



**MASINDE MULIRO UNIVERSITY OF  
SCIENCE AND TECHNOLOGY  
(MMUST)**

**MAIN CAMPUS**

**UNIVERSITY EXAMINATIONS  
2021 / 2022 ACADEMIC YEAR**

**SPECIAL / SUPPLEMENTARY EXAMINATION**

**FOR THE DEGREE  
OF  
BACHELOR OF SCIENCE IN BUILDING TECHNOLOGY  
(THIRD YEAR)**

**COURSE CODE: BTB 321**

**COURSE TITLE: CONSTRUCTION PLANT & EQUIPMENT**

**DATE: 27 JULY 2022**

**TIME: 2PM - 4PM**

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**INSTRUCTIONS:**

- 1. This paper contains FOUR questions**
- 2. QUESTION ONE IS COMPULSORY**
- 3. Attempt any TWO questions from the remaining.**
- 4. Question ONE carries 30 marks and the REST 20 marks each.**
- 5. Examination duration is 2 (TWO) HOURS**

MMUST observes ZERO tolerance to examination cheating

This Paper Consists of 3 Printed Pages. Please Turn Over.

**QUESTION ONE** **(30Marks)**

- a) Name the various site clearing functions carried out on labour – based road works and give one example of hand tool used for each type of clearing ( 8 Marks)
- b) Briefly discuss the components of an equipment Operating costs ( 10 Marks)
- c) A Grader will be purchased for a cost of Kshs. twenty million. After a useful life of 5 years, it is assumed the equipment will be sold for Kshs. five million. Assume interest of 8% for borrowing money, 4% for risk and 2% for taxes, insurance and storage. Calculate the annual ownership cost and the ownership cost per hour assuming the equipment will be used for 1800 hr/year ( 12 Marks)

**QUESTION TWO** **(20Marks)**

- a) Explain the reasons for using construction plant and equipment in the Construction Industry **(6 Marks)**
- b) State the demerits of Hiring Mechanical Plants **(4 Marks)**
- c) Discuss the advantages of the use of machinery in construction industry **(10 Marks)**

**QUESTION THREE** **(20Marks)**

- a) List the most common excavators used in the construction industry **(5 Marks)**
- b) Discuss the application of Bulldozers in the construction industry **(5 Marks)**
- c) Enumerate and briefly explain the uses of the various compacting equipment in construction industry **(10 Marks)**

**QUESTION FOUR** **(20Marks)**

- a) Find the expected production in loose cubic metres ( $Lm^3$ ) per hour of a  $2.8 m^3$  hydraulic shovel equipped with a front-dump bucket. The material is common earth with a bucket fill factor of 1.0. The average angle of swing is  $90^\circ$  and job efficiency is 75%. **(5 Marks)**

Production for hydraulic shovels may be estimated using Equation 1 and table 1 below, which has been prepared from manufacturer’s data.

Production (L m<sup>3</sup>/h) = C\*S\*V\*B\*E -----Equation 1

Where,

C = cycles/hr; S = swing factor; V = heaped bucket volume ( Lm<sup>3</sup>); B = bucket fill factor and E = Job efficiency.

**Table 1: Standard cycles per hour for Hydraulic Shovels**

MACHINE SIZE						
	Small under 3.8 m <sup>3</sup>		Medium 3.8 – 7.6 m <sup>3</sup>		Large over 7.6m <sup>3</sup>	
Soil Type	Bottom Dump	Front Dump	Bottom Dump	Front Dump	Bottom Dump	Front Dump
Soft(sand, gravel, coal)	190	170	180	160	150	135
Average( common earth, soft clay, well blasted rock)	170	150	160	145	145	130
Hard( tough clay, poorly blasted rock)	150	135	140	130	135	125
<b>ADJUSTMENT FOR SWING ANGLE</b>						
Angle of Swing (degrees)						
	45	60	75	90	120	180
Adjustment factor	1.16	1.10	1.05	1.00	0.94	0.83

- b) If the truck capacity is 15Lm<sup>3</sup> and truck cycle time, excluding loading is 30 minutes; calculate number of trucks theoretically required to cope up with the shovel production in (a) above and the expected production of the shovel if two trucks are removed from the fleet. **(8 Marks)**
- c) Discuss the Asphalt Mixing Plant equipment and its uses in the construction industry. **(7 Marks)**