

TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division
2079 Chaitra

Exam.	Regular		
Level	BE	Full Marks	80
Programme	BCE	Pass Marks	32
Year / Part	IV / II	Time	3 hrs.

Subject: - Road Safety (Elective II) (CE76522)

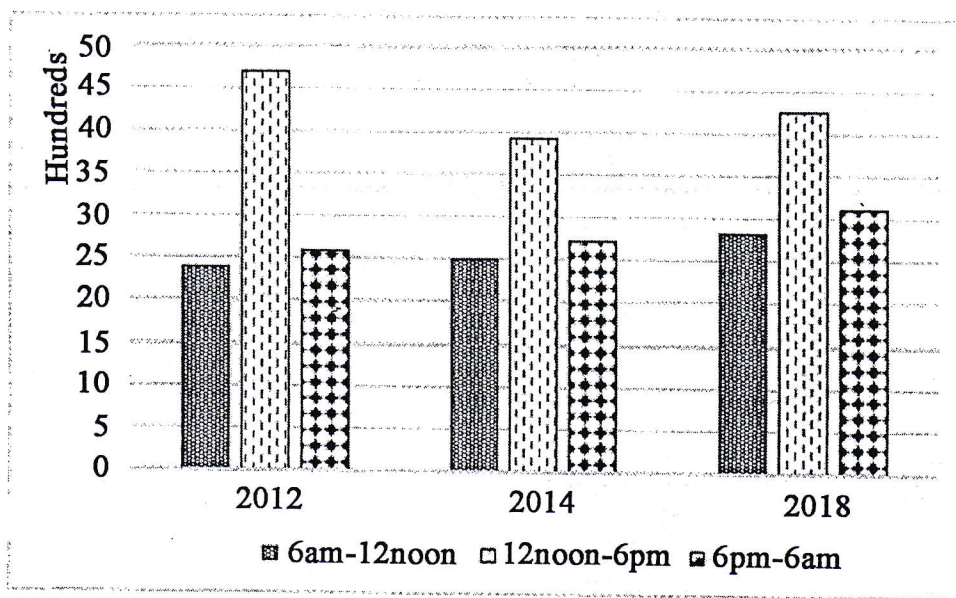
- ✓ Candidates are required to give their answers in their own words as far as practicable.
- ✓ Attempt All questions.
- ✓ The figures in the margin indicate Full Marks.
- ✓ Assume suitable data if necessary.



1. a) Compare scenario of the fatalities by modes of transportation as given in table below. [5]

	1980	1990	2000	2010	2020
Air	1380	870	750	480	350
Road	51100	44600	42000	33000	38800
Rail	1420	1300	940	735	750
Water	1360	865	700	820	840
Pipeline	20	10	40	22	15

- b) Elaborate vulnerable road users. Discuss crash pattern as per following figure. [5]



2. Explain different types of vision with respect to its importance in safe driving and road safety. Explain perception reaction process. [7+3]
3. Determine the crash rate for the following two routes and compare the results. The crash exposures are km travelled, route length, vehicle volume and population. [10]

Road	Area Population	Length (km)	Traffic volume	Years of Data	Numbers of Crash
A	15,000	19	4000	5	150
B	10,000	23	2500	5	150

4. Before collision, two vehicles E and N weigh 4000 kg and 6000 kg were approaching to intersection from west and other from south. After collision vehicle E skids 10 m in a direction 75° North of West and Vehicle N skids 8 m in a direction of 50° East of North. The initial skid marks before collision for vehicles E and N being 4m and 6m respectively. If the speed limit was 60 kmph and $f = 0.4$, check for over speeding. [10]
5. Define Counter measures and list of 3 any three counter measures. Estimate the predicted average crash frequency of the roadway segment for a particular year with the following data. Length of Section - 2 - mi length of Tangent roadway segment and Traffic volume - 12,203 veh/day. AMFs applicable for lane width, shoulder, driveway density and road side environment are 1.2, 1.1, 1.01, 1.07 respectively. The calibration function is 1.15. [10]
6. a) The number of traffic accidents at a certain intersection is thought to be well modeled by a Poisson process with a mean of 4 accidents per year. What is the probability that there will be exactly 3 accidents in 6 months? What is the probability that there will be 3 accidents in first year? What is the probability that there is no accidents in coming five years? [5]
- b) A road safety audit team inspects a critical curve along a hill road. They found extra widening of 1.0 m and speed limit value on curve as 40 kmph. Check the geometric features and speed limit is adequate from safety aspect for a vehicle of 6.1 length of wheel base. The curve is assumed to have radius of 35 m., Super elevation of 6.7% and coefficient of friction of 0.15. [5]
7. Write down the any five actions for road safety education. Write down the list of guidelines for Passengers for safe road use. [5+5]
8. Write down effect of UN Decade of Action for Road Safety 2011 – 2020. Write down the role and responsibilities of government, civil society, funders, private sections and UN agencies in road safety. [10]

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1. What is the global and national statistics of road crashes? Briefly explain about the pillar of UN Decade of Road Safety 2011-2020. (3+5)
2. What are the various factors contributing to road crashes? Explain about crash data recording system. (3+5)
3. What are the various criteria for countermeasures selection? Explain about the various counter measures to be adopted on road design. Give specific examples in context of hill roads of Nepal (3+7)
4. What is road Safety Audit (RSA)? Discuss in detail about the various stages of RSA. (2+6)
5. Discuss about Crash Modification factor (CMF). The CMF for single vehicles runoff accidents for 1% increase in grade is 1.04. What is the effect of increasing the grade 2% to 4%. (3+3)
6. Recent study on public transportation shows that Sajha Yatayat driver drives 4800Km during the entire year. The probability of having crases is 95 per 180million vehicle-Kms. What is the probability of driver having at least one crashes during his driving carrier of 25 years? (8)
7. Vehicles from West and B from South weigh 4 and 5 tonne respectively approaching at right angle collide with each other. After collision vehicle A skids 18m in a direction 65°North of East and Vehicle B skids 8m in a direction of 32° South of East. The initial skid resistance of vehicles A and B are 3.5 and 10m respectively. Calculate the initial speeds of vehicles if skid resistance of pavement is 0.61 (8)
8. A road safety audit team inspects a critical curve along a hill road. They found extra widening of 1.5m and speed limit value on curve as 40kmph. Check whether the geometric features and speed limit is adequate from safety aspect. The curve is assumed to have radius of 20m, super elevation of 6.7% and coefficient of friction as 0.15. Assume length of wheel base as 6.1 m (8)

9. Based on following data, determine all crash and fatalities rate.

(8)

Crashes: 300, Fatal crashes: 10

Fatalities: 15

Area population: 40,000

Registered vehicles: 25,000

Annual VKT: 8,000,000

10. Write short notes on: (Any two)

(2*4=8)

- a. Safe System Approach
- b. Human Vehicle Environment
- c. Crash Estimation
- d. Crash Ranking
