowly dipping Faults are also called .....  
A- high-angle faults    B- vertical    C- subvertical    D- none of them
- 6- ac joint also described as ..... joint.  
A- dip                      B- longitudinal                      C- strike                      D- bedding plane

**Q.12) What are differences between:**

- 1- systematic joint and nonsystematic joint.
- 2- syntaxial vein and antitaxial vein.
- 3- dip-slip faults and strike-slip faults.
- 4- conjugate joint and orthogonal joint.

**Q.13) Talk briefly about:**

- 1- Stylolite.      2- Vein.      3- Oblique slip fault.      4- Strike- slip fault.

**Q.14)** Draw with labelling these structures:

- 1- Reverse fault with their principal stresses ( $\sigma_1$ ,  $\sigma_2$  and  $\sigma_3$ ).
- 2- Mode III & I of fractures/cracks.
- 3- Normal fault with their principal stresses ( $\sigma_1$ ,  $\sigma_2$  and  $\sigma_3$ ).

**Q.15)** Draw with labelling these structures:

- 1- hko/b subsystem with their principal stresses ( $\sigma_1$ ,  $\sigma_2$  and  $\sigma_3$ ).
- 2- hko/a subsystem with their principal stresses ( $\sigma_1$ ,  $\sigma_2$  and  $\sigma_3$ ).
- 3- Mohr diagrams for tension and extension fractures with their matrix.

**Q.16)** What are differences between:

- 1 - bedding –parallel stylolite and tectonic stylolite.
- 2- blocky vein and fibrous vein .
- 3- plume axis and arrest lines.

**Q.17)** What are uses of sigmoidal tension gashes ?

**Q.18)** Answer these questions.      (40 Marks)



- 1- Construct three tectonic/geometric axes in this figure. (1M)
- 2- Draw hol/c joint subsystem with their principal stress axes ( $\sigma_1$ ,  $\sigma_2$ ,  $\sigma_3$ ). (6M)
- 3- Draw okl/b joint subsystem with their principal stress axes ( $\sigma_1$ ,  $\sigma_2$ ,  $\sigma_3$ ). (6M)
- 4- Draw ab, ac, bc and hkl joint sets in the same figure. (4M)
- 5- hol /c joint subsystem may develop to .....fault. (2M)
- 6- okl /b joint subsystem may develop to .....fault. (2M)
- 7- If  $2\theta > 60^\circ$ , the state of stresses that producing joint equals ..... (3M)
- 8- If  $2\theta < 60^\circ$ , the state of stresses that producing joint equals ..... (3M)
- 9- bc joint also called ..... or ..... (2M)

10- ac joint also called ..... or ..... (2M)

11- ab joint also called ..... (1M)

12- Are the hol /c and okl /b joint subsystems form during same tectonic stress direction ( $\sigma_1$ )? Yes, or No? Give reason. (8M)

**Q.19)** Answer these questions about the faults A and B . (30Marks)

1- Find dip direction of the fault A. (2M)

2- Mark hanging wall and foot wall on the faults A and B. (4M)

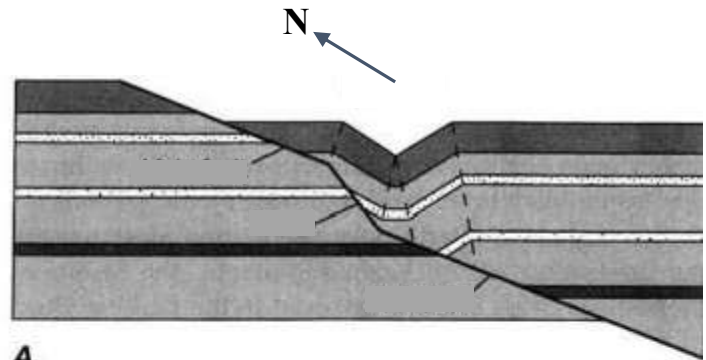
3- What's type of net slip in the fault B. (2M)

4- Classify the faults A and B based on genetic classification. (2M)

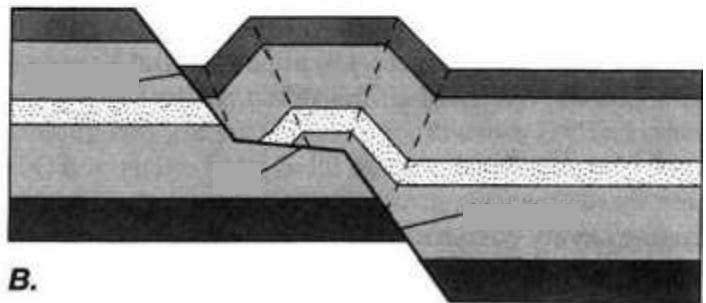
5- Draw  $\sigma_1$ ,  $\sigma_2$  and  $\sigma_3$  on the faults B and A. (6M)

6- What's the name of structure that developed in hanging wall of the faults A and B. (6M)

7- What are main differences between the faults A and B. (8M)



A.



B.

**Q.20)** Answer these questions about this plumose structure. (20Marks)

1- Draw plume axis on the plumose structure with arrow marking the leading tip of the joint front . (2M)

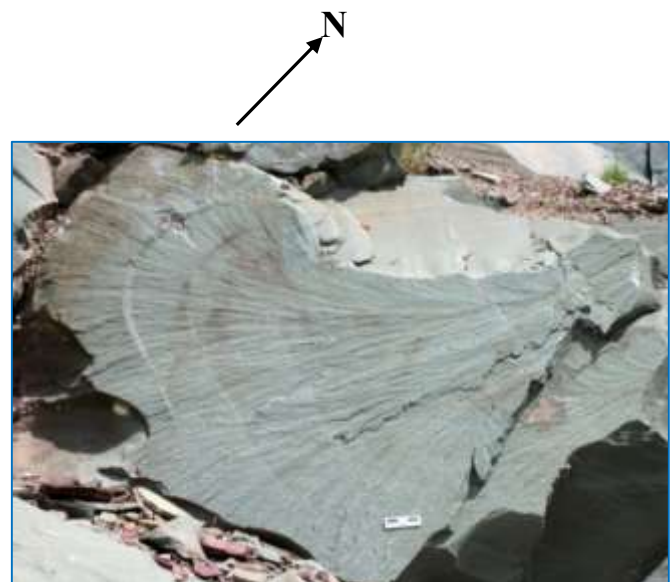
2- Plume axis indicating .....(4M)

3- Find trend of plume axis in this figure. (2M)

4-Draw arrest lines on the plumose structure. (2M)

5- Arrest lines indicate .....(4M)

6- This joint is extension or hybrid or shear joint? Why? (6M)

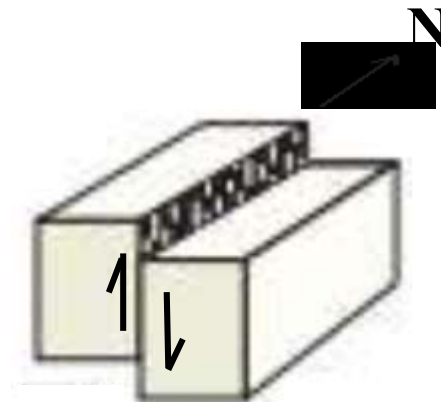


**Q.21)** What's a fault separation? Talk about types of the fault separation.

**Q.22)** Answer these questions about this fault in below figure: (3Marks)

1- Find dip and strike of the fault. (1 Mark)

2- Can determine hanging-wall block and footwall block for this fault? Yes, or No. Why? (2 Marks)



**Q.22)** Answer these questions. (27Marks)

1- Construct three tectonic/geometric axes in this figure. (2M)

2- Draw hol/a joint subsystem with their principal stress axes ( $\sigma_1$ ,  $\sigma_2$ ,  $\sigma_3$ ). (5M)

3- Draw draw okl/c joint subsystem with their principal stress axes. ( $\sigma_1$ ,  $\sigma_2$ ,  $\sigma_3$ ). (5M)



4- Draw ac & bc joint sets in the same figure. (4M)

5- hol /a joint subsystem may develop to .....fault. (2M)

6- okl /c joint subsystem may develop to .....fault. (2M)

7- Are the hol /a and okl /c joint subsystems form during same tectonic stress direction ( $\sigma_1$ )? Yes, or No? Give reason. (7M)

**Q.23)** What are factors on which the fracture/joint spacing is depended .

- Q.24)** Define: 1- plumose structures. 2- slickenfiber. 3- fault bend fold. 4- fissures.
- Q.25)** Define: 1- khl system. 2- ab joint. 3- fracture plane angle. 4- fracture angle.
- Q.26)** Why don't shear fracture form at about  $45^\circ$  to the  $\sigma_1$  (along planes of maximum shear)?
- Q.27)** What's a tensile fracture? What are types of the tensile fractures(cracks)?
- Q.28)** What are modes of fractures based on displacement field of fractures?
- Q.29)** What is unrealistic about the domino fault model?
- Q.30)** What are the difference between a fault-propagation fold and a fault-bend fold?
- Q.31)** What's a thrust system? What are types of the thrust system?
- Q.32)** What's a ramp? What are types of the ramp?
- Q.33)** What's a fault-related fold? What are types of the fault-related folds?
- Q.34)** Compare between salient and recesses.
- Q.35)** Compare between pop-up and triangle zone structures.
- Q.36)** What is the difference between a thrust sheet and thrust slice?
- Q.37)** What are the difference between Allochthon and Autochthon?
- Q.38)** What are the difference between Klippe and Window?
- Q.39)** What are types of salient and recesses?
- Q.40)** What's a Break-forward sequence? What is difference between in sequence thrusting and out of sequence thrusting?
- Q.41)** How can you determine movement direction of thrust faults.
- Q.42)** What is "Bow and Arrow Rule"? what is advantage of "Bow and Arrow Rule" in the fold thrust belt?
- Q.43)** Explain this statement "Cross-sections should always be drawn parallel to the direction of tectonic transport".
- Q.44)** Compare between the root zone model and the subduction model?
- Q.45)** What is detachment folds? What are the two end-member mechanisms for the formation of detachment folds?
- Q.46)** What is Fault-bend folds? What are difference between active axial planes and passive axial planes in Fault-bend folds?
- Q.47)** What is compressional duplex? compare between a hinterland-dipping duplex and a foreland-dipping duplex.
- Q.48)** define:1- Inversion tectonics; 2- Growth fold; 3- Foreland basin.
- Q.49)** What is a flower structure? What are types of the flower structures?
- Q.50)** Compare between the Transpression and Transtension structures.