

(8)

Ex/PE/T/224/117/12

14. (a) Explain when Pressure Die casting is selected to be used. 2

(b) With the help of a comparative chart, decide which machine would you select to produce 200000 numbers of a mild steel component of 18mm O.D. x 12mm I.D. x 20mm long?

Machine	Price of Machines	Wages /month(Rs.)	Overheads /month (Rs.)	Hours required for 2,00,000 pcs.	Hours required /month
A	2.8	10,000	2500	240	200
B	4.1	12,000	3000	190	200
C	5.6	14,500	5000	110	200

The interest rate is 12% p.a. and the Depreciation is 10% p.a. WDV for all three machines. 10

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BACHELOR OF ENGG. POWER EXAMINATION, 2012

(2nd Year, 2nd Semester)

Material and Processes

Time : Three hours.

Full Marks : 100
(50 marks for each part)

Use a separate Answer-Script for each part.

PART - I

Answer q.no.1 and any **four** from the rest.

- Describe annealing process of heat treatment.
 - Sketch and label a typical TTT curve for a plain carbon steel.
 - Describe the precautions which must be taken in the operation of Brinell hardness test.
 - Explain the yield point behaviour of Ductile material
 - Show how the rate of cooling affects the macrostructure of an ingot.
 - Show the dendritic growth of metallic crystals from the liquid state.
 - Draw the potential energy diagram for the interactions of two atoms.
 - What is the difference between slip and twinning
 - Explain the term numerical aperture and resolving power of object. 9x2

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2. (a) Distinguish between creep and stress relaxation.
(b) Distinguish between crystalline solids and amorphous solids.
(c) Distinguish between hardness and toughness. 8
3. (a) A 20cm long rod with a diameter 20mm is loaded with a 4000N weight. If the diameter decreases to 18mm. Compute the true stress and true strain at this load.4
(b) The temperature of 1kg of the alloy is lowered slowly until the liquid-solution composition is 18 wt% B and the solid-solution composition is 66wt% B. Calculate the amount of each phase. 4
4. What are the materials of the items given below and why?
(a) Water level indicator
(b) Pressure cooker
(c) Fork end of Knuckle joint
(d) Down rod of ceiling fan
(e) Punch
(f) Steering
5. During a bend test of commercial plywood (IS 710) the following data were obtained. 8
(a) Width of sample 50mm
(b) Thickness of sample 12mm
(c) Span length of sample = 24 x thickness of sample
(d) Maximum load 1000 N
(e) Load at proportional limit 800 N
(f) Deflection at proportional limit 20mm
Determine (a) Modulus of elasticity (b) Modulus of rupture.

(7)

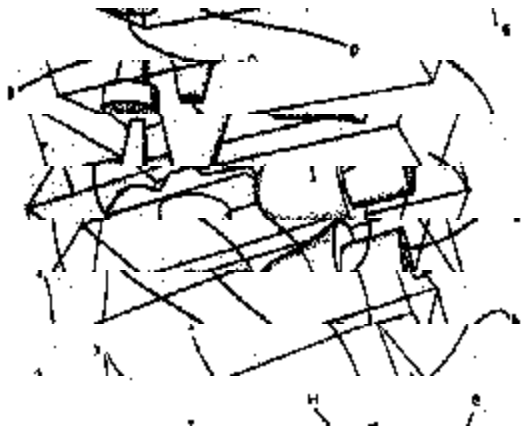
11. (a) A metal washer of 50mm O.D.x30mmx1mm thick has to be produced at a production rate of 3500 pieces (approx. per hour). The ultimate stress of the raw material is 6 kgf per sq.mm. Select a suitable power press—specify strokes/min and capacity in tons of the power press. 6
(b) What is the need of providing clearance between die and punch in press tools? 3
(c) Explain why flywheel is required in mechanical press. 3
12. (a) Write names of all permanent mold castings. 3
(b) Write three most important features to be followed during forged component design. 3
(c) Explain wire drawing process with help of a labeled diagram. 4
(d) Briefly explain when planning machine is preferred over shaping machine. 2
13. (a) What is the basic difference between vertical boring m/c and vertical lathe? 2
(b) What is the main constituent of flux in SMAW electrodes? 2
(c) Name the molding processes used for producing PET drinking water bottles? 2
(d) Which portion of wire drawing die conforms the diameter of produced wire and why? 2
(e) Draw a labeled self-explanatory sketch of GTAW process. 4

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(xx) 100000 numbers of a job– 100mm O.Dx80mm I.D.x0.5mm thick mild steel washers can be most cheaply produced by–
(a) Machining (b) Power Press (c) Casting (d) Forging.

9. (a) Draw a diagram as shown below labeling names of items A,B,C,D... 6



(b) With help of sketch show up-milling and down-milling and indicate the difference. 4

(c) Name four welding defects. 2

10. (a) What is the basic difference between jig and fixture? Explain. 2

(b) Name the three basic operations of Powder metallurgy process. Give one example of product made thus. 2

(c) What is the difference between 25 H8 dia. and 25 h8 dia? 2

(d) Name different types of forging and write three advantages of forging over casting? 6

(3)

6. (a) Define thermal shock. 2
(b) In a laboratory creep experiment at 1000°C, a steady state creep rate of $5 \times 10^{-1}\%$ per hour is obtained in a metal alloy. The creep mechanism for this alloy is known to be dislocation climb with an activation energy of 200KJ/mol. Predict the creep rate at a service temperature of 600°C. (Assume that the lab experiment duplicated the service stress). 6

7. During a Rockwell hardness test on a standard test block for HRC 65.5 ($U = \pm 2.84$ HRC at 95% C.L). The following test results were obtained from the standard test block. Observed hardness, HRC=66,65,64,65 and 64, Estimate the hardness (HRC) with uncertainty. Assume i) Resolution of Rockwell hardness testing machine 1 HRC ii) Uncertainty of measurement of Rockwell hardness testing machine from calibration certificate 0.5 HRC. 8

PART - II

Answer q.no. 8 and any **three** questions.

8. Write the correct answer (any fourteen) 14x1
(i) viii what will be the minimum batch size for Al alloy gravity die casting?
(a) 20-30 (b) 70-100 (c) 80,000-1,00,000 (d) 3000-4000
(ii) Compacting is a manufacturing step in–
(a) Sand casting (b) extrusion (c) powder metallurgy (d) heat treatment.

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- (iii) What is the single major difference between sand casting and plaster casting?
(a) riser is not required in plaster casting (b) cores are not used in plaster casting (c) molding material is different (d) none
- (iv) A 20 L plastic bucket is produced by –
(a) Injection moulding (b) blow moulding (c) vacuum forming (d) none.
- (v) Which process you will follow to produce 2000kgs of 1.2mm dia medium carbon steel wire –
(a) Cold extrusion (b) cold rollign (c) wet drawing (d) hot extrusion.
- (vi) Which mechanical property of metal helps higher deformation in hot forging–
(a) density (b) ductility (c) hardness (d) malleability
- (vii) Cold rolling is preferred to hot rolling for producing –
(a) blooms (b) I-beams (c) thin sheets (d) rail sections
- (viii) Work hardening is most associated with which manufacturing process –
(a) centrifugal casting (b) powder metallurgy (c) cold rolling (d) none
- (ix) Which process will you adopt to produce one number complicated machine frame weighing 825kgs?
(a) impression die forging (b) pressure die casting (c) sand casting (d) net shape forging
- (x) Which welding process is used for producing LPG cylinders?
(a) SMAW (b) GMAW (c) FCAW (d) SAW

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- (xi) Powder metallurgy is used to produce components from–
(a) Powdered metal (b) powdered alloy (c) powdered metal and alloy (d) molten metal and alloy
- (xii) 25 H8 holes can be produced by–
(a) Drilling (b) Riming (c) Boring (d) none.
- (xiii) The principal property required for good quality extrusion
(a) Higher hardness (b) Higher ductility (c) higher malleability (d) none
- (xiv) Which one of the following is not a single point cutting tool?
(a) turning tool (b) milling cutter (c) boring tool (d) parting tool
- (xv) Combination of rotating job and non-rotating tool is used in–
(a) lathe (b) vertical milling (c) shaping (d) surface grinding
- (xvi) Which is the oldest form of metal manufacturing process?
(a) casting (b) presswork (c) machining (d) welding.
- (xvii) Which of the following can produce highest accuracy?
(a) drilling (b) turning (c) milling (d) cylindrical grinding
- (xviii) Maximum metal removal in one step is done by–
(a) lathe (b) milling (c) planing (d) drilling
- (xix) Which of the following is most productive for mass production items.
(a) Center a lake (b) Drilling machine (c) Milling machine (d) Broadching machine.

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