Code No: R1921034 **R19** SET - 1

**II B. Tech I Semester Regular Examinations, March - 2021**
**PRODUCTION TECHNOLOGY**
(Mechanical Engineering)

Time: 3 hours Max. Marks: 75

Answer any **FIVE** Questions each Question from each unit
All Questions carry **Equal** Marks
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|---|---|---|---|
| 1 | a) | Distinguish clearly between the following casting terms: Moulding sand, backing sand and facing sand | [8M] |
| | b) | Distinguish between liquid shrinkage and solid shrinkage as related to castings. Explain how these are taken care of in designing sand castings. | [7M] |

Or

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| 2 | a) | What is meant by core prints? Explain how they are to be provided. | [8M] |
| | b) | What is meant by double shrinkage allowance? | [7M] |
| 3 | a) | What are the essential conditions that are to be kept in mind while designing risers? | [8M] |
| | b) | Calculate the optimum pouring time for a casting whose mass is 20kg and having an average section thickness of 15mm. The materials of the casting are grey cast iron and steel. Take the fluidity of iron as 711.2mm. | [7M] |

Or

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| 4 | a) | True centrifugal casting process in horizontal configuration is to be used for casting a metallic cylinder with outside diameter 0.275 m and inside diameter 0.250 m. If G-factor (ratio of centrifugal force experienced by the rotating cast metal to its weight) is 65 and acceleration due to gravity is 9.8 m/s2, find the minimum rotational speed (in rpm) required. | [8M] |
| | b) | A sand casting process has a mold constant of 2 s/mm2 and solidification exponent of 2. If the solidification time is to be doubled for a given unit volume of material, calculate the corresponding reduction in the cast surface area (in %). | [7M] |
| 5 | a) | In a DC arc welding operation, the voltage-arc length characteristic was obtained as 20+ 5l where the arc length l was varied between 5 mm and 7 mm. Here Varc denotes the arc voltage in Volts. The arc current was varied from 400 A to 500 A. Assuming linear power source characteristic, calculate the open circuit voltage and the short circuit current for the welding Operation. | [8M] |
| | b) | 'Two plates were welded together and then the strength of the joint was tested. It was found that the weld was stronger than either of the plate'. Do you think that the above statement is incorrect? Comment, giving valid reasons. | [7M] |

Or

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| 6 | a) | Explain the reasons why DC arc welding is more used than AC arc welding for specialised applications. | [8M] |
| | b) | In a given arc welding operation, the power source is at 20 V and current at 300 A. If the electrode travel speed is 6 mm/s, calculate the cross-sectional area of the joint. The heat transfer efficiency is taken as 0.80 and melting efficiency as 0.30. Heat required to melt the steel is 10 J/mm3. | [7M] |



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| 7 | a) | In a single pass rolling process using 410 mm diameter steel rollers, a strip of width 140 mm and thickness 8 mm undergoes 10 % reduction of thickness. Calculate the angle of bite in radians. | [8M] |
| | b) | What is counter locking of forging dies? Write the cause and effect of the same. | [7M] |

Or

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| 8 | a) | What do you understand by the term flash in a forging? Explain with the help of a sketch | [8M] |
| | b) | What will happen if the fillet and corner radii are not provided in the case of a drop-forging die? Explain with sketches. | [7M] |
| 9 | a) | A hole of 10 mm ¥ 25 mm is to be cut in a 3 mm thick sheet. The shear strength of the material is 80 MPa. Estimate the press load required. | [8M] |
| | b) | For a washer, it is proposed to have the burrs obtained in the two operations, viz blanking and piercing to be on the same side. Suggest a suitable arrangement of the die giving reasons for your choice. | [7M] |

Or

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| 10 | a) | Two holes of 50 mm diameter are to be punched simultaneously in a C30 steel stock of 4 mm thick. The shear strength of the material is about 470 MPa. The only available punch press in the shop is of the capacity 200 kN. Examine the possibility, whether the operation could be done on this press. If not suggest any alternative procedure with justification. | [8M] |
| | b) | How is the grain direction in the sheet metal affect the design of blanking dies? | [7M] |



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Time: 3 hours Max. Marks: 75

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|---|---|---|---|---|
| 1 | a) | Explain briefly with neat sketches the following patterns.<br>a) Loose Piece Pattern<br>b) Skeleton Pattern<br>c) Segmental Pattern | | [8M] |
| | b) | Name the pattern allowances which can be quantitatively specified. Write a brief note on each of them. | | [7M] |
| | | Or | | |
| 2 | a) | Explain with a neat sketch, the use of a follow board pattern. | | [8M] |
| | b) | Explain the method of determining the moisture content in a moulding sand. | | [7M] |
| 3 | a) | What are the various elements that comprise of the gating system? Explain briefly? | | [8M] |
| | b) | Calculate the size of a cylindrical riser (height and diameter equal) necessary to feed a steel slab casting of dimensions 25 x 25 x 5cm with a side riser, casting poured horizontally into the mould. For steel the values of constants a, b and c are given as 0.10, 0.03, and 1.00 | | [7M] |
| | | Or | | |
| 4 | a) | Why is aluminium preferred to be done by cold chamber die casting than hot chamber die casting? | | [8M] |
| | b) | "Large parts cannot be manufactured by the centrifuging process." Comment on the statement. | | [7M] |
| 5 | a) | Explain the reasons why D.C Arc Welding is more used than A.C Arc Welding for specialized applications. | | [8M] |
| | b) | What is pre heating and post heating in welding? How it affects the weld strength? | | [7M] |
| | | Or | | |
| 6 | a) | Determine the appropriate welding speed to be used to weld 8 mm C50 steel plates when the power source is at 30 V and current at 325 A. The arc efficiency is 0.80 while the maximum cooling rate allowed is 6°C/s at a temperature of 550°C. Possible welding speeds are 6, 7, 8 and 9 mm/s. | | [8M] |
| | b) | Describe the effect of various welding parameters that control the metallurgical structure of the heat affected zone in C50 steel. | | [7M] |
| 7 | a) | What do you mean by the terms ingot, slab, bloom and billet? | | [8M] |
| | b) | Indicate by means of a flow diagram the different stages in manufacture of 50 mm diameter rod from a steel ingot. | | [7M] |
| | | Or | | |
| 8 | a) | What are the methods in which the roll-separating force could be reduced in cold rolling. | | [8M] |
| | b) | Briefly explain the meaning of draught and elongation as related to hot rolling. | | [7M] |



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9 a) For a punching operation, a cast steel sheet of thickness 1.5 mm is used. The diameter of the punch used in this operation is 30 mm. The shear strength of this material is known to be 250 MPa. Calculate the following: [8M]
(a) Shear area
(b) Force acting on the punch

b) In a particular piercing operation, 20 mm holes are to be punched in a brass sheet of 3 mm thick. The maximum shear strength of the sheet may be taken as 185 MPa. Design the punch and the die sizes as well as the required punch force. [7M]

Or

10 a) What is the largest diameter that can be pierced in a 1.5 mm thick steel plate of 310 MPa shear strength on a 250 kN press? Design the punch and the die dimensions for this operation. [8M]

b) A 60 degree bend is required on a sheet metal component. Should the die angle be equal to, more, or less than 60 degrees? Give reasons in support of your answer. [7M]



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| | | | |
|---|---|---|---|
| 1 | a) | What is meant by grain fineness number? Explain the procedure for determining this number for a moulding sand. | [8M] |
| | b) | Show graphically how the green strength of sand varies with moisture and clay contents. Describe the behaviour. | [7M] |
| | | Or | |
| 2 | a) | Name any two allowances provided on the pattern for a sand-casting and state the reasons why they are provided. | [8M] |
| | b) | Why is a loose piece pattern used? Give its problems. | [7M] |
| 3 | a) | What are the functions of a riser? Write the requirements of a good riser. | [8M] |
| | b) | Determine the casting of a certain alloy using a sand mould, it took 155 seconds for a cube shaped casting to solidify. The cube was 60mm on each side<br>i) Determine the value of the mould constant in chvorinov's rule<br>ii) for the same alloy and mould, determine the total solidification time for a cylindrical casting whose diameter is 30mm and length is 50mm. | [7M] |
| | | Or | |
| 4 | a) | Give examples of the typical products of the following processes: Die casting, centrifugal casting, permanent mould casting and shell moulding. | [8M] |
| | b) | Why are most die castings not made out of high strength materials? | [7M] |
| 5 | a) | With the help of a neat sketch of welding torch explain the oxy acetylene process of welding. | [8M] |
| | b) | What are the various methods available for arc cutting of metals? Compare them with reference to the applications, ease of use and quality of the cut obtained. | [7M] |
| | | Or | |
| 6 | a) | Distinguish between Soldering and Brazing from the point of view of The Filler Materials used, Applications and The Strength of the Joint obtained. | [8M] |
| | b) | Write a short note on Laser Beam Welding detailing the applications. | [7M] |
| 7 | a) | What is the significance of Roll Diameter with reference to Roll Separating Force in Rolling? | [8M] |
| | b) | For hot working it is often necessary to heat the work piece in a furnace and there are scale losses and other problems. Why is hot working sometimes preferred to cold working in spite of such disadvantages? | [7M] |
| | | Or | |
| 8 | a) | Why is hot working sometimes preferred to cold working inspite of some disadvantages? | [8M] |
| | b) | Describe the working principle of Hydrostatic extrusion with a neat sketch. | [7M] |



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9 a) In a hypothetical three station progressive die, three circular holes of diameters 10, 15 and 30 mm are to be made in that order at the three stations. The distance between the centre of the first hole and the second one is 50 mm, and between second and third is 45 mm. Find the point through which the centre line of the ram should pass through. [8M]

b) Generally, the die opening is straight up to a certain length and tapered thereafter. Explain the reason for such a shape [7M]

Or

10 a) What is the procedure to be adapted for punching a 75 mm diameter hole in a 4 mm thick C60 steel stock with a 250 kN press? The maximum shear strength for the material can be taken as 710 MPa. Make the necessary calculations in support of your answer. [8M]

b) What methods are used to overcome spring back in sheet metal bending operation? [7M]



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| | | | |
|---|---|---|---|
| 1 | a) | "Natural sand is often not suitable for moulding purposes" – comment on this statement giving reasons. | [8M] |
| | b) | What is the relevance of the facing sand towards the casting quality? Describe the facing sands normally used. | [7M] |

Or

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|---|---|---|---|
| 2 | a) | Explain the desirable characteristics of any core in sand casting. | [8M] |
| | b) | Describe a method of calculating the core print dimensions. | [7M] |
| 3 | a) | Give the merits and demerits of Modulus method in riser design? | [8M] |
| | b) | Differentiate between pressurized and unpressurised gating systems with reference to the applications. | [7M] |

Or

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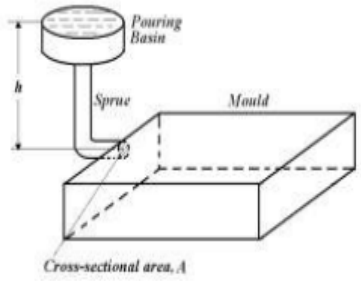
| 4 | | A mould having dimensions 100 mm × 90 mm × 20 mm is filled with molten metal through a gate as shown in the figure. For height h and cross-sectional area A, the mould filling time is t1. The height is now quadrupled and the cross-sectional area is halved. The corresponding filling time is t2. Evaluate the ratio t2/t1 . | 15M |

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| 5 | a) | Explain briefly the problems faced in Submerged Arc Welding in Horizontal and Vertical Welding Positions? | [8M] |
| | b) | What types of structure and property modifications can occur in welding heat zones? | [7M] |

Or

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|---|---|---|---|
| 6 | a) | Distinguish between Arc and Gas Welding processes from the point of view of Heat Concentration, Temperature, Ease of operation and Running cost. | [8M] |
| | b) | For welding heavy rail sections, Thermit welding is often used. Explain how the necessary heat for the joining process is obtained | [7M] |
| 7 | a) | Differentiate between Two High Reversing Mill and Three High Mill. Sketch them | [8M] |
| | b) | Describe the working principle of Hydrostatic extrusion with a neat sketch. | [7M] |

Or



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| 8 | a) | Explain the working principle of Impact Extrusion with a sketch. | [8M] |
| | b) | What type of products can be made easily with impact extrusion process and describe for one product | [7M] |
| 9 | a) | Estimate the diameter of the blank required to draw a cup of 10 mm diameter and 10 mm height. | [8M] |
| | b) | Distinguish between Bending and Drawing in Sheet Metal operations? | [7M] |

Or

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|---|---|---|---|
| 10 | a) | Draw a sketch of a Punch and a Die Set used for punching operation. Indicate its various parts. | [8M] |
| | b) | Calculate the size of the blank for a tumbler to be deep drawn from a stainless steel sheet of 1 mm thickness. The diameter of the tumbler is 75 mm and height is 150 mm. Assume that the thickness of the blank and the cylindrical portion of the tumbler are not the same. Neglect the effect of the die and punch radii. No ironing is allowed. | [7M] |



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