Escola de Camins
Escola Tècnica Superior d'Enginyeria de Camins, Canals i Ports
UPC BARCELONATECH

Civil and Environmental Engineering (Dept.)
Transportation Infrastructure and Territory (Group)
BIT – Barcelona Innovative Transportation
BarcelonaTech

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Transportation Planning and Management on the Territory

MEng in Civil Engineering

Course 2018-2019, quarter Q2 (April 3, 2019)

Quiz1 (Classes 1-15)

PERMUTATION A

TIME: **30 MIN**.

Student: _____.

ID/Passport = _____.

Signature:

MULTIPLE CHOICE. **PLEASE WRITE THE ANSWER HERE (BOXES BELOW)**.
CORRECT ANSWER = 10/3 points. BLANK ANSWER = 0 points. **WRONG ANSWER = -5/6 POINTS**.

_____

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15

16	17	18	19	20	21	22	23	24	25	26	27	28	29	30

_____

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1. Select the value that better approximates the capacity of one freeway lane:

A=	1,800 veh/h	B=	2,000 veh/h	C=	2,500 veh/h	D=	3,000 veh/h

2. LWR traffic flow theory considers that traffic shockwaves can travel faster than the vehicles free-flow speed.

A.	True.
B.	False.
C.	True, only considering the triangular diagram simplification.
D.	The free-flow speed is not defined in LWR theory.

3. The first traffic diagram measured by Greenshields (1934):

A.	Defines a linear relationship between the average speed and density.
B.	Defines a linear relationship between flow and density.
C.	Defines a triangular relationship between average speed and density.
D.	Defines a triangular relationship between flow and density.

4. LWR traffic flow theory is a good model…

A.	to estimate traffic emissions.
B.	to analyze overtakings (“adelantamientos”) between car and trucks.
C.	to model the capacity drop.
D.	to predict the physical extension of queues.

Questions 5-8 are about TRANSIT (Public Transportation) and all make reference to the following case:

A bus line of length L=12km (roundtrip) presents stops evenly spaced (“uniformemente distribuidas”) at s=300 m. The service is operated at time headway H= 5 min and buses can maintain a cruising speed v=30km/h. Origins and destinations of users are uniformly distributed along the corridor and their walking speed is w_a=2 km/h. The time penalty to perform one stop due to the vehicle acceleration and braking operation is τ=18 seconds. The total demand captured during one hour of service is Λ =3,600 pax/h and the unit boarding and alighting time per passenger is τ'=3 seconds.

5. The average access time of a single user, including the egress leg of the trip, is

A=	2.5 min	B=	4.5 min	C=	5.5 min	D=	6 min

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6. The average waiting time, assuming regular arrivals at stops and no information available, is:

A=	2 min	B=	2.5 min	C=	3 min	D=	5 min

7. The total distance run by the whole fleet in one hour of service in terms of (veh-km/h) is:

A=	144	B=	166	C=	212	D=	272

8. The commercial speed of the bus line (in km/h) is contained in the following domain/range:

A=	12-13.5	B=	13.6-15	C=	15.1-16.5	D=	16.6-18

9. A squared-shaped city is served by a transit system with semi-flexible routes in vertical and horizontal directions. Each bus line runs along a "tube" of width *w.* Vehicles stop at all potential origins and destinations of passengers located within the tube boundaries. However, at each bus line (tube) vehicles must stop at mandatory transfer stations. Considering that N is the number of transfer stations at each line (tube), the transit system presents…

A.	N^2 tubes (lines) and 2N transfer stations.
B.	2N tubes (lines) and 2N transfer stations.
C.	N tubes (lines) and N transfer stations.
D.	2N tubes (lines) and N^2 transfer stations.

10. The unit transportation cost of the system defined in question **#9** (band/tube model)…

A.	is lower than the unit transportation cost of mass transit systems when the demand density is huge.
B.	is lower than the corresponding unit transportation cost of taxis when the demand density is really small.
C.	is lower than the unit transportation cost of mass transit systems with given layout when the demand density presents intermediate values.
D.	is always higher than the unit transportation cost of mass transit systems (with a given layout).

11. In the dispatching taxi service, the cost incurred by taxi drivers and users can be minimized with regard to T_0 in order to obtain the optimal number of taxis in operation ($M=n_s+n_a+n_i$). What does T_0 mean?

A=	Target waiting time of users	B=	Target door-to-door travel time	C=	Average transfers	D=	Payment time at destination

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12. The solution of the optimization problem stated in question **#11** …

A.	does not ensure that all users will be served by taxis.
B.	is achieved when $T_0 = \ell / v$, when ℓ is the user trip length and v the cruising speed.
C.	always guarantees a positive profitability for taxi drivers.
D.	may cause a negative profitability for taxi drivers.

13. Assume an instantaneous investment I at time t=0, a benefits function b(t) and a cost function c(t) along the lifespan of the project 0<t≤T. The discount rate is r. When is the investment feasible?

A.	$\int_0^T [b(t) - c(t)]\, e^{-rt}\, dt > 0$	C.	$\int_0^T [b(t) - c(t)]\, (1+r)^{-k}\, dt > I$
B.	$\int_0^T [b(t) - c(t)]\, dt > I$	D.	$\int_0^T [b(t) - c(t)]\, e^{-rt}\, dt > I$

14. What treatment have the fares, tolls and taxes paid by the users in a Cost Benefit Analysis?

A.	They are costs to the users.
B.	They are income for the operators and the state.
C.	We should be careful not to double-count these values.
D.	They are transfers among stakeholders and they should not be included.

15. In the formulation of the optimal shipment size provided by EOQ model (Economic Order Quantity, we have seen it in logistics, one-to-one distribution), if we ship to longer distances the shipment size…

A=	increases	B=	decreases	C=	is constant	D=	irrelevant

16. What's the typical analysis technique for strategic planning?

A=	SWAT	B=	SWEET	C=	SWEAT	D=	SWOT

17. What transportation plan gave first the idea of L9 metro line?

A=	PIT-1992	B=	PDI-2001	C=	PEIT-2006	D=	PMU-2010

18. What's the optimal pricing policy?

A=	Maximum profit	B=	Average cost	C=	Marginal cost	D=	Unrelated

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19. What city of Latin America is implementing Daganzo's mixed strategy of restriction and pricing?

A=	B=	C=	D=
Santiago (Chile)	Bogotá	Medellín	Cali

20. Why urban public transportation (transit) should be subsidized if we want to operate at optimal social equilibrium? MC= marginal cost, AV= average cost, TC= total cost, and q=demand.

A=	B=	C=	D=
AC<MC	AC>MC	AC= TC/q	MC = ∂TC/∂q

21. What's the name of the "paradox" that happened in Ireland with potatoes? After a bad potato harvest, potato's prices increased, but their demand also increased….

A=	B=	C=	D=
Vickrey	Mogdridge	IAI	Giffen

22. Necessary condition to find an Eulerian cycle in any graph:

A.	The number of links must be larger than the number of nodes squared.
B.	The network density (km of lings over the surface) must be high.
C.	The sum of the degrees of the nodes with even degree plus the nodes with odd degree is even.
D.	The degree of each node must be even.

23. What are the units of mobility when a truck moves 10 tones along 10 km at 10km/h?

A=	B=	C=	D=
1 ton/km	10 km/h	100 ton-km	1,000 tones

24. Fundamental equation of traffic:

A=	B=	C=	D=
k=qv	v=q/k	q=kv^2	q=kv

25. Fastest door-to-door mode in Barcelona?

A=	B=	C=	D=
Car	Motorcycle	Bicycle	Scooter

26. Commercial speed of the metro in Barcelona?

A=	B=	C=	D=
22 km/h	25 km/h	28 km/h	30 km/h

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27. Most commonly used production functions in Microeconomics:

A=	Gravity	B=	Marshalian	C=	Leontiev	D=	Cobb-Douglas

28. There are cars and trucks on a highway and we count p percentage of truck at a section. The percentage of trucks on an air picture is:

A=	Lower than p	B=	Higher than p	C=	Equal to p	D=	Depends on the speed

29. We have seen the "median problems" in:

A=	Location	B=	Microeconomics	C=	Appraisal	D=	Networks

30. What's the influence area (closest points) of a terminal?

A=	Isochrone	B=	Euler	C=	Voronoi	D=	Hamilton

CONGRATULATIONS!!!!! YOU FINISHED THE QUIZ!!!!