ANNAMACHARYA INSTITUTE OF TECHNOLOGY & SCIENCES :: RAJAMPET
(AUTONOMOUS)
III B.Tech. I Semester Regular Examinations, January 2014
Heat Transfer
(Mechanical Engineering)

Time: 3 hours   Max Marks: 70

Answer any FIVE Questions from the following
All questions carry equal marks (14 Marks each)
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1. a) What are different modes of heat transfer? Explain briefly giving governing equations and at least two examples to each.   6M

    b) Derive, starting from fundamentals, general conduction equation in Cartesian coordinates and deduce it to one dimensional steady state condition with no internal heat generation.   8M

2. a) Sketch various types of fin configurations?   6M

    b) Aluminum fins of rectangular profile are attached on a plane wall with 5 mm spacing. The fins have thickness 1 mm, length = 10 mm and the normal conductivity K=200 W/mk. The wall is maintained at a temperature of 200^0C and the fins dissipate heat by convection into ambient air at 40^0C, with heat transfer coefficient = 50 W/m^2k. Find the heat loss.   8M

3. a) Explain the lumped heat capacity analysis?   6M

    b) A 40×40 cm copper slab 5mm thick at a uniform temperature of 250^0C. Suddenly has its surface temperature lowered to 30^0C. Find the time at which the slab temperature becomes 900C, ρ = 9000 kg/m3, Cp = 0.38 kJ/kg.k, K=370 W/mk and h = 90 W/m^2k.   8M

4. a) What is the significance of dimensional analysis? Derive expressions for Reynolds, Pradtl and Nusselt numbers using dimensional analysis.   7M

    b) Show by dimensional analysis for free convection Nu= f(Pr, Gr).   7M

5. a) What is Reynolds analogy? Describe the relation between fluid friction and heat transfer.   6M

    b) Air at 20^0C and 1 atmosphere flows over a flat plate at 35 m/s. The plate is 75 cm long and is maintained at 60^0C. Calculate the heat transfer from the plate per unit width of the plate. Also calculate the turbulent boundary layer thickness at the end of the plate assuming it to develop from the leading edge of the plate.   8M

6. a) When does a bubble grow or collapse as it moves up through the liquid?   6M

    b) An electrically heated copper kettle with a flat bottom of diameter 25 cm is to boil water at atmospheric pressure at a rate of 2.5 kg/h. What is the temperature of the bottom surface of the kettle?   8M

7. a) Obtain an expression for effectiveness in terms of NTU for counter flow heat exchangers.   7M

    b) A liquid (Cp=0.8 kJ/kg K) is entering a counter flow heat exchanger at 25^0C at a rate of 2.5 kg/s. It is heated to 750^0C by another fluid (Cp=1 kJ/kg K) with a flow rate of 2 kg/s entering at 1000^0C. With these things remaining same, what will be percentage change in the area of heat exchanger if the fluid is heated up to 600^0C instead of 750^0C?   7M

8. a) Explain about Kirchhoff's law, Planck's law, Wein's law and Stefan Boltzman law.   6M

    b) An enclosure measures 1.5 m x 1.7 m with a height of 2 m. The walls and ceiling are maintained at 250^0C and the floor at 130^0C. The walls and ceiling have an emissivity of 0.82 and the floor 0.7. Determine the net radiation to the floor.   8M

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ANNAMACHARYA INSTITUTE OF TECHNOLOGY & SCIENCES :: RAJAMPET
(AUTONOMOUS)
III B.Tech. I Semester Regular Examinations, January 2014
Machine tools
(*Mechanical Engineering*)

Time: 3 hours   Max Marks: 70

Answer any FIVE Questions from the following
All questions carry equal marks (14 Marks each)

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1. a) Sketch a single point cutting tool under ASA system. Define various tool angles and discuss their importance.

   b) Explain importance of merchant's force diagram

2. a) Calculate the change gears to cut a single thread of 0.5mm pitch on a center lathe having a lead screw of 12mm pitch.

   b) Explain the principle features of multi spindle automatic

3. a) Sketch and explain the working of slotter.

   b) Write the advantages of planers

4. a) How the size or capacity of a radial drilling machine is specified?

   b) Differentiate brining Vs reaming

   c) Sketch a jig borer and explain its working.

5. a) Describe the difference between a horizontal milling machine and a vertical milling machine.

   b) Write on the following milling operations

      (i) Gange milling

      (ii) Strasdle milling

6. a) What is meant by dressing and turning of grinding wheels

   b) Sketch and discuss a tool and cutter grinder

7. a) Compare grinding, Lapping and honing

   b) With the help of neat sketch, discuss the working of a surface broaching machine.

8. a) Explain the uses jigs and fixtures

   b) Explain principle of location and clamping with neat sketches

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III B.Tech. I Semester Regular Examinations, January 2014
Magerial Economics and Financial Analysis
(Common to ME & ECE)

Time: 3 hours Max Marks: 70

Answer any FIVE Questions from the following
All questions carry equal marks (14 Marks each)

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1. State and Explain the law of Demand .What are its Exceptions? 14M

2. What is Elasticity of Demand? Explain factors Governing ·Elasticity of Demand? 14M

3. From the following Information Calculate Break Even Point In units and in sales value?

Output	= 3000 units
Selling price per unit	= Rs 30
Variable Cost Per unit	= Rs 20
Total Fixed Cost	= Rs 20,000

14M

4. Define Monopoly? How Price and output are determined under Monopoly? 14M

5. Discuss the advantages and disadvantages of a Sole Trader? 14M

6. What are the sources of long term Finance? 14M

7. Prepare Final accounts for the year ending 31-2008

	Debit Rs	Credit Rs
Opening Stock	4,500	
Purchases	25,000	
Wages	2,500	
Salaries	2,000	
Postage	200	
Drawings	2,800	
Debtors	2,000	
Buildings	7,500	
Furniture	4,000	
Sales		30,000
Capital		16,500
Creditors		3,300
Interest received		700
	50,500	50,500

Additional Information:-

a) Closing Stock	=	Rs 90,000
b) Out Standing Wages	=	500
c) Interest Received In Advance	=	200

14M

8. State Significance of each of the following ratios and turn over's and explain how each one is calculated?
   a) Current Ratio
   b) P/E Ratio
   c) Debt turnover ratio
   d) Earnings per share

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ANNAMACHARYA INSTITUTE OF TECHNOLOGY & SCIENCES :: RAJAMPET
(AUTONOMOUS)
III B.Tech. I Semester Regular Examinations, January 2014
Thermal Engineering II
(Mechanical Engineering)

Time: 3 hours   Max Marks: 70

Answer any FIVE Questions from the following
All questions carry equal marks (14 Marks each)

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1. A steam power plant operates on a theoretical reheat cycle. Steam from boiler at 150 bar, 550°C expands through the high pressure turbine. It is re heated at a constant pressure of 40 bar to 550°C and expands through the low pressure turbine to a condenser at 0.1 bar. Draw T-s and h-s diagrams. Find

    (i) Quality of steam at turbine exhaust,

    (ii) Cycle efficiency,

    (iii) Steam rate in kg/kWh

2. With the aid of a neat sketch, explain the working of Babcock and Wilcox boiler

3. Derive an expression for natural draught and maximum discharge rate of gases through the chimney for a given height of the chimney, clearly stating the assumptions made.

4. 5kg of steam per minute pass through a convergent-divergent nozzle. The pressure and temperature of steam supplied to the nozzle box is 10 bar and 200°C respectively. The discharge pressure is 0.1 bar. The expansion is super-saturated up to throat and in thermal equilibrium afterwards. Calculate

    (i) The area of nozzle at exit

    (ii) The maximum degree of super saturation,

    (iii) The degree of under cooling at the throat.

5. In a single stage impulse turbine the mean diameter of the blade ring is 1m and the rotational speed is 3000rpm. The steam is issued from the nozzle at 300m/s and nozzle angle is 20°. The blades are equiangular. If the friction loss in the blade channel is 19% of the kinetic energy corresponding to the relative velocity at the inlet to the blades, what is the power developed in the blades when the axial thrust on the blades is 98N

6. A stage of a turbine with Parson's blading delivers dry saturated steam at 2.7 bar from the fixed blades at 90 m/s. The mean blade height is 40 mm, and the moving blade exit angle is 20°. The axial velocity of steam is ¾ of the blade velocity at the mean radius. Steam is supplied to the stage at the rate of 9000kg/h. The effect of the blade tip thickness on the annulus area can be neglected. Calculate:

    (i) The wheel speed in rpm;

    (ii) The diagram power;

    (iii) The diagram efficiency;

    (iv) The enthalpy drop of the steam in this stage.

7. To check the leakage of air in a condenser, the following procedure is adopted. After running the plant to reach the steady conditions the steam supplied to the condenser and the air and condensate pump are shut down, thus completely isolating the condenser. The temperature and the vacuum readings are noted at shut down and also after a period of 10 minutes. They are 39°C and 685 mm Hg and 28°C and 480 mm Hg respectively. The barometer reads 750 mm Hg. The effective volume of the condenser is 1.5 m³. Determine

   (i) Quantity of air leakage into the condenser during the period of observation;

   (ii) The quantity of water vapour condensed during the period.

8. The following data refer to a single stage double acting steam engine: high pressure= 7 bar; low pressure = 1.2 bar; cut-off and clearance are respectively 40% and 10% of stroke volume; compression of steam starts at 20% of stroke volume; specific volume of steam at 1.2 bar is 1.455 m³/kg; steam consumption = 2700 kg/hour; engine speed= 240 rpm; quality of steam supplied= 0.9 and amount of jacket steam condensed = 18kg/hour. Calculate :

   (i) The mep of the cycle;

   (ii) The diagram factor;

   (iii) The power output if mechanical efficiency is 0.85;

   (iv) The missing quantity per cycle at the state during expansion, where the pressure is 5 bar.

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ANNAMACHARYA INSTITUTE OF TECHNOLOGY & SCIENCES :: RAJAMPET
(AUTONOMOUS)
III B.Tech. I Semester Regular Examinations, January 2014
### Design of Machine Elements-I
(ME)

Time: 3 hours

Max Marks: 70

Answer any FIVE Questions from the following
All questions carry equal marks (14 Marks each)

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1. a) Write a short note on 'Preferred numbers'. 6M

   b) Explain the steps involved in machine design process. 8M

2. a) Write short notes on 'Factor of safety'. 4M

   b) A mass of 50 kg drops through 25 mm at the center of a 250 mm long simply supported beam. The beam has square cross section. It is made of steel, having ultimate strength in tension is 400 MPa. Determine the dimensions of the cross section of the beam for a factor of safety 2. Take modulus of elasticity is 2.07×10^5 MPa. 10M

3. a) Define the following terms:

   (i) Stress concentration   (ii) Notch sensitivity 4M

   b) A transmission shaft carries a pulley midway between two bearings. The bending moment at the pulley varies from 200 N-m to 600 N-m, as the torsional moment in the shaft varies from 70 N-m to 200 N-m. The frequencies of variation of bending and torsional moments are equal to the shaft speed. The shaft is made of steel having ultimate strength of 540 MPa and yield strength in tension of 400 MPa. The corrected endurance limit of the shaft is 200 MPa. Determine the diameter of the shaft using a factor of safety of 2. 10M

4. a) Sketch and explain various types of Riveted joints. 6M

   b) A bracket shown in figure-1 is fastened to the frame by three bolts. Design the size of the bolts, assuming the permissible tensile stress intensity as 30 N/mm².
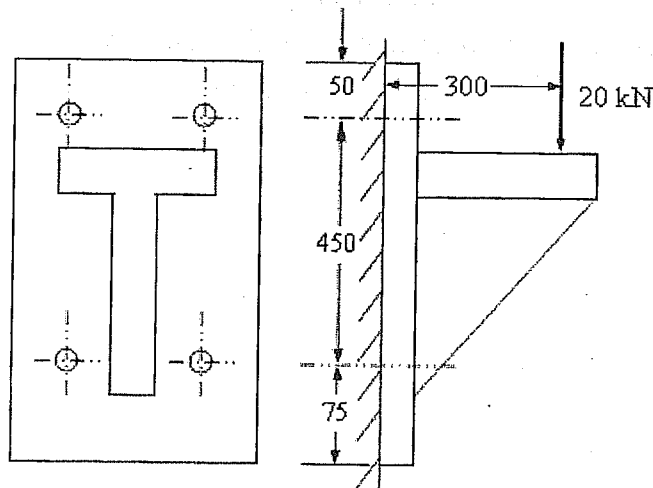
All dimensions are in mm

Figure-1

8M

5. a) A circular steel bar 50 mm diameter and 200 mm long is welded perpendicularly to a steel plate to form a cantilever to be loaded with 5 kN at the free end. Determine the size of the weld, assuming the allowable stress in the weld as 100 MPa.   6M

    b) What is an eccentric loaded welded joint? Discuss the procedure for designing such a joint?   8M

6. a) Why gibs are used in a cotter joint? Explain with the help of a neat sketch the use of a single and double gib.   4M

    b) Design a knuckle joint to transmit 150 kN. The design stresses may be taken as 75 MPa in tension, 60 MPa in shear, and 150 MPa in compression.   10M

7.   A shaft is supported on two bearings placed 0.6 m apart. The shaft supports a 0.5 m diameter pulley, located at 0.25 m to the right of the left hand bearing, and the belt drives a pulley located directly below the shaft. Another pulley of 0.4 m diameter is located 0.125 m to the right of the right of the bearing, and the belt is driven by a pulley located horizontally to the right. For both belt drives, the coefficient of friction is 0.3, and the angle of contact may be taken as 180^0. The maximum tension in the belt on the smaller (0.4 m diameter) pulley is 3.6 kN. Assuming permissible shear stress for the shaft material as 42 MPa, determine the diameter of the shaft.   14M

8.   Design a bushed pin type flexible coupling for connecting a motor shaft to a pump shaft, with following service conditions:

    Power to be transmitted = 40 kW;

    Speed of the motor shaft = 1000 rpm;

    Diameter of the motor and pump shaft = 45 mm;

    Bearing pressure on the rubber bush = 0.7 N/mm^2;

    Allowable stress in the pin = 6 MPa;

    Permissible shear stress in the flange material (CI) = 14 MPa;

    Permissible shear stress in the shaft and key material = 45 MPa; and

    Permissible crushing stress in the key material = 100 MPa.

    Draw a neat dimensioned diagram of the coupling.   14M

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ANNAMACHARYA INSTITUTE OF TECHNOLOGY & SCIENCES :: RAJAMPET
(AUTONOMOUS)
III B.Tech. I Semester Regular Examinations, January 2014
Dynamics of Machinery
(Mechanical Engineering)

Time: 3 hours   Max Marks: 70

Answer any FIVE Questions from the following
All questions carry equal marks (14 Marks each)

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1. Find the angle of inclination with respect to the vertical of two wheeler negotiating a turn. Given combined mass of the vehicle with its rider 250 kg; moment of inertia of the engine flywheel 0.3 kg-m^2; moment of inertia of each road wheel 1 kg-m^2, speed of engine flywheel 5 times that of road wheels and in the same direction, height of center of gravity of rider with vehicle 0.6 m, two wheeler speed 90 kmph, wheel radius 300mm, radius of turn 50m?   14M

2. a) Derive a expression for the friction moment of a conical pivot, assuming uniform pressure?   6M

    b) The pitch of 50 mm mean diameter threaded screw of a screw jack is 12.5 mm. The coefficient of friction between the screw and the nut is 0.13. Determine the torque required on the screw to raise a load of 25 kN, assuming the load to rotate with the screw. Determine the ratio of the torque required to raise the load to the torque required to lower the load and also the efficiency of the machine?   8M

3. a) Distinguish between brakes and dynamometers?   4M

    b) A centrifugal clutch is to transmit 15 kW at 900 r.p.m the shoes are four in number. The speed at which the engagement begins is 3/4th of the running speed. The inside radius of the pulley rim is 150mm and the centre of gravity of the shoe lies at 120 mm from the centre of the spider. The shoes are lined with Ferrodo for which the coefficient of friction may be taken as 0.25. Determine 1.Mass of the shoes and 2. Size of the shoes, if angle subtended by the shoes at the centre of the spider is 60° and the pressure exerted on the shoes is 0.1 N/mm^2?   10M

4. The turning moment diagram for a four stroke gas engine may be assumed for simplicity to be represented by four triangles. The areas of which from the line of zero pressure are as follows: Suction stroke=0.45×10^{-3} m^2; Compression stroke = 1.7×10^{-3} m^2; Expansion stroke=6.8×10^{-3} m^2; Exhaust stroke=0.65×10^{-3} m^2. Each m^2 of area represents 3 MN-m of energy. Assuming the resistance torque to be uniform, find the mass of the rim of a flywheel required to keep the speed between 202 and 198 r.p.m. The mean radius of the rim is 1.2 m?   14M

5. In a spring loaded governor of the Hartnell type, the mass of each ball is 1 kg, length of vertical arm of the bell crank lever is 100 mm and that of the horizontal arm is 50 mm. The distance of fulcrum of each bell crank lever is 80 mm from the axis of rotation of the governor. The extreme radii of rotation of the balls are 75 mm and 112.5 mm. The maximum equilibrium speed is 5 percent greater than the minimum equilibrium speed which is 360 r.p.m. Find neglecting obliquity of arms, initial compression of the spring and equilibrium speed corresponding to the radius of rotation of 100 mm? 14M

6. a) What do you understand by static and dynamic balancing? 4M

   b) A shaft carries four masses A,B,C and D of magnitude 200 kg, 300 kg,400 kg and 200 kg respectively and revolving at radii 80 mm,70 mm, 60 mm and 80 mm in planes measured from A at 300 mm, 400 mm, and 700 mm. The angles between the cranks measured anticlockwise are A to B 45°, B to C 70° and C to D 120°. The balancing masses are to be placed in planes X and Y. The distance between the planes A and X is 100 mm, between X and Y is 400 mm and between Y and D is 200mm. If the balancing masses revolve at a radius of 100 mm, find their magnitudes and angular positions? 10M

7. The three cranks of a 3 cylinder locomotive are all on the same axle and are set at 120°. The pitch of the cylinders is 1 metre and the stroke of each piston is 0.6m. The reciprocating masses are 300Kg for inside cylinder and 260Kg for each outside cylinder and the planes of the rotation of the balance masses are 0.8m from the inside crank. If 40% of the reciprocating parts are to be balanced, find 1. The magnitude and position of the balancing masses required at a radius of 0.6m, and 2. The hammer blow per wheel when the axle makes 6 r.p.s? 14M

8. a) What do you understand by 'Torsionally equivalent shaft'? 5M

   b) Describe in detail the method of finding the frequency of torsional vibration of a two rotor system? 9M

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