



# MACHAKOS UNIVERSITY

University Examinations for 2020/2021 Academic Year

SCHOOL OF ENGINEERING AND TECHNOLOGY

DEPARTMENT OF BUILDING AND CIVIL ENGINEERING

THIRD YEAR FIRST SEMESTER EXAMINATION FOR

BACHELOR OF SCIENCE (CIVIL ENGINEERING)

ECV 306: TRANSPORTATION PLANNING AND DEVELOPMENT

DATE: 9/8/2021

TIME: 8.30-10.30 AM

## INSTRUCTIONS

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

## QUESTION ONE (30 MARKS)

- 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)

| <b>Table 2:</b> 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 (20 MARKS)

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

### QUESTION THREE (20 MARKS)

Transport needs in Kenya are very dynamic. Using relevant illustrations and examples discuss the following transport system as constituted currently.

- a) Public Transport (10 marks)
- b) Private Transport (10 marks)

#### QUESTION FOUR (20 MARKS)

- a) Discuss any **FOUR** major financiers of LAPSET projects being undertaken in Kenya. (8 marks)
- 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 (20 MARKS)**

- 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)