American University of Beirut
Geology 304
Final Exam

Student Name:_____   June 20, 1997

Part I. Circle T = true and F= false and explain why if it is false (40 pts.).

T   F   1. Migration is the process that repositions reflected energy from its CMP position to its true subsurface location.

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T   F   2. Due to the filtering action of the earth which causes time lags, it is easier to determine the absolute depth of a reflecting interface than to measure relative depths between two points located at the same reflecting boundary.

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T   F   3. Diffraction patterns originate from the edges of beds disrupted by faulting or basement irregularities...etc. The resulting pattern will have shape like trace of maximum convexity. sometimes they may look deceptively like a reflection of symmetrical syncline.

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T   F   4. The velocity pitfalls in structural interpretation of seismic data, occur when the velocity of a certain body is more than that in the surrounding (laterally), this would reflect a structural uplift below this body.

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T   F   5. A reflection does not originate from a point on a reflector but from a zone on the reflector. The radial width of this zone (The Fresnel zone) is defined as

$$F_r = \frac{V}{4}\sqrt{\frac{t}{f}}$$

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T   F   6. P waves are affected by the gas saturation in the pore space and travel at slower velocity, while shear waves travel at higher velocity.

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T   F   7. The interference effects on reflection amplitudes might occur when two or more reflecting surfaces are close together compared to wavelength. The pulses reflected will be superimposed and the amplitude will always be stronger.

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T   F   8.   The natural frequency of geophones used in refraction prospecting is normally higher than that of the geophones used in ordinary reflection prospecting.

T   F   9.   In refraction method, only the initial arrivals of seismic energy (first and second events) are recorded.

T   F   10. If any bed in the sequence has a lower speed than the one above, it will not be detectable by refraction shooting at all.

T   F   11. In land areas, the geoid is defined as the surface that would be assumed by the top of the water in a narrow sea level canal extended inland across continents connecting one ocean to another.

T   F   12. The gravitational potential is defined as the work required for gravity to move one unit mass from infinite distance to the point in question (at distance R).

T   F   13. Pratt's hypothesis of Isostasy suggests that the crust has uniform density and laterally varying roots.

T   F   14. The regions with negative isostatic anomaly (areas covered by ice during Pleistocene) are isostatically undercompensated.

T   F   15. The drift of gravimeters is caused by earth tides and uncompensated temperature effects.

T   F   16. The Bouguer correction accounts for the attraction of the slab of material having a bottom surface at sea level and a top surface at the elevation of the station.

Part II. Answer the following three questions (30 pts).

1. Transmission of refracted waves:

A. Derive the time TD, (D, at distance x from the shot point) required for the propagation of refracted seismic wave from the source A to the detector D in terms of X, Z, V1 and V2.
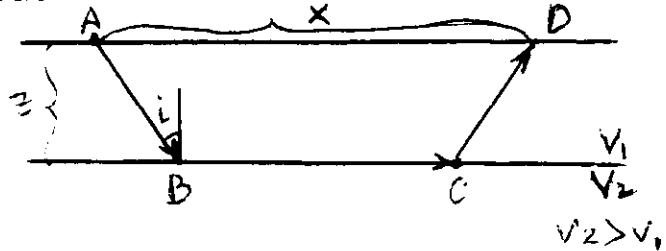

B. Calculate the depth Z separately in terms of Ti and X cross.

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2. Check the given seismic record and delineate and explain the types of the following events:

   direct wave; refracted first and second event, reflected events and briefly explain why they have this geometry.
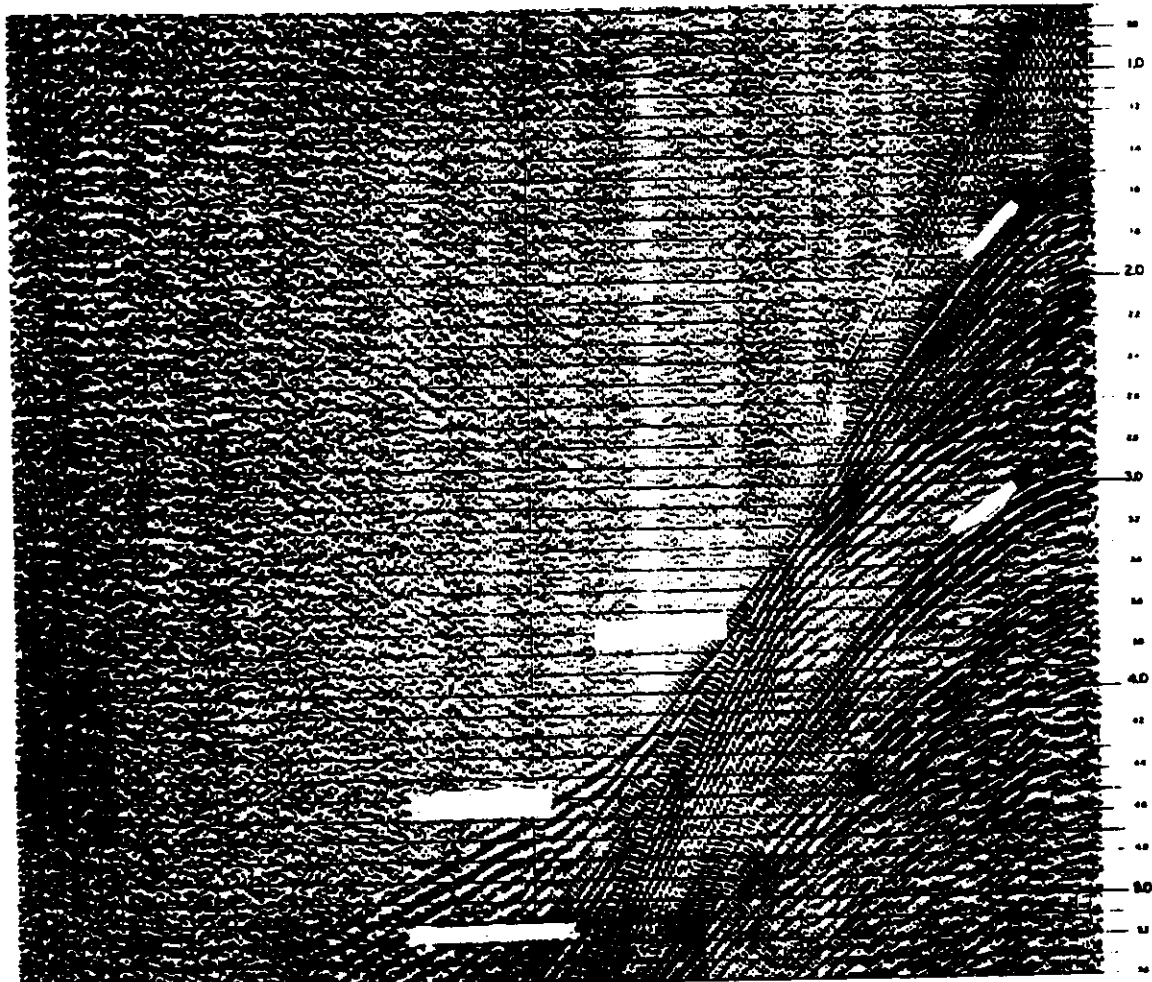
3. Try to interpret the given seismic records, by delineating the reflectors, faults, anticline, salt domes, diffraction patterns... etc.
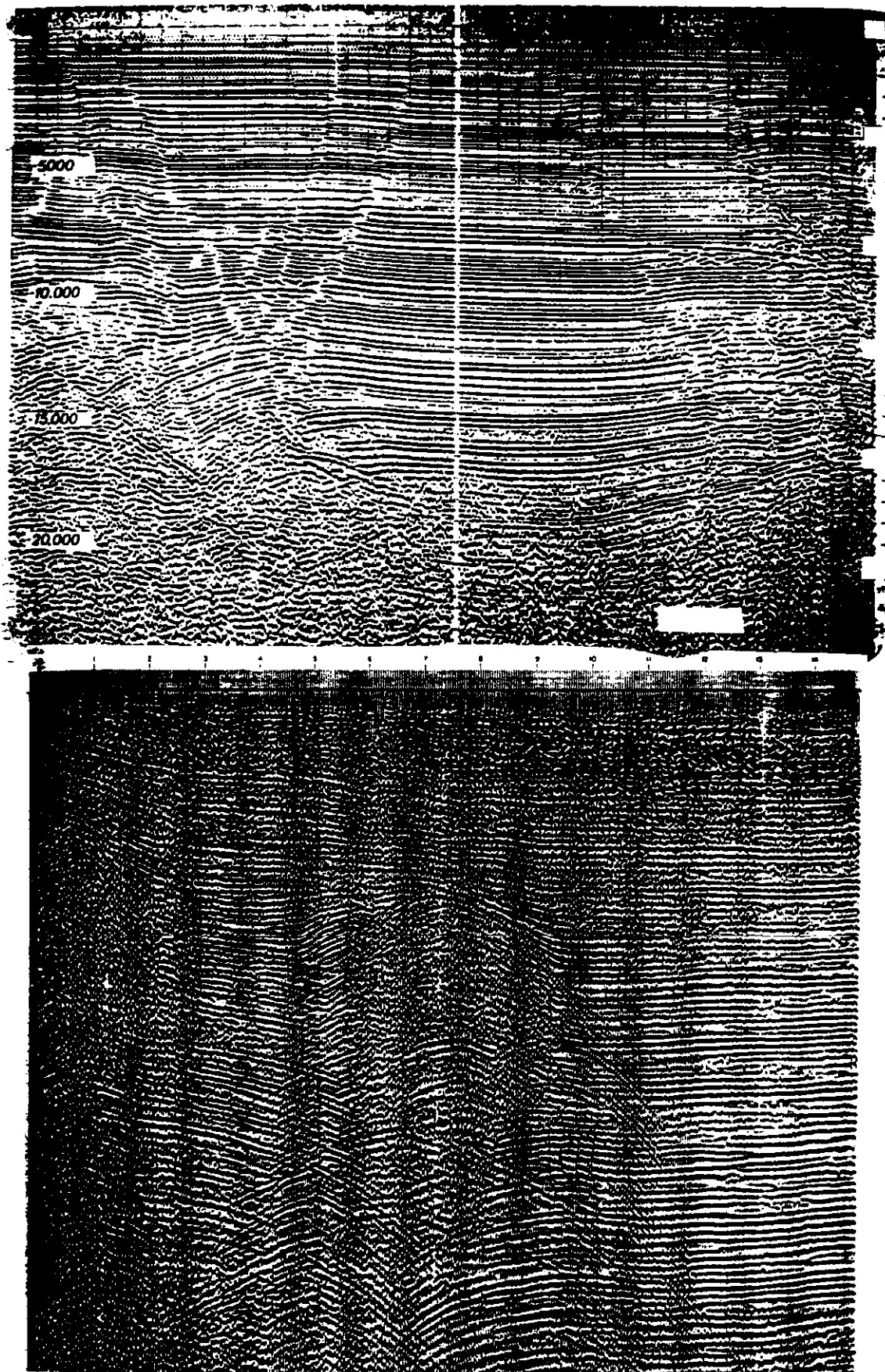
Part III. Answer three of the following four questions (30pts.)

1. Discuss the case of blind zone (refraction shooting) and draw illustrative cross-section and time-distance diagram.

2. Discuss the global variation in gravity, the reason behind it, and indicate and define the theoretical and real shape of the earth's globe.

3. Discuss the free air, latitude and terrain corrections (draw schemes).

4. Discuss the gravity measurement on land including determining position for stations; surveying; transportation and operation of the instrument, and adjustment for drift.

GOOD LUCK