MECHANICAL ENGINEERING DEPARTMENT
I.I.T. KANPUR
TA 201N
Second mid. Sem. Exam.

Max. Marks = 60
Time:11.00-12.10 PM
VKJ / smse / 04-05

NOTES:

(I) Answers should be brief and to-the-point, and be supplemented with neat sketches if necessary.
(II) Figures on the right-hand side within parentheses indicate full marks.
(III) Attempt the questions in the order they are given.
(IV) All the sketches should be drawn neatly and clearly readable.
(V) Start a new question from a new page.
(VI) All the abbreviations should be clearly stated what for they stand.

Q1

(i) Draw three orthographic views of a single point turning tool. Show all the six angles, and nose radius in these views. The tool is specified as 6, 10, 5, 7, 9, 11, 3mm [6]

(ii) Draw a three stage flank wear curve for HSS single point turning tool. Name the parameters of ordinate and abscissa, and also write their units. Take maximum permissible flank wear as 1.00 mm. Show its position on the curve. [3]

(iii) Draw a tool (single point) in cutting action, and show PSDZ and SSDZ. Also, show three sources of heat generation, different velocities applicable to this case, and shear plane angle in the figure. Write the *full forms of abbreviations*, if used. [5]

(iv) Draw a free body diagram of a chip formed during turning and show the various forces acting on it. Write the names of each force. [3]

(v) Choose the most appropriate answer: [3]

(a) Time taken to machine 2.5 cm of length of a shaft at 300 RPM at a feed rate of 0.25 mm/rev. will be: (a_1) 10 s, (a_2) 40 s, (a_3) 20 s, (a_4) 50 s.

(b) During cutting of M.S., chip thickness ratio will be: (b_1) >1, (b_2) <1, (b_3) =1.

(c) The continuos chip with BUE: (c_1) yields good surface finish, (c_2) yields poor surface finish, (c_3) has no effect on surface roughness.

Q2.

(i) Draw a time- temperature curve followed during the solidification of casting of aluminium which has been heated to 100^0 C above its melting point. Clearly indicate liquid zone, solidification zone, solid zone and allotropic transformation zone. Indicate location of 100^0 C superheat on the curve. [2]

(ii) Three pieces being cast have the same volume but different shapes as follows: (a) sphere, (b) cylinder with height equal to two times its diameter, (c) cuboid with three sides in the ratio of 1:1:2. Which piece will solidify first. [5]

(iii) An alloy consisting of two elements say iron and carbon, has been heated to the temperature T_f which is higher than its melting temperature. It cools down to room temperature. Its specific volume changes with time. Plot the relationship between time and specific volume. Clearly indicate ordinate, abscissa and the units of the parameters shown on these axes. Only correct shapes of the curves will enable full marks. Show the point T_f, melting temperature, solidification shrinkage, liquid shrinkage and solid shrinkage on the curve. [4]

(iv) Match the items of column B with column A (Ex. a-b,.. No partial grading) : [5]

(A)	**(B)**
(a_1) Quality of castings is affected	(b_1) increases cooling rate of the casting
(a_2) Riser	(b_2) equiaxed grains
(a_3) Absence of thermal gradient within the solidifying metal	(b_3) viscosity of the molten material
(a_4) Aluminium chill	(b_4) melting temperature of casting material
(a_5) Casting defect	(b_5) thermal properties of mold material
	(b_6) Blister
	(b_7) None of these

(v) Answer in brief. [4]

(a_1) Why the metal should be in red hot condition during forging?

(a_2) What is the primary criteria of selection of soldering material?

(a_3) How is porosity controlled in P/M fabricated parts.

(a_4) Why high carbon steel welds crack easily?

Q.3.

(i) A company uses 61 as prefix to indicate exact kind of abrasive and 32 as suffix to indicate its private marking. The grinding wheel uses rubber as the bonding material, dense structure (can be indicated as 5) and, SiC abrasive of medium size (30 mesh size). The wheel is of soft grade (take E as its symbol). Write its specifications as a standard practice. Write the names of two other types of bonding material and two other types of abrasives. [3.5]

(ii) Make a part of the grinding wheel and workpiece to show wheel's partial loading, chip being removed, active grain, inactive grain, bond material and porosity. [3]

(iii) If the grinding ratio is 50. What do you understand by this? Will you recommend high grinding ratio for grinding M.S. using SiC abrasive grinding wheel? [2]

(iv) Draw a neat sketch of centerless external cylindrical grinding and label its various elements showing the arrows of rotation / movement. [2.5]

(v) Differentiate between truing and dressing of a grinding wheel. Which material for a dressing tool will you use for Al_2O_3 grinding wheel? [3]

(vi) **(A)** [3]

Assertion (A): ECM can not be used for machining Al_2O_3.

Reason (R): Al_2O_3 is electrically conducting.

Choose the most appropriate answer:

(a_1) A and R both are correct, (a_2) A and R both are wrong, (a_3) A is correct but R is wrong, (a_4) A is wrong but R is correct.

(B)

Assertion (A): EDM produces a surface that gives better lubricating properties.

Reason (R): During EDM, sparking takes place between the electrodes, that creates craters on the machined surface, which retain the lubricant.

Choose the most appropriate answer.

(b_1) A and R both are correct, (b_2) A and R both are wrong, (b_3) A is correct but R is wrong, (b_4) A is wrong but R is correct.

(vii) Match the following. [3]

(A)	**(B)**
(a_1) Conventional machining	(b_1) Kerosene used as dielectric
(a_2) ECM	(b_2) used to make a turbine blade
(a_3) EDM	(b_3) CBN as a tool material
	(b_4) Not environment friendly
	(b_5) Evolution of H_2 during machining
	(b_6) Very low MRR

Good Luck