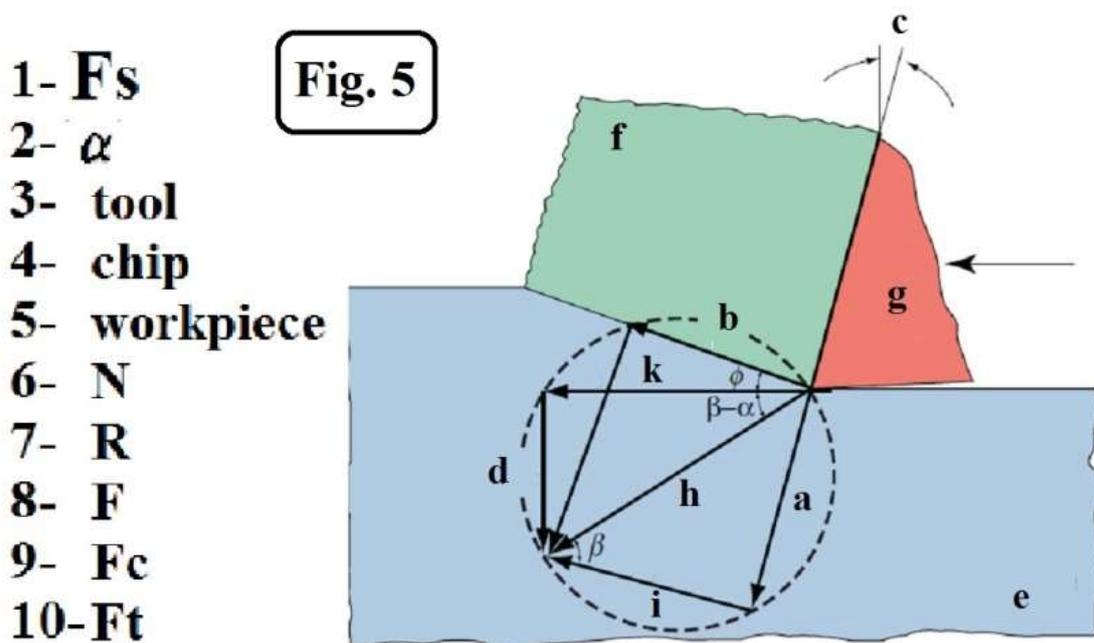
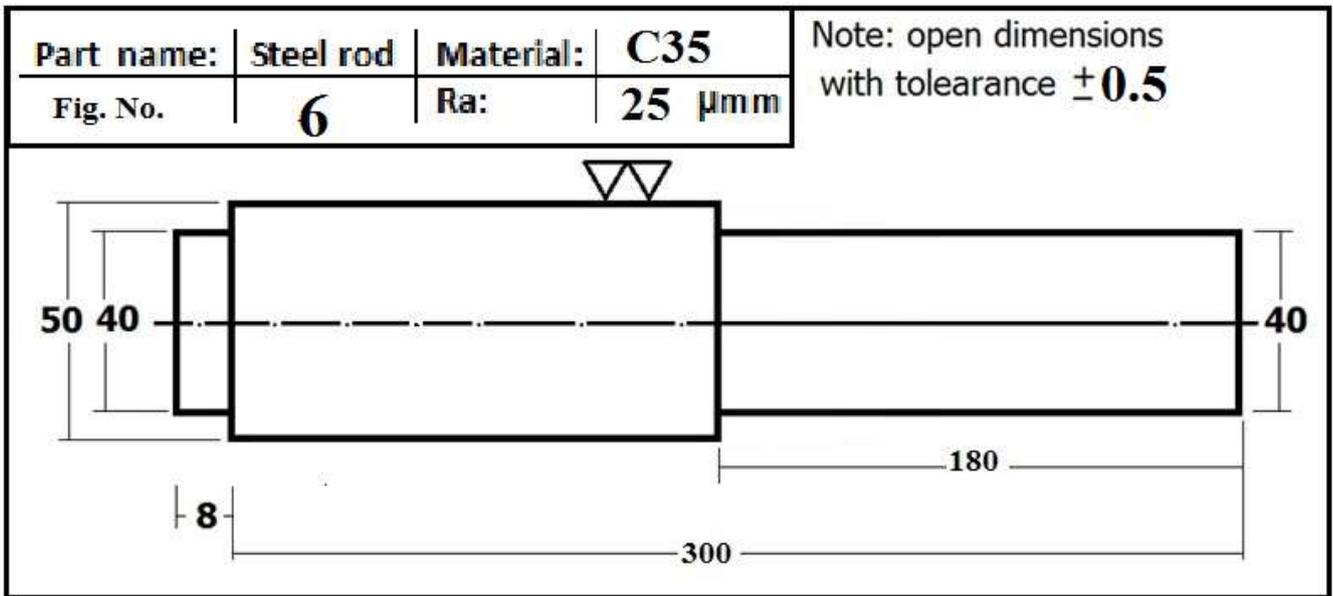


Q3-A: Write the number and right character for diagram shown in Fig. 5 (10 marks)



Q3- B: A 50mm diameter carbon steel rod, as raw material, is being reduced by turning on a lathe as shown in Fig. 6, the tool is carbide. Find the following: (15 marks)

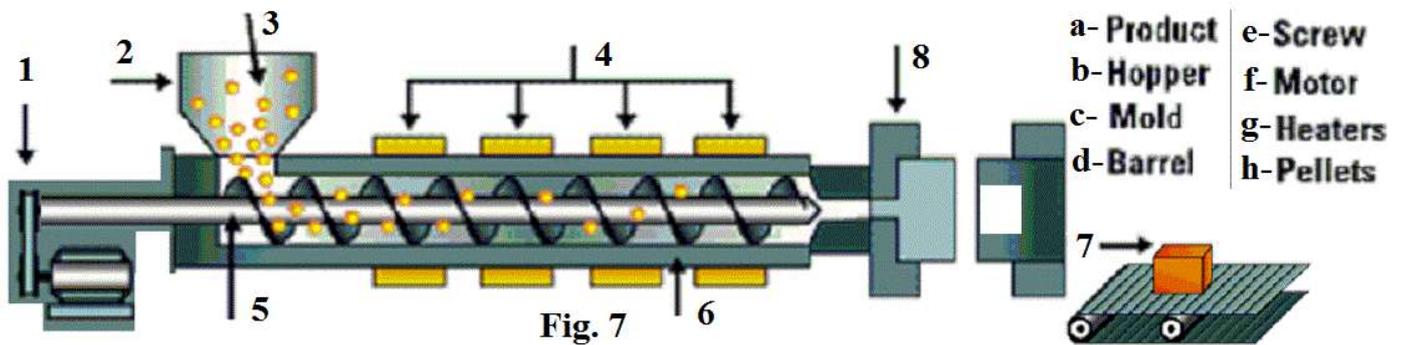
- (1) Optimal operating conditions; cutting speed, feed and depth from table 1.
- (2) The revolutions of spindle (RPM).
- (3) The material removal rate.
- (4) The required power of turning machine. (specific power =  $5 \text{ w.s/mm}^3$ )
- (5) The cutting force due to operation.



Q4-A Assume that tolerances of all dimensions of Fig. 3, are more than 1mm, than:

- (1) sketch the detail drawing of blank
- (2) sketch design of the mold for sand casting. ( 17 marks)

Q4-B: Write the number and right character for diagram shown in Fig. 7 ( 8 marks)

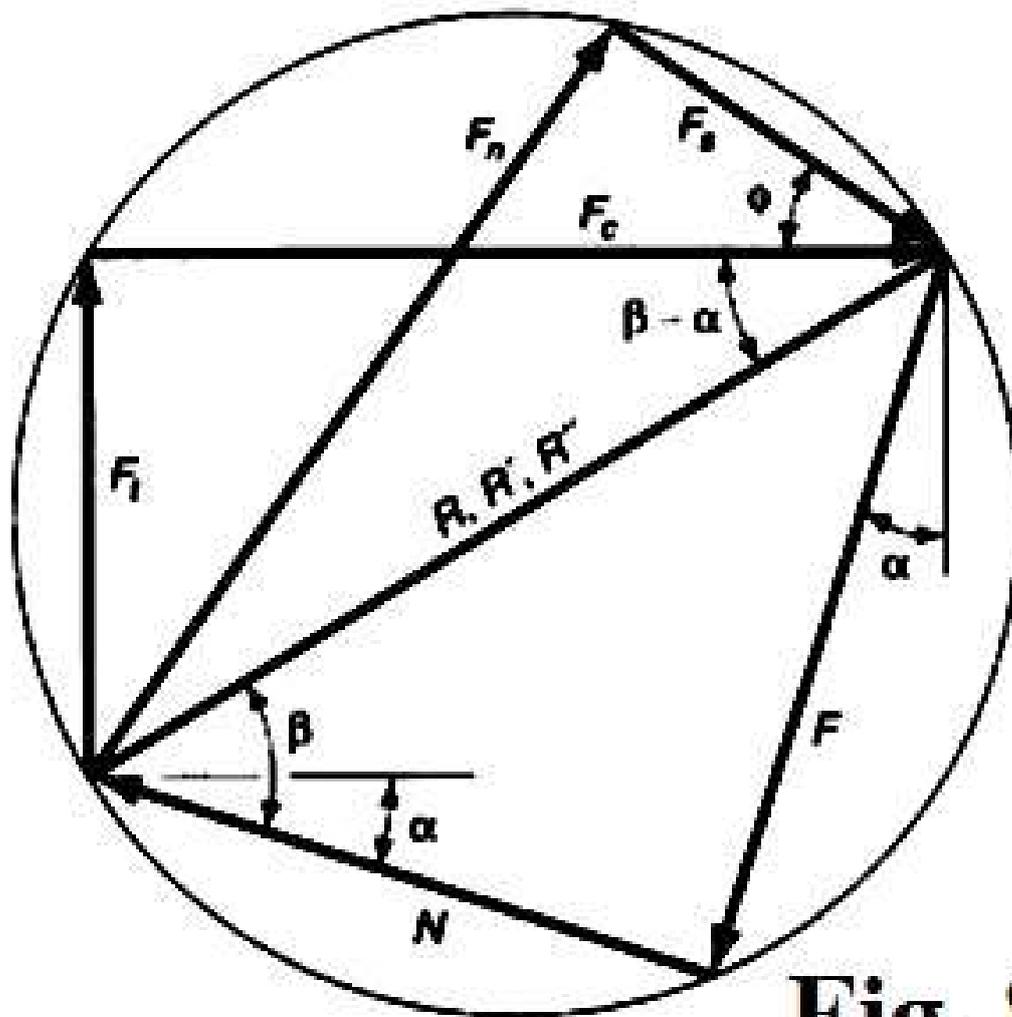


Q5-A: : In a machining operation, the cutting tool has a rake angle =  $7^\circ$ . The chip thickness before the cut  $t_0=0.50\text{mm}$  and the chip thickness after the cut  $t_c=1.125\text{mm}$ .

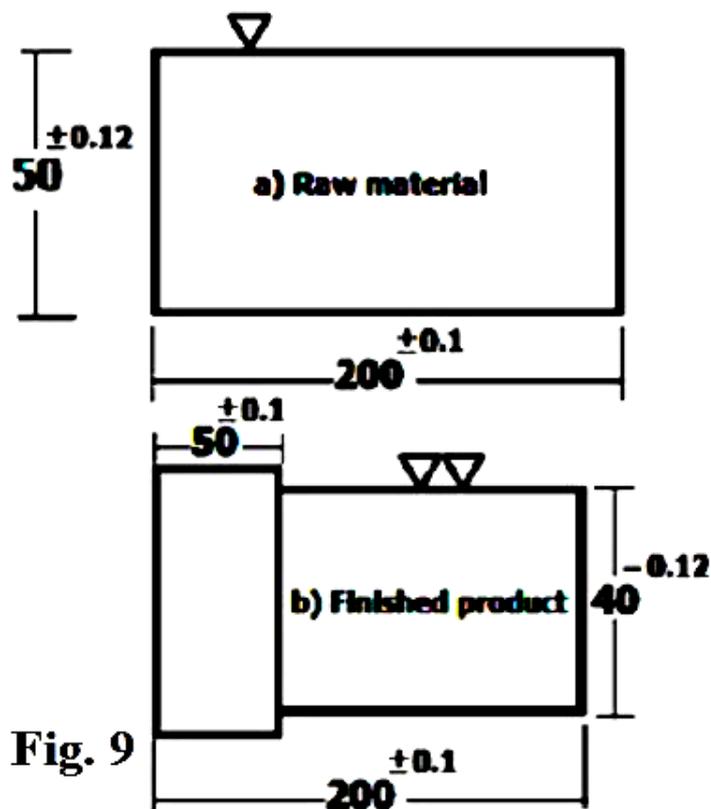
- (1) Calculate the shear plane angle and the shear strain.
- (2) determine the shear strength of the work material, if;  $F_c = 1559\text{ N}$ ,  $F_t = 1271\text{ N}$ , and  $w=3.0\text{mm}$ . HINT: The force diagram as shown in Fig. 8. (11 marks)

Q5-B: A: If in turning operation as a given in Fig. 9, the tool life decreases from 84 min to 21 min. due to increase in cutting velocity, VC from 50.5 m/min to 131.3 m/min., then at what cutting velocity the life of that tool under the same condition and environment will be 30 min.?

HINT: Taylor's tool life equation is:  $VT^n = C$  (8marks)



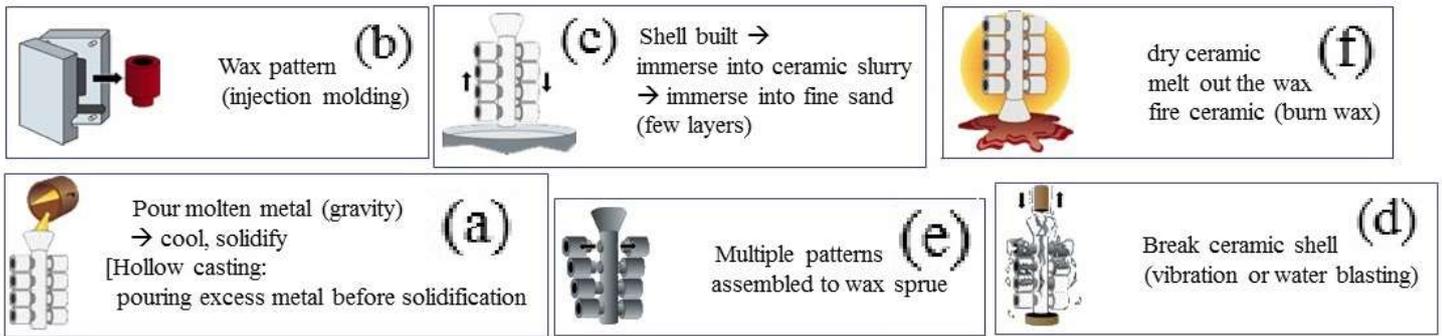
**Fig. 8**



**Fig. 9**

Q5-C: Operations of Investment casting (precision casting) as shown in following Figure, but with wrong sequences. Write number of the expression and State TRUE or FALSE.

(6marks)



- 1- b → c → d → e → f → a T OR F
- 2- b → a → f → e → d → c T OR F
- 3- b → e → c → f → a → d T OR F

- 4- d → a → e → b → f → c T OR F
- 5- a → b → c → d → e → f T OR F
- 6- c → d → a → b → f → e T OR F

**Table1:** Roughness ,Tolerance and Operating conditions

Ra micrometer μ m	Roughness Grade Numbers	Operation (Technical method)	Tolerance mm		Operating conditions		
			≤10mm	>10mm	depth mm	feed (mm/rev.)	speed (m/min)
> 70	~	Casting, Forging, sawing, flam cut.	± 0.5	± 1.0			
>50		Precision casting	± 0.3	± 0.7			
50 25 12.5	▽	Roughing (milling, turning , drilling)	± 0.1	± 0.2	3	0.3	50
6.3 3.2 1.6	▽▽	Finishing (milling, turning , drilling)	±0.07	± 0.1	1	0.1	100
0.8 0.4 0.2	▽▽▽	Grinding, Honing Broaching	± 0.01	± 0.02	0.2	0.05	130

**NOTE :** This virtual table is valid for this exam only For LOW CARBON STEEL and Operating conditions for milling, turning, drilling useful for carbide tool