Total No. of Questions : 12]

SEAT No. :

P1061

[Total No. of Pages : 4

[4659]-54

B.E. (Mechanical Sandwich)

MACHINE AND COMPUTER AIDED DESIGN

(2008 Course) (Semester - I) (402061)

Time : 3Hours] *[Max. Marks :100*

Instructions to the candidates:

1) ***Answers to the two sections should be written in separate answer books.***
2) ***Answer any three questions from each section.***
3) ***Neat diagrams must be drawn wherever necessary***
4) ***Figures to the right side indicate full marks.***
5) ***Use of calculator is allowed.***
6) ***Assume suitable data, if necessary.***

SECTION-I

Q1) a) Derive relation for Beam strength of bevel gears. **[8]**

b) A pair of Bevel gear transmits 7.5 kW at 300 rpm. The pressure angle is 20^o. Pitch circle diameter for the pinion and the gear is 150 mm and 200 mm respectively. Face width is 40 mm. Determine the components of gear tooth force and draw a free body diagram of forces acting on the pinion and the gear. **[10]**

OR

Q2) a) Discuss the thermal considerations in worm-gear drive. **[6]**

b) A worm gear pair 2/40/10/4 is having phospher-bronze gear with ultimate tensile strength 300 MPa. The worm is made of steel with ultimate tensile strength of 740 MPa. The coefficient of friction between the worm and worm-gear is 0.03 and normal pressure angle is 20^o. For the worm gear, wear factor is 0.9 N/mm^2. The overall heat-transfer coefficient for the gear box is 18 W/m^2 ^{o}C. The permissible temperature rise for the lubricating oil is 50^oC. The worm rotates at 720 rpm and service factor is 1.5. Determine input power rating based on Beam strength, wear strength and thermal consideration. Assume effective surface area of the gear box as 0.8 m^2 and factor of safety as 1.5. **[12]**

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Q3) a) Define pressure vessel and explain general design considerations for the design of unfired pressure vessel. **[8]**

b) A high pressure vessel is to be operated at 150 N/mm^2. The inside diameter of the vessel is 30 cm. Vessel is fabricated from high tensile steel having permissible tensile stress 500 N/mm^2. Determine the wall thickness on the basis of the maximum tangential stress at inner surface. **[8]**

OR

Q4) a) Derive the expression for the thickness of thick cylinder subjected to internal pressure on the basis of maximum shear stress theory. **[8]**

b) A hydraulic cylinder with closed ends is subjected to an internal pressure of 15 MPa. The inner and outer diameters of the cylinder are 240 mm and 300 mm respectively. The cylinder is made of Cast Iron FG300. Determine the factor of safety in the design. If the cylinder pressure is increased by 25%, what will be the factor of safety? **[8]**

Q5) a) Explain the general guidelines for design for casting and forgings. **[8]**

b) Discuss the significance of Ergonomics. **[8]**

OR

Q6) a) Distinguish between quality of design and quality of conformance. Explain the economics of quality of design. **[8]**

b) Explain following terms (any four): **[8]**

i) Natural tolerances

ii) Aesthetic design principles

iii) Principles of Design for assembly

iv) Mechanical Reliability

v) Factor of Safety

SECTION-II

Q7) a) What do you understand by conveying equipment? With the aid of a neat labelled sketch explain various components of Belt conveyor system. **[6]**

b) A flat horizontal belt conveyor is used for transporting crushed rock having a mass density of 2 t/m^3. The belt is 800 mm wide and has a speed of 1.75 m/s. Determine the capacity of conveyor in t/hr. **[10]**

OR

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Q8) a) Explain conveyor belt sag in belt conveyors. State equations for carrying and return idlers. **[6]**

b) State the important properties to be considered in the design of material handling equipment for unit loads. **[4]**

c) State for what applications the following material handling equipment is used. Justify your answer with sketch. **[6]**

i) Fork lift truck

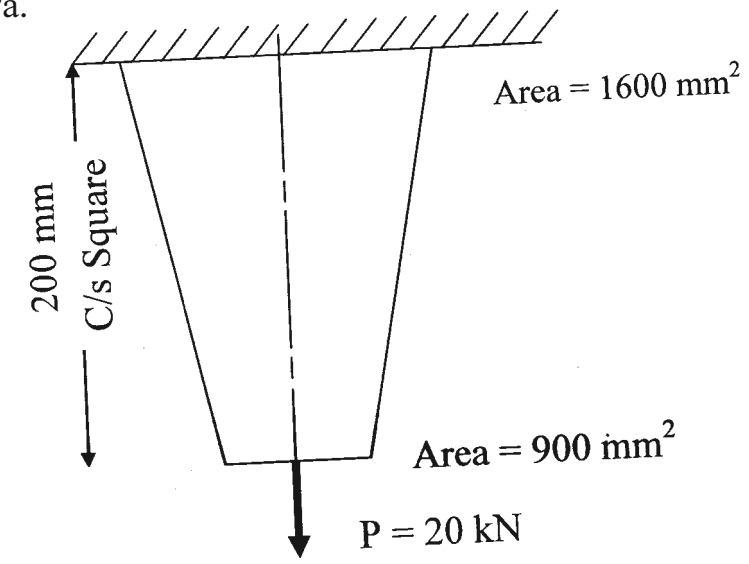
ii) Jib crane

iii) Belt conveyor

iv) Roller conveyor

Q9) a) Explain solution of 2-Dimensional problems using Constant Strain Triangle (CST). **[6]**

b) Find the stresses and reaction at the support by modeling following system in two finite elements. Assume Modulus of Elasticity (E) = 210 GPa. **[10]**



OR

Q10)a) Define the term FEM. Explain its general applications in brief. **[4]**

b) An axial load P = 200 kN is applied as shown in fig. Using penalty approach for handling boundary conditions, determine: **[12]**

i) Nodal displacements

ii) Stresses in each element

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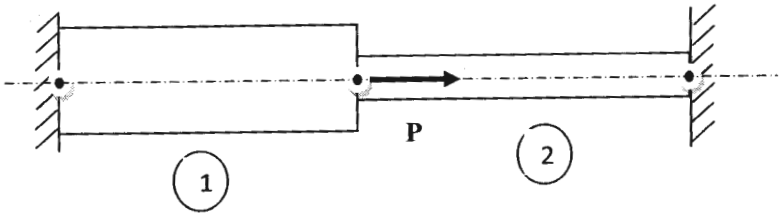
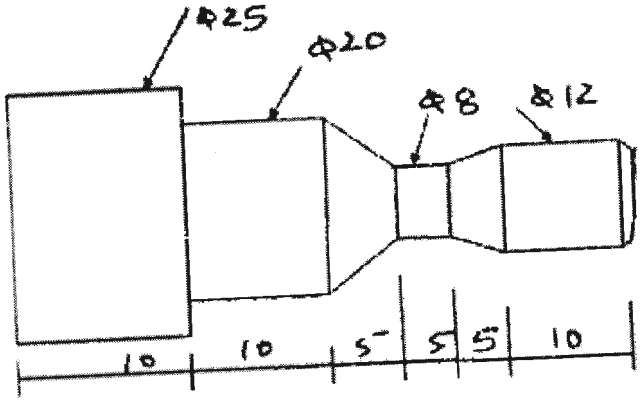
iii) Reaction forces



Element No.	Material	Modulus of Elasticity	C/s Area	Length
1	Aluminum	70 X 10^9 N/mm^2	2400 mm^2	300 mm
2	Steel	200 X 10^9 N/mm^2	600 mm^2	400 mm

Q11)a) Write a manual part program for finishing a forged component as shown in the figure. Assume the speed and feed on the turning centre as 600 rpm and 0.2 mm/rev. Assume 1mm material is to be removed radially from external diameter. **[10]**



b) Compare fixed, programmable and flexible automation. **[8]**

OR

Q12)a) What are the features of CNC machines as compared to NC machines.**[6]**

b) Explain following with the help of neat sketches (Any two): **[12]**

i) Flexible Manufacturing system (FMS).

ii) Automatic Storage and Retrieval System (ASRS).

iii) Automated Guided Vehicles (AGV).

EEE

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