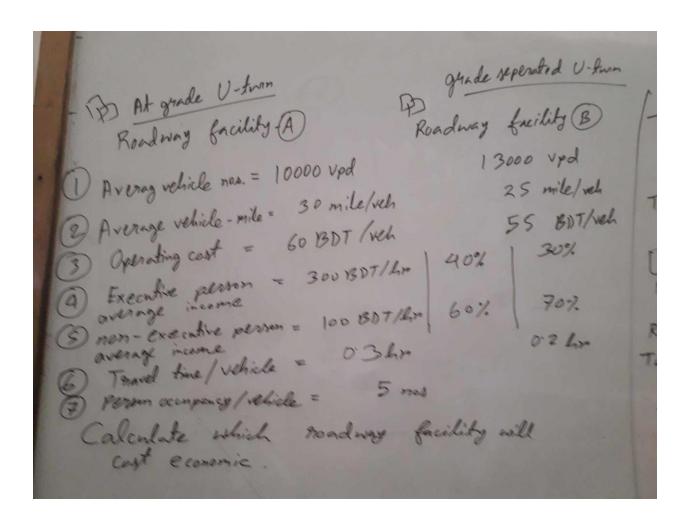Calculate which road infrastructure facility will be cost efficient between A: At grade U-turn and B: Grades separated U-turn. Use Vehicle operating cost (VOC) and value of travel time (VOT) for the decision making.

Item	Roadway facility A: At grade U-turn	Roadway facility B: Grade separated U-turn
Daily average vehicle	10000 vpd	13000 vpd
Average vehicle-mile	30 mile/veh.	25 mile/veh.
Operating cost	60 BDT/vehicle-mile	55 BDT/vehicle-mile
Passenger nos. (Executive)	40%	30%
Passenger nos. (Non-executive)	60%	70%
Travel time/vehicle	0.3 hr	0.2 hr
Average income of an executive	300 BDT/hr	
Average income of a non- executive	100 BDT/hr	
Person occupancy/vehicle	5 nos.	

(7) At grade U-turn

Roadway facility (A)

(1) Averag vehicle nos. = 10000 vpd

(2) Average vehicle - mile = 30 mile/veh

(3) Operating cost = 60 BDT/veh

(4) Executive person = 300 BDT/hr | 40%
average income

(5) non-executive person = 100 BDT/hr | 60%
average income

(6) Travel time/vehicle = 0.3 hr

(7) Person occupancy/vehicle = 5 nos

grade seperated U-turn

Roadway facility (B)

13000 vpd

25 mile/veh

55 BDT/veh

30%

70%

0.2 hr

Calculate which roadway facility will
cost economic.

Soln:

(A)

VOC

Total VOC_A = average vehicle nos. × Avg. veh.-mile
$$\times \text{ Operating cost}$$
$$= 10000 \times 30 \times 60 = 1,80,00,000 \text{ BDT}$$

VOT

Road user (executive) nos. = Avg. veh. no × person occupancy
$$\times \text{ proportion of user}$$
$$= 10000 \times 5 \times 0.4 = 20000 \text{ nos.}$$

Road user (non-executive) nos. = $10000 \times 5 \times 0.6$
$$= 30000 \text{ nos.}$$

Total VOT_A = road user noo. × Avg. income × travel tim
$$= 20000 \times 300 \times 0.3 + 30000 \times 100 \times 0.3$$
$$= 27,00,000 \text{ BDT}$$

Total cost, T_A = $VOC_A + VOT_A$ = $1,80,00,000 + 27,00,000$
$$= 2,07,00,000 \text{ BDT}$$

(B)

VOC

Total $VOC_B = 13000 \times 2.5 \times 55$
$= 1,78,75,000$ BDT

VOT

Road users (exe.) nos. $= 13000 \times 5 \times 0.3$
$= 19,500$ nos.

Road users (non-exe.) nos. $= 13000 \times 5 \times 0.7$
$= 45,500$ nos.

Total $VOT_B = 19500 \times 300 \times 0.2 + 45500 \times 100 \times 0.2$
$= 20,80,000$ BDT

Total cost, $T_B = 1,78,75,000 + 20,80,000$
$= 1,99,55,000$ BDT

So, $T_B < T_A$

So, Roadway facility (B) i.e.
grade-seperated u-turn will
be cost effective ar economic.