2503/204
2509/204
ENGINEERING DRAWING
AND DESIGN
Oct./Nov. 2021
Time: 3 hours

THE KENYA NATIONAL EXAMINATIONS COUNCIL

DIPLOMA IN AUTOMOTIVE ENGINEERING
DIPLOMA IN MECHANICAL ENGINEERING
(CONSTRUCTION PLANT OPTION)

MODULE II

ENGINEERING DRAWING AND DESIGN

3 hours

INSTRUCTIONS TO CANDIDATES

You should have for the examination:
- *Answer booklet*
- *Drawing instruments*
- *Drawing papers*
- *Drawing board/table*
- *Non-programmable calculator*

*This paper consists of **TWO** sections **A** and **B**.*
*Answer question **ONE** in section **A** (Compulsory) and any other **THREE** questions from section **B**.*
All questions carry equal marks.
Candidates should answer the questions in English.

This paper consists of 5 printed pages.
Candidates should check the question paper to ascertain that
all the pages are printed as indicated and that no questions are missing.

Turn over

SECTION A

Answer ALL questions in this section (Compulsory)

1. Figure 1 shows the parts of a trolley wheel assembly. Using an M 14 x 100 mm bolt, nut and plain washer, assemble the given parts and draw full size in FIRST ANGLE projection the following views of the assembly.

(a) a front elevation along section A - A;

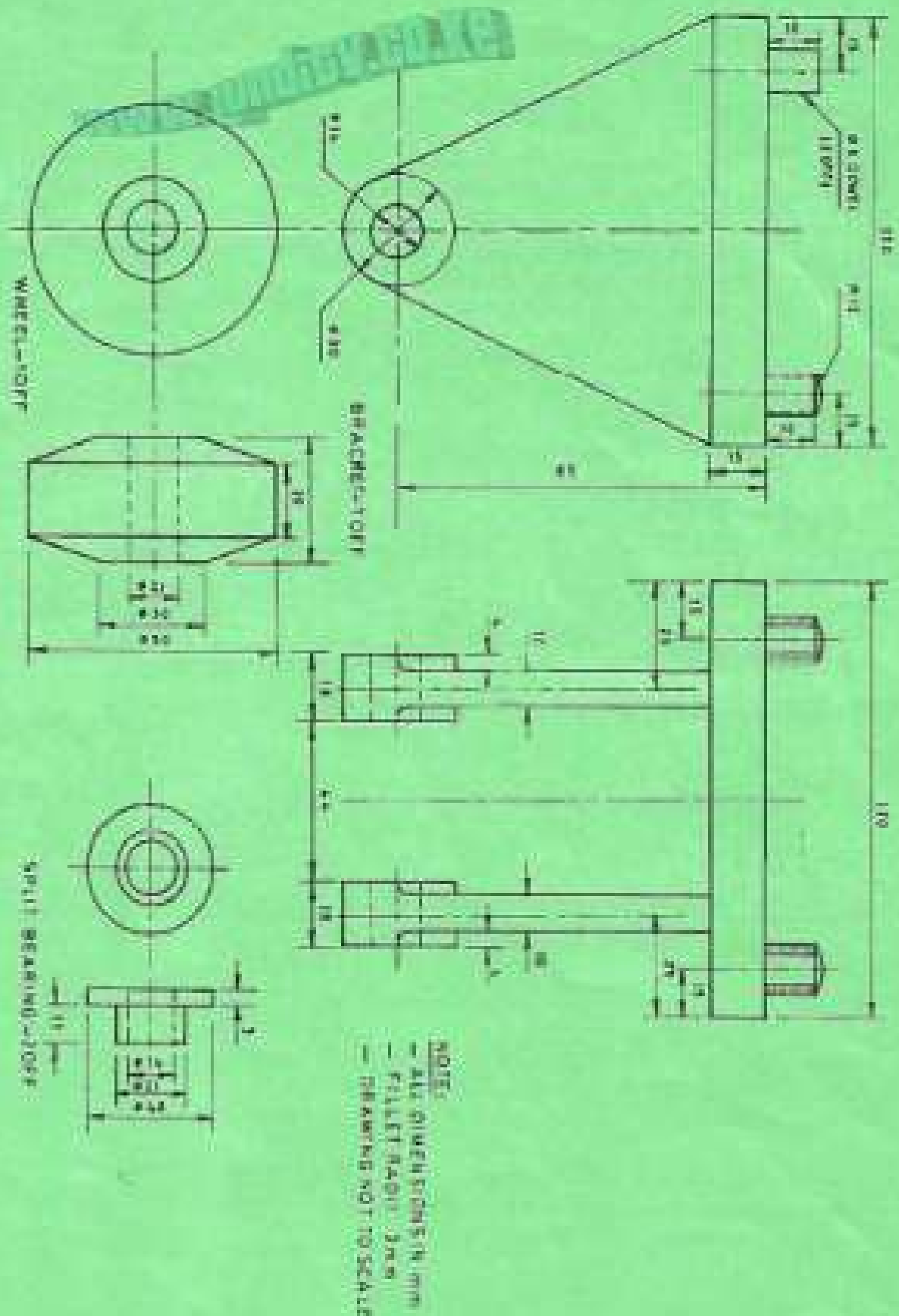
(b) an end elevation;

(c) a complete plan.

Include:

(i) six major dimensions;
(ii) projection symbol;
(iii) all hidden details.

All dimensions are in millimetres. (40 marks)


WHEEL-1OFF
BRACKET-1OFF
SPLIT BEARING-2OFF
NOTE:
- ALL DIMENSIONS IN mm
- FILLET RADII 3mm
- DRAWING NOT TO SCALE

SECTION B

*Answer **THREE** questions from this section.*

2. (a) State:

(i) **five** steps of design;
(ii) **four** factors to consider in designing a component.

(9 marks)

(b) Illustrate the following:

(i) detailed metric screw thread and show two parts of the thread;
(ii) cap nut;
(iii) spring washer;
(iv) eye bolt.

(11 marks)

3. (a) Illustrate the following types of bearings:

(i) footstep;
(ii) journal;
(iii) hook;
(iv) pen shell.

(8 marks)

(b) Illustrate the following fits and state **two** applications of each in the vehicle:

(i) interference;
(ii) clearance;
(iii) transition.

(12 marks)

4. Construct the cam profile and the displacement diagram of a radial cam that imparts the following motion to an offset roller follower:

0° - 120° rise of 40 mm with simple harmonic motion
120° - 150° dwell
150° - 180° rise of 24 mm with uniform velocity
180° - 210° dwell
210° - 360° fall of 64 mm with uniform acceleration and retardation

The roller follower is 20 mm in diameter.
The direction of rotation of the cam is clock wise and the nearest approach of roller center to cam centre is 64 mm.

(20 marks)

5. Construct two teeth of a gear wheel in mesh with three teeth of a pinion given the following data:

Number of teeth on gear wheel	= 24
Number of teeth on pinion gear	= 16
Module	= 8
Pressure angle	= 20°

(20 marks)

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