B.TECH/ME/6TH SEM/MECH 3202/2017

(b) Define Machinability of a work material. Discuss on the major factors affecting Machinability.

8 + 4 = 12

- 9. (a) Write down Taylor's Tool Life equation explaining the different variables and constants used. Determine the values of constant 'C' and the exponent 'n' of the Taylor's tool life equation for a cutting condition, if the life of the tool increases from 30 min to 60 min due to reduction in cutting velocity from 200 m/min to 160 m/min.
 - (b) What are NC and CNC Machine tools. State the advantages of such Machine tools over conventional ones.

(4+4)+4=12

B.TECH/ME/6TH SEM/MECH 3202/2017

MACHINING PRINCIPLE AND MACHINE TOOLS (MECH 3202)

Time Allotted : 3 hrs

Full Marks: 70

Figures out of the right margin indicate full marks.

Candidates are required to answer Group A and <u>any 5 (five)</u> from Group B to E, taking <u>at least one</u> from each group.

Candidates are required to give answer in their own words as far as practicable.

Group – A (Multiple Choice Type Questions)

1. Choose the correct alternative for the following:

 $10 \times 1 = 10$

- (i) Under the same condition of turning, the cutting force can be reduced by increasing the cutting tool's,
 (a) Clearance angle
 (b) Rake angle
 (c) Nose radius
 (d) Principal cutting edge angle.
- (ii) Orthogonal plane of a single-point tool is normal (or perpendicular) to the tool's
 - (a) Principal cutting edge
 - (b) Normal plane and reference plane
 - (c) Cutting plane and reference plane
 - (d) Rake surface and normal plane
- (iii) The tool angle that causes oblique cutting is (a) rake angle (b) clearance angle

(u)	rune ungie
(c)	inclination angle

(b) clearance angle(d) side cutting edge angle.

- (iv) The component of cutting force which is used to evaluate the cutting power consumption in straight turning is
 - (a) Axial component
 - (b) Radial or transverse component
 - (c) Tangential component
 - (d) none of the above.
- (v) If, in any machining, the value of chip reduction co-efficient becomes equal to 2.0 then the ratio of chip velocity to cutting velocity will be very close to

(a) 0.1	(b) 0.5	(c) 2.0	(d) 4.0.

MECH 3202

MECH 3202

1

B.TECH/ME/6TH SEM/MECH 3202/2017

- (vi) The maximum amount of heat that is generated at the cutting zone during machining goes to (a) cutting tool (b) workpiece (c) chip (d) none of these.
- (vii) In Lathe, the Generatrix is provided in the form of a circle and its diameter gradually decreases in
 - (a) straight turning (c) grooving

- (b) internal turning (d) facing.
- (viii) Formation of Built up edge in machining

(a) Raises magnitude of cutting forces	(b) Reduces tool life
(c) Increases surface roughness	(d) All of the above.

- Slotted arm oscillating mechanism is used for transforming rotation (ix) into linear motion in (b) Shaping machine
 - (a) Broaching machine
 - (c) Planning machine
- (d) Gear shaping machine.
- Use of CNC machine tools is not justified for (x)

(a) Piece production	(b) Batch production
(c) Small lot production	(d) Mass production.

Group – B

- 2. How is the geometry of single-point cutting tool designated in ASA (a) system and ORS system?
 - With the help of a suitable diagram derive the expression: (b) $tan\beta = \frac{rcosy}{1 - rsiny}$, where r is the cutting ratio, β is the shear angle and γ is the tool rake angle.

6 + 6 = 12

- Determine the values of φ , γ_0 , λ of a tuning tool whose geometry is 3. (a) specified in ASA system as 8° , 11° , 7° , 8° , 25° , 30° , 0 (inch), where φ is the principal cutting edge angle, γ_0 is the orthogonal rake angle and λ is the inclination angle.
 - (b)Describe briefly with the help of suitable diagram the basic principle or mechanism of chip formation in machining ductile metals.

6 + 6 = 12

Group – C

Draw the Merchant circle diagram of forces and deduce the following relations, 4. (a)

2

B.TECH/ME/6TH SEM/MECH 3202/2017

 $F = P_z Sin \gamma_0 + P_{xy} Cos \gamma_0$ and $N = P_z Cos \gamma_0 - P_{xy} Sin \gamma_0$. Where F & N are friction and normal force acting at the chip-tool interface P_z & P_{xy} are the component of forces acting on the tool in the orthogonal plane γ_0 = orthogonal rake angle.

In orthogonal turning of a steel bar of 150 mm diameter, at a speed of (b)560 rpm, feed of 0.32 mm/rev, by a tool of geometry 0°, -12°, 8°, 7°, 30°, 60°, 0.8 (mm), it was observed that $P_z = 1000$ N, and $P_{xy} = 400$ N and chip thickness $a_2 = 0.80$ mm. Determine the values of F, N, P_x , P_y and μ (symbols are as per convention).

6 + 6 = 12

- 5. (a) With a neat sketch explain how tool force can be measured by a strain gauge type turning dynamometer. Also show the electrical circuit for strain gauge connection.
 - Discuss on the causes and location of heat generation in machining. (b) Show with the help of a graph how cutting temperature varies with tool rake angle.

6 + 6 = 12

Group - D

- Briefly explain with the help of suitable diagrams the principle of 6. (a) production of flat surfaces and cylindrical surfaces with the help of Generatrix and Directrix.
 - State why GP (geometric progression) is preferred to AP (arithmetic (b)progression) for layout of spindle speeds in machine tools. 6 + 6 = 12
- 7. (a) Draw the Kinematic diagram of a Shaping Machine and label its major components.
 - Describe the process of Taper turning in a Centre lathe (without (b)attachment). Show how the same operation can be done using a taper turning attachment.

6 + (3 + 3) = 12

Group – E

8. (a) Design a speed changing gear box for a drilling machine requiring six spindle speeds with common ratio, $\Phi = 1.26 \ (\equiv 2^{1/3})$. The design should include (i) drawing the gearing diagram, (ii) Ray diagram, (iii) number of teeth of all the gears.

MECH 3202

MECH 3202