



MACHAKOS UNIVERSITY

University examinations 2022/2023

SCHOOL OF ENGINEERING AND TECHNOLOGY

DEPARTMENT OF BUILDING AND CIVIL ENGINEERING

FOURTH YEAR SPECIAL/SUPPLEMENTARY EXAMINATION FOR BACHELOR IN CIVIL ENGINEERING

ECV 402: IRRIGATION ENGINEERING I

Date 6/3/2023

Time: 8:30 – 10:00 AM

INSTRUCTIONS

- This paper comprises of four questions. Answer **two** questions
- Question one is **compulsory** and carry 30 marks
- Answer any other **one** questions

QUESTION ONE

- a) List any **FIVE** major causes of road accidents on Kenya roads (5 Marks)
- b) Machakos County Township contains 200 hectares of residential land, 50 hectares of commercial land and 10 hectares of park land. The Township's predicted target year household composition is as shown in table 1,

Table 1: Machakos Township's predicted target year household composition				
Vehicles per household	Number of households			
	No of persons per household			
	1	2-3	4	5+
0	100	200	150	20
1	300	500	210	50
2+	150	100	60	00

Using the calibrated cross classification rates given in Table 2 estimate the total home based non work trips that the zone produces during a typical day of the target year. (10 Marks)

Table 2: Example of home based non work trip production rates for cross classification

Area type	Vehicles available per household	Trips per household per day			
		No of persons per household			
		1	2-3	4	5+
Urban high density	0	0.57	2.07	4.57	6.95
	1	1.45	3.02	5.52	7.90
	2+	1.82	3.39	5.89	8.27
Suburban medium density	0	0.97	2.54	5.04	7.42
	1	1.92	3.49	5.99	8.37
	2+	2.29	3.86	6.36	8.74
Rural low density	0	0.54	1.94	4.44	96.82
	1	1.32	2.89	5.39	7.77
	2+	1.69	3.26	5.76	8.14

- c) Briefly discuss any five most important impacts of transport on the environment. (15 Marks)

QUESTION TWO

- a) Discuss a Smart transportation planning process that the County government of Nairobi can use to improve on transport industry within Nairobi. (10 Marks)
- a) Discuss the **FIVE** most significant components of urban dynamics witnessed in Kenya: (10 Marks)

QUESTION THREE

- b) Transport needs in Kenya are very dynamic. Using relevant illustrations and examples discuss the following transport system as constituted currently.
- Public Transport (10 Marks)
 - Private Transport (10 Marks)

QUESTION FOUR

- a) Discuss any **FOUR** major financiers of LABSET projects being undertaken in Kenya. (8Marks)

- b) Four zones of Kiambu region have the following areas of land use as shown in Table 3. Calculate the trips produced and attracted by the zones using the trip rates given in Table 4.

(12 Marks)

Table 3: Kiambu region land use activities				
Land use category		Area (ha)		
		Zone 1	Zone 2	Zone 3
Residential		2500	150	50
Commercial	Retail	375	900	150
	Wholesale	450	500	200
	Services	150	250	200
Manufacturing		125	0	2500
Transportation		80	250	350
Public buildings		230	1500	125
Public open space		300	350	100

Table 4 Person trips per hectare by land use and zone. (Ref. Fundamentals of Transportation Engineering by CS Papacostas p 255)

Personal trips per hectare										
Zone	Residential	Commercial			Manufacturing	Transportation	Public buildings	Public open space	Average	
		Retail	Wholesale	Services					Used land	All land
1	128	850	135	445	353	73	595	5	128	100
2	108	423	90	258	183	25	265	3	75	50
3	93	563	115	505	83	35	375	10	80	55
4	75	670	73	385	73	25	245	5	65	43
5	55	463	60	365	55	13	90	5	43	20
6	45	485	48	338	53	18	48	3	35	13
7	38	380	40	328	35	15	10	3	28	8
Average	60	565	328	78	65	23	115	5	50	23

QUESTION FIVE

- a) To reduce road carnage in Kenya, the government has initiated a number of measures and legislations. Discuss such major road safety initiatives done between the year 2003 to the year 2018. (10 Marks)
- b) Discuss **FIVE** general goals and objectives of national transport planning. (10 Marks)