NATIONAL BUSINESS AND TECHNICAL EXAMINATION BOARD
NATIONAL TECHNICAL CERTIFICATE EXAMINATION
MECHANICAL ENGINEERING CRAFT
PRACTICE

PAPER CODE 061-1

QUESTION 1(a)

State the essential safety precautions that must be taken when using an off hand grinding machine.

ANSWER

THREE essential safety precautions that must be taken when using an off-hand grinding machine

(i) The grinding wheel must be tested for cracks before using it in order to avoid possible busting of the wheel during operation
(ii) The wheel must be rigidly held in the machine spindle
(iii) Correct surface speed must be applied: in order to enable the wheel to cut effectively.
(iv) The operator must wear face goggles while grinding.

QUESTION 1(b)

Mention the main parts of the off-hand grinding machine.

ANSWER

Main parts of off-hand grinding machine Base.

- Grey Cast Iron body
- Spindle for holding the abrasive wheel
- Abrasive Wheel
- Tool Rest
- Paper Washers and flanges for holding the wheel in position.

QUESTION 2(a)

Outline FOUR functions of a slotting machine.

ANSWER

FOUR Functions of a slotting machine

(i) Machining of keyways
(ii) Machining of splines in holes
(iii) Machining of internal serrations
(iv) Used for circular work using rotary

(v) QUESTION 2(b)

Differentiate between slotting and shaping machine cutting tools.

ANSWER

(i) The slotting tool is supported and moves relative to the work and, cut parallels with its shank. It is a single point cutting tool with the point modified to resemble a half round chisel.

(ii) The shaping machine tool is similar to that of slotting machine but with a robust shank to withstand the increased cutting force during operation. The tool can be of swan-neck or cranked tool.

QUESTION 3(a)

State FIVE safety precautions on milling machine.

ANSWER

Five safety precaution on a milling machine

(i) Tool should rigidly held in the arbor

(ii) The arbor must be supported with arbor supporting bracket

(iii) Work must be rigidly held in the machine vice

(iv) Over hanging of the tool must be avoided

(v) Do not take measure while the machine is in operation

(vi) When holding job directly on the machine table, parallel, tee bolts washes, nuts and clamps must be tightened very well.

(vii) QUESTION 3(b)

Name FIVE different cutters and state their uses.

ANSWER

CUTTERS	**USES**
Slab Cutters	To produce plain surfaces
Convex Cutters	To produce concave surfaces
Concave Cutters	To produce convex surfaces
Slotting Cutters	To produce slots; keyways
Divel Cutters	To produce dovetail guides
Involutes Gear Cutters	For machining gears
Wood ruff Cutters	For machining woodruff keyways
Tee slot Cutters	For cutting Tee slots on milling machine tables to accommodate tee bolts

QUESTION 3(c)

List FOUR common features of a milling machine.

ANSWER

FOUR common features of a milling machine

(i) The column
(ii) The over arm
(iii) Arbor and Arbor support
(iv) Spindle
(v) Machine Table
(vi) Machine Vice

QUESTION 4(a)

Find the cutting speed of a drilling machine used to drill a hole of 150mm diameter with a machine speed of 250rev/min and the height of the machine bench is 350mm.

ANSWER

Diameter (D) = 150mm
Speed = 250rev/min = N
Cutting speed = m/min = S

Formula Cutting Speed $= \frac{\pi DN}{1000} = S$

Cutting Speed(S) $= \frac{3.14 \times 150 \times 250 m/min}{1000}$

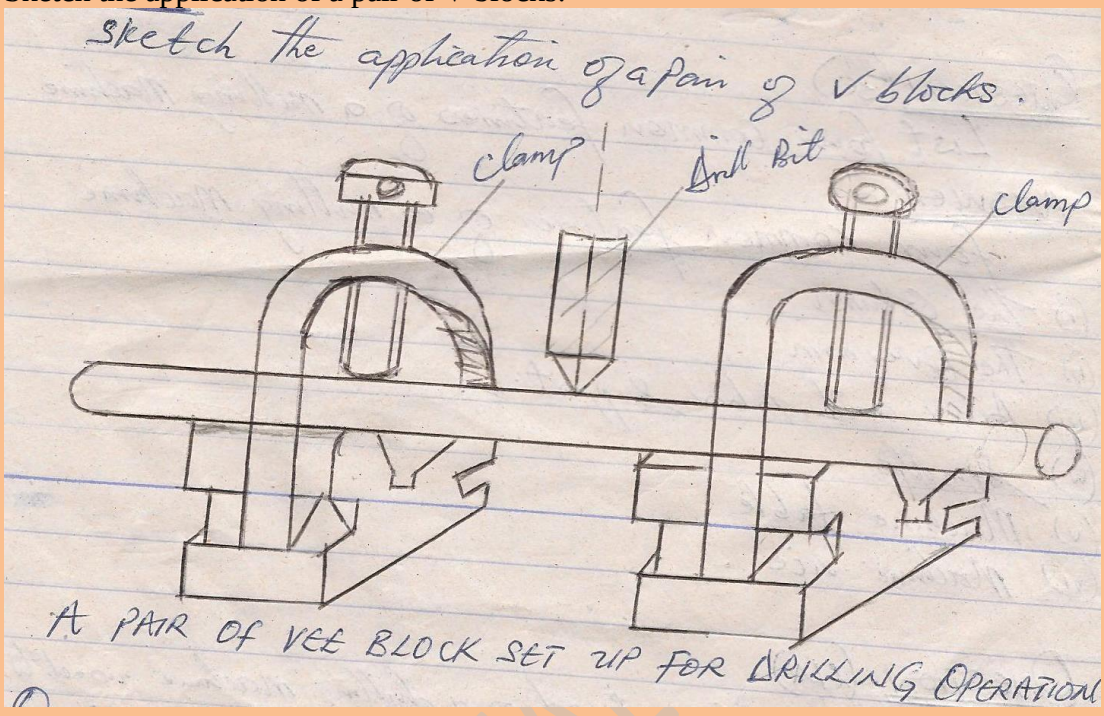
$= \frac{3.14 \times 3 \times 25 m/min}{2}$

$= \frac{235.50 m/min}{2}$

= **117.7m/min**

QUESTION 4(b)

Sketch the application of a pair of V blocks.



QUESTION 5(a)

What is a blind hole?

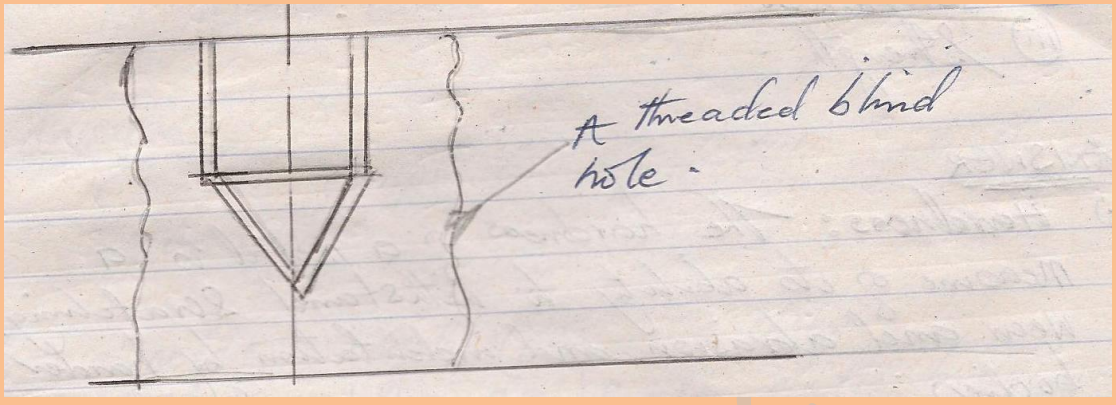
ANSWER

(a) A blind hole is a hole which is not drilled through a component

QUESTION 5(b)

Show by means of a sketch, how a threaded blind hole is?

ANSWER



QUESTION 6(a)

Explain the following phrases in relation to machining process.

(i) cutting

(ii) cutting feed

ANSWER

(i) Cutting – the process of removing metal (swarf or chips) from the parent metal with the help of cutting tool i.e. on the centre lathe or slotting machine.

(ii) Cutting Feed – This is the rate at which the tool is fed into the work. This depends upon various factors. A high rate of feed will produce a course and rough surface and will get the job done in less time while a slower rate will produce a fine finish with longer time.

QUESTION (6b)

What is meant by the following properties of metal?

(i) Hardness

(ii) Toughness

(iii) Strength

ANSWER

(i) **Hardness**: The hardness of a metal is a measure of its ability to withstand scratching, wear and abrasion and indentation by harder bodies

(ii) **Toughness**: This is the amount of energy a material can absorb before it fractures.

(iii) **Strength:** the strength of a metal is its ability to resist the application of force without rupture i.e. tensile, compressive and shear forces.

QUESTION (7a)

Differentiate normalizing process from annealing process

ANSWER

Normalizing is the process of refining the structure of steel and remove stains which might have been caused by cold working

Annealing is the process of heating the metal to a certain temperature and allows it to cool. This will make the metal easy to machine and also relieve the internal stress which might have been caused by working the metal or by unequal contraction in casting.

QUESTION (7b)

Name the carbon composition and application of the following steel:

(i) Mild steel.

(ii) Medium carbon steel.

ANSWER

Carbon composition and their application.

S/N	METAL	CARBON (%)	USES
1	Mild Steel	0.15-0.3	Boiler plates, bridge work structure sections, drop forgings, general workshop purposes
2	Medium carbon Steel	0.3 to 0.5 0.5 to 0.7	Axels, drop forgings high tensile tubes wire, agricultural tools Springs, locomotive tyres large forging dies wire ropes, hammers and snaps for riveting.