Tertiary & Vocational Education Commission

Production Technology

Model paper for NCT equivalence Examination

Answer all questions

Question No 01

1. A manufacturing organization engage in production of screws has a continuous order to produce 2000 numbers of full thread bolts per batch, from milled steel. Specification of the bolt is given as M20X100 mm.
    a. State the alternative methods which can be used to manufacture the bolts (04 Marks)
    b. Compare the above methods in terms of quality, cost & time of manufacture to select the best method. (06 Marks)
    c. State the machines required to execute the production from selected method mentioned above. (04 Marks)
    d. Briefly explain the production process of bolts in each machine stated above, based on the sequence of operation. (06 Marks)

Question No 02

a. Explain the cutting angles of single point cutting tool with the aid of suitable sketches (05 Marks)

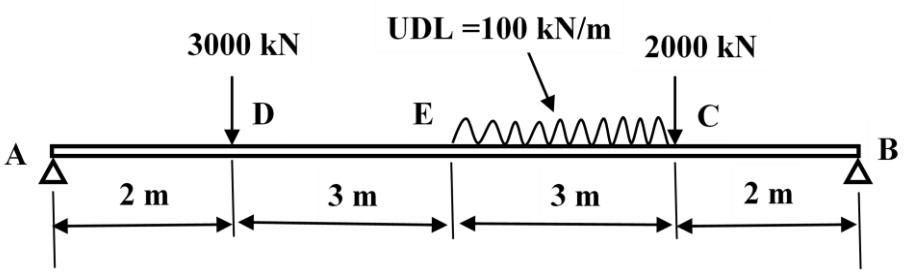
b. A single point cutting tool is use to rough parallel turning operation of an aluminum alloy round bar with a 12 mm diameter and 1.0 m length. The expected outside diameter of the bar after rough turning operation is 10 mm and the desired feed rate for the machining process is 2 mm/rev. Maximum allowable cutting speed for the cemented carbide tool and the high speed steel tool are 7 m/s & 4 m/s respectively. Compare the machining time for rough cut with above tools. (07 Marks)

c. Explain the difference between the peripheral & face milling with appropriate diagrams (04 Marks)

d. State the applications of peripheral & face milling. (04 Marks)

Question No 03

a. The simply supported beam "AB" shown in the figure bellow subjected the point loads of 3000 kN & 2000 kN on "A" & "B" respectively. The section "EC" is subjected to a uniformly distributed load of 100 kN/m.

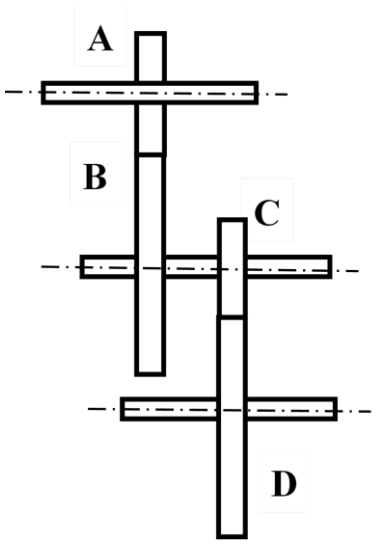


i. Calculate the shear forces and bending moments acting on the beam.

ii. Draw the sear force and bending moment diagram by selecting a suitable scale.

(12 Marks)

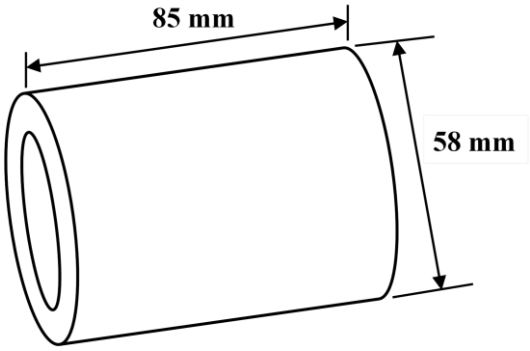
b. A compound gear train used to transfer the power to the leads screw in a lathe machine show bellow. Number of teeth in the gears A, B, C, & D are 20, 40, 12 & 36 respectively. The input power and the drive speed of the wheel "A" are 2.5kW and 1500 rpm respectively. If the mechanical efficiency of each gear pair is 95%, calculate the speed and the torque of the output gear "D".



(08 Marks)

Question No 04

A hollo cylindrical casting made from brass show in the figure bellow having the uniform thickness of 10 mm. This casting is used to manufacture of plain bearing with the inner and outer diameters are $50.00^{+0.03}_{-0.02}$ mm & $30.00^{+0.05}_{-0.03}$ mm respectively. Length of the bearing is $80.00^{+0.02}_{-0.02}$ mm.



a. State the casting defects which can be expected in the above casting. (05 Marks)
b. Calculate the solid material volume of the casting. (03 Marks)
c. Calculate the material volume to be removed to manufacture the plain bearing by using this casting. (03 Marks)
d. State any two measuring instruments can be used to obtain each of the measurements mentioned above, with their least count. (04 Marks)
e. Briefly explain the types of errors can be take place when taking the above measurements. (05 Marks)

Question No 05

a. A solid disc flywheel in a press machine has a diameter of 400mm and a mass of 18kg. Find;
   i. The moment of inertia of flywheel along the axis of rotation.
   ii. The kinetic energy stored in the flywheel when rotating at 1050 rev/min.
   iii. Tangential velocity of a point in the outer surface of the solid disc when the flywheel rotates with above rotating speed.

(10 Marks)

b. A single phase, 240 V, 50 Hz electric motor is used to drive the Flywheel of the above machine with the aid of gear train. Output power and the power factor of the electric motor are 3kW & 0.80 respectively. Calculate,

i. Input power of the motor

ii. Current passing through the electric motor

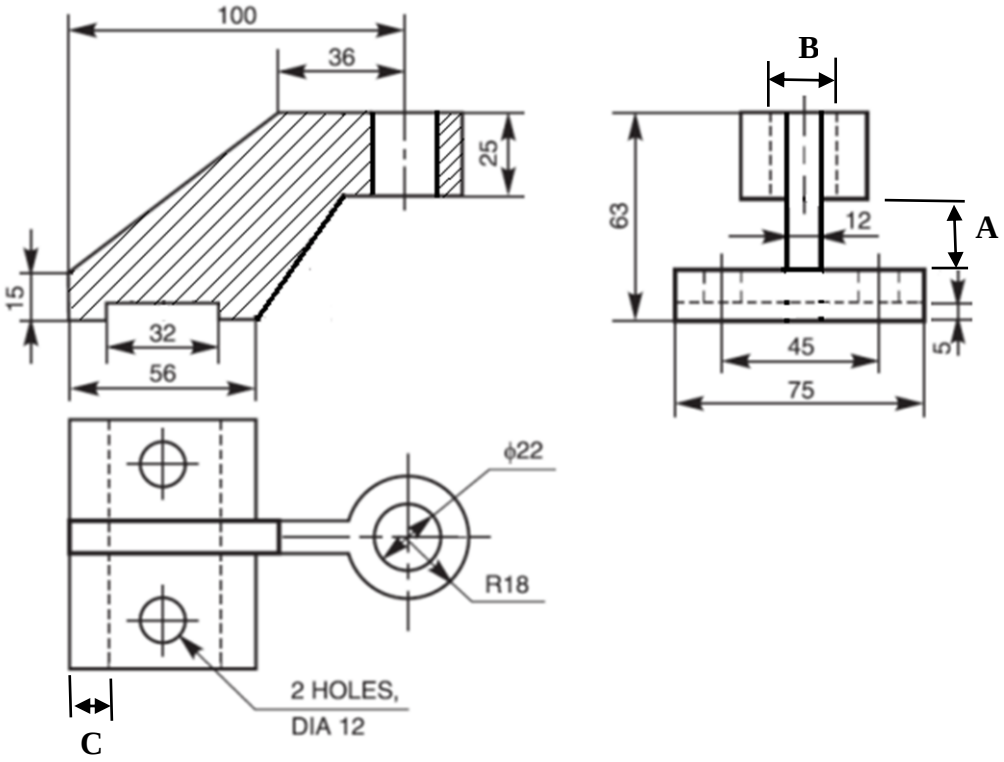
(06 Marks)

c. What is transformer, briefly explain the application of transformers in electrical circuits

(04 Marks)

Question No 06

a. Answer the following questions by interpreting the drawing bellow



i. Find the values of detentions "A, B, & C". (03 Marks)

ii. What are meat by ϕ22 and R18. (02 Marks)

iii. State the depth of diameter 12 mm holes. (01 Marks)

iv. Calculate the total length of the object. (01 Marks)

v. Draw a 3D sketch of the object shown in the drawing. (05 Marks)

b. Shaft and hole size of an engineering fit is defined as follows

Shaft $30.000^{+0.010}_{-0.016}$ mm Hole $30.000^{+0.024}_{+0.012}$ mm

Calculate maximum and minimum tolerances for the shaft and hole. Hence, state the type of fit use for the above engineering fit.

(08 Marks)

Question No 07

a. Differentiate $y = \frac{(2x+3)^2}{x}$ with respect to x. (04 Marks)

b. Determine $\int (5 + \frac{2}{5x} + 6x^3)\, dx$ (04 Marks)

c. Briefly explain **any three** of the following

i. Truing and Dressing of grinding wheel (04 Marks)

ii. Hand forging (04 Marks)

iii. Injection molding and blow molding (04 Marks)

iv. Duties and responsibilities of safety officer (04 Marks)

v. Causes of industrial accidents (04 Marks)

Question No 08

A tile manufacturing plant engage in production of flow tiles with variety of products from deferent colour, print, size and surface finish etc. The factory is operating 24 hrs. to get the **continuous production** while some areas are operating two shifts.

a. Proposed a suitable type of layout for the production plant. (02 Marks)

b. Briefly explain the proposed layout with appropriate diagram. (06 Marks)

c. What type of quality control procedure should be adapted to ensure the quality of tiles? Briefly explain. (06 Marks)

d. How do you communicate this quality assurance procedure to your subordinates? Explain with examples, (06 Marks)

Question No 09

A Company Produces the **few variety** of cosmetics products based on the customer demand. From the experience of last two years they realize that the demand for the product is fluctuating time to time without any trend.

a. Explain suitable methods to quantify the demand for the products, two weeks in advance. (4 Marks)
b. How do you face for this fluctuating demand while assuring the customer need and the survival of business? (6 Marks)

c. How do you motivate your subordinates to achieve the production targets? (5 Marks)
d. What type of employees can be acquired to the plant to meet the fluctuating demand? (05 Marks)

Question No 10

a. Briefly explain the manual metallic arc welding process with suitable sketches (03 Marks)
b. Briefly explain the arc welding defect with suitable sketches (05 Marks)
c. Explain the destructive and nondestructive tests use to find out the welding defects? (04 Marks)
d. Classify the types of maintenance. (03 Marks)
e. How these types of maintenance are applying for plant maintenance, briefly explain with example? (05 Marks)

Question No 11

The **predecessor** and **duration** for the activities in a project are given in the table below.

Activity	Description	predecessor	Duration (days)
A	Product design	-	5
B	Market research	-	2
C	Product analysis	A	2
D	Product model	A	3
E	Sales broacher	A	2
F	Cost analysis	C	3
G	Product testing	D	4
H	Sales training	B, E	2
I	Pricing	H	1
J	Project report	F, G, I	1

a. Draw the network diagram for the project (06 Marks)

b. Find the earliest and latest possible time for each activity (05 Marks)

c. Find the slack for each node (04 Marks)

d. Hence, find the critical path (05 Marks)

Question No 12

a. Two parallel shafts are to be connected by the suitable cross belt drive with pulleys of 240 mm and 450 mm diameters. Determined the required length of flat belt, if the center distance is 2.5 m. (08 Marks)

b. Calculate the power which can be transmitted by the above belt drive, when the large pulley rotates at 200 rpm and the maximum permissible tension of the belt is 2 kN. Assume, coefficient of friction between belt and each pulley is 0.30 (06 Marks)

c. Briefly describe the factors affecting for selection of bearings (06 Marks)

Question No 13

a. State the methods of surface finish measurement. Briefly explain ay three of them.

(08 Marks)

b. Hundred (100) pieces of soap are taken as the random samples from a production process and weight of each piece is measured in grams. The frequency distribution for pieces of soap is given in the table below.

Class interval	Frequency
117.5 – 120.5	3
120.5 – 123.5	5
123.5 – 126.5	10
126.5 – 129.5	19
129.5 – 132.5	30
132.5 – 135.5	18
135.5 – 138.5	8
138.5 – 141.5	5
141.5 – 144.5	2

Find, arithmetic mean weight of a peace of soap sample and the standard deviation.

(12 Marks)

Question No 14

Briefly explain any **five** of the following

a. Group technology (04 Marks)

b. Importance of improving Productivity (04 Marks)

c. Properties of lubricants (04 Marks)

d. Material handling equipment in production plant (04 Marks)

e. SWOT analysis (04 Marks)

f. QMS and MIS (04 Marks)

g. CAD and CAM (04 Marks)