Code: 9A03505

R09

III B. Tech I Semester (R09) Supplementary Examinations, May 2012

HEAT TRANSFER

(Mechanical Engineering)

Time: 3 hours Max Marks: 70

Answer any FIVE questions
All questions carry equal marks
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1 (a) Define heat flux and thermal diffusivity and explain its importance in conduction mode of heat transfer.

(b) A plane wall 80 mm thick (K=0.15 W/mK) is insulated on one side while the other is exposed to environment at 90^0C. If the convective heat transfer coefficient between the wall and the environment is 560 W/m^2 K, determine the temperature at the surface of the wall will be subjected.

2 Determine the rate of heat flow through a spherical boiler wall which is 2 m in diameter and 2 m thick steel (k = 58 W/m K). The outside surface of boiler wall is covered with asbestos (k = 0.116 W/m K) 5 mm thick. The temperature of outer surface and that of fluid inside are 50^0C and 300^0C respectively. Take inner film resistance as 0.0023 K/W.

3 (a) Sheets of brass and steel, each of thickness 1 cm, are placed in contact. The outer surface of brass is kept at 100^0C and the outer surface of steel is kept at 0^0C. What is the temperature of the common interface? The thermal conductivities of brass and steel are in the ratio of 2:1.

(b) How long will it take to form a thickness of 4cm of ice on the surface of a lake when the air temperature is -6^0C? K of ice = 1.675 W/m K and its density = 920 kg/m^3. Take the latent heat of fusion of ice as 335 kJ/kg.

4 Starting with the two dimensional Navier Stokes equation, listing all assumptions, and performing an order of magnitude analysis, show that for flow over a flat plate, the pressure is a function of *x* alone. (Please proceed systematically for full credit. Brute force application of known result will yield zero credit).

5 (a) Estimate the heat transfer from a 40 W incandescent bulb at 127^oC to 27^oC quiescent air. Approximate the bulb as a 50 mm diameter sphere. What percentage of the power is lost by free convection?

(b) What is the boundary layer thickness? What do you mean by laminar and turbulent boundary layers? What is laminar sub layer?

6 (a) Explain the flow regimes in two phase flow through a tube. What is the difference between slug flow regime and annular flow regime?

(b) Saturated steam at atmospheric pressure condenses on a horizontal copper tube of 25 mm inner diameter and 29 mm outer diameter through which water flows at the rate of 30 kg/min entering at 32^0C and leave at 72^0C. Calculate: (a) the condensing heat transfer coefficient, (b) the inside heat transfer coefficient and (c) the length of the tube.

7 (a) Define heat exchanger effectiveness and explain its significance.

(b) In a counter flow double pipe heat exchanger water is heated from 40^0C to 80^0C with oil entering at 105^0C and leaving at 70^0C.Taking the overall heat transfer coefficient as 300 W/m^2k and the water flow rate as 0.1Kg/s. Calculate the heat exchanger area .

8 Explain the following laws relevant to radiation heat transfer:
(i) Kirchhoff's law. (ii) Wien's displacement law. (iii) Planck's law. (iv) Lambert Law.

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Code: 9AHS401

R09

III B. Tech I Semester (R09) Supplementary Examinations, May 2012

MANAGERIAL ECONOMICS & FINANCIAL ANALYSIS

(Common to CE, BT, ME, EEE & ECC)

Time: 3 hours Max Marks: 70

Answer any FIVE questions
All questions carry equal marks
*****

1 What are the contributions and limitations of managerial economics to business managers?

2 How do you measure elasticity of demand? Illustrate graphically.

3 What is production function? How is it useful to the manufacturer?

4 How does an individual firm behave under perfect completion? Also explain the firm and industry equilibrium under perfect competition.

5 Discuss about the short-comings of the public sector enterprises in India and what is their future.

6 (a) What is the importance of capital?
(b) What factors determine the working capital requirements of a company?

7 (a) What is 'Journal Entry' and describes its importance in account books?
(b) Explain the basic accounting concepts and convention. Give examples.

8 What is meant by ratio analysis? Explain briefly various techniques of ratio analysis.

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Code: 9A03501

R09

III B. Tech I Semester (R09) Supplementary Examinations, May 2012

THERMAL ENGINEERING II

(Mechanical Engineering)

Time: 3 hours Max Marks: 70

Answer any FIVE questions
All questions carry equal marks
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1 (a) What is reheating? What the advantages of reheat Rankine cycle?
(b) A simple Rankine cycle works between pressures of 28 bar and 0.06 bar, the initial condition of steam being dry saturated. Calculate the cycle efficiency, work ratio and specific steam consumption rate.

2 (a) What is a boiler? Explain the classification of boilers.
(b) What is the necessity for safety valves in a boiler?

3 Dry and saturated steam expands in a convergent-divergent nozzle from 12 bar to 1 bar. The throat diameter is 1 cm and the divergent portion of the nozzle is 8 cm long. Neglecting the effect of friction, find out the semi cone angle of the divergent section.

4 Explain the pressure-compounded impulse steam turbine showing pressure and velocity variations along the axis of the turbine.

5 (a) What are the important considerations for selection of blade material for a steam turbine?
(b) What do you mean by steam turbine governing?

6 With a neat sketch explain the working of a jet condenser.

7 A gas turbine plant consists of two turbines. One turbine drives the compressor and the other develops the power output. Both turbines have their own combustion chambers which are served by air directly from the compressor. Air enters the compressor at 1 bar and 15ºC and is compressed to 8 bar with an isentropic efficiency of 80%. Due to heat addition in the combustion chamber, the inlet temperature of gas to both the turbines reaches to 900ºC. The isentropic efficiency of the turbine is 85%. The mass-flow rate of air at the compressor is 20 kg/s. The calorific value of fuel is 42000 kJ/kg. Calculate the output of plant and thermal efficiency, if mechanical efficiency is 96% and the generator efficiency is 95%. Take C_p=1.005 kJ/kgK and γ = 1.4 for air and C_p=1.128 kJ/kgK and γ = 1.34 for gases. Neglect the mass of fuel.

8 What are the different types of rocket engines? What are its applications?

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Code: 9A03502

R9

B.Tech III Year I Semester (R09) Supplementary Examinations, May 2012

DYNAMICS OF MACHINERY

(Mechanical Engineering)

Time: 3 hours Max Marks: 70

Answer any FIVE questions

All questions carry equal marks

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1 (a) What do you understand by gyroscopic couple? Derive a formula for its magnitude.

(b) The mass of the motor cycle along with the rider is 180 kg. The height of the centre of gravity of total mass is 60 cm above the ground when it moves straight. Each wheel has diameter equal to 70 cm and polar mass moment of inertia of each wheel is 2 kgm^2. The engine rotates at a speed 5 times the road wheel and engine rotating parts have polar mass moment of inertia equal to 0.2 kgm^2. Determine the angle of heel required if motor cycle negotiates a curve of radius 100 m at a speed of 108 km/hr.

2 (a) Explain the terms: friction circle and friction axis.

(b) Deduce an expression for the efficiency of an inclined plane when a body moves down a plane.

3 (a) Which of the two assumptions-uniform intensity of pressure or uniform rate of wear, would you make use of in designing friction clutch and why?

(b) A cone clutch with cone angle 20^0 is to transmit 7.5 kW at 750 r.p.m. The normal intensity of pressure between the contact faces is not to exceed 0.12 N/mm^2. The coefficient of friction is 0.2. If face width is $1/5^{th}$ of mean diameter, find:

(i) The main dimensions of the clutch, and

(ii) Axial force required while running.

4 (a) What is the function of flywheel? How does it differ from that of a governor?

(b) The torque delivered by a two-stroke engine is represented by T = (1000 + 300 sin 2ø - 500 cos 2ø) N.m where ø is the angle turned by the crank from the inner-dead centre. The engine speed is 250 rpm. The mass of the flywheel is 400 kg and radius of gyration 400 mm. Determine:

(i) The power developed.

(ii) The total percentage fluctuation of speed.

(iii) The angular acceleration of flywheel when the crank has rotated through an angle of 60^0 from the inner-dead centre.

(iv) The maximum angular acceleration and retardation of the flywheel.

Contd. in Page 2

5 (a) What are centrifugal governors? How do they differ from inertia governors?

(b) The mass of each ball of a proell governor is 3 kg and the weight on the sleeve is 20 kg each arm is 220 mm long and the pivots of the upper and the lower arms are 20 mm form the axis. For the midposition of the sleeve the extension links of the lower arms are vertical, the height of the governor 180 mm and the speed 150 rpm. Determine the lengths of the extension links and the tension in the upper arms.

6 (a) Define and explain the term 'balancing of rotating masses' what will be the harm if the rotating parts of a high speed engine are not properly balanced?

(b) A shaft carries four rotating masses A, B, and C which are completely balanced. The masses B, C and D are 50 kg, 80kg and 70 kg respectively. The masses C and D make angles of 90^0 and 195^0 respectively with mass B in the same sense. The masses A, B, C and D are concentrated at radius 75 mm, 100 mm, 50 mm and 90 mm respectively. The plane of rotation of masses B and C are 250 mm apart. Determine:

(i) The mass A and its angular position.

(ii) The position of planes of A and D.

7 (a) Explain the term 'partial balancing of primary force'. Why is it necessary?

(b) A four cylinder vertical engine has cranks 300 mm long. The planes of rotation of the first, third and fourth cranks are 750, 1050 and 1650 mm respectively from that of the second crank and their reciprocating masses are 150, 400 and 250 kg respectively. Find the mass of the reciprocating parts for the second cylinder and the relative angular positions of the cranks in order that the engine may be in complete primary balance.

8 (a) What do you understand by 'Torsionally equivalent shaft'?

(b) Describe in detail the method of finding the frequency of torsional vibration of a two rotor system.

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Code: 9A03503

R09

III B. Tech I Semester (R09) Supplementary Examinations, May 2012

MACHINE TOOLS

(Mechanical Engineering)

Time: 3 hours Max Marks: 70

Answer any FIVE questions
All questions carry equal marks
*****

1 Discuss in detail about the basic objectives of efficient and economical metal cutting operations.

2 Describe a multi-spindle automatic lathe machine in details.

3 With a neat sketch, explain the processing of producing horizontal flat surface by using a shaper.

4 Explain in detail, how facing operation is performed on a boring machine.

5 Classify various milling operations that can be performed on a milling machine.

6 (a) What do you understand by a vitrified bond?
(b) What are the advantages and disadvantages of this bond?

7 What is lapping? Explain in detail how it is done.

8 What are jigs and fixtures? Explain the use of jigs and fixtures in mass production.

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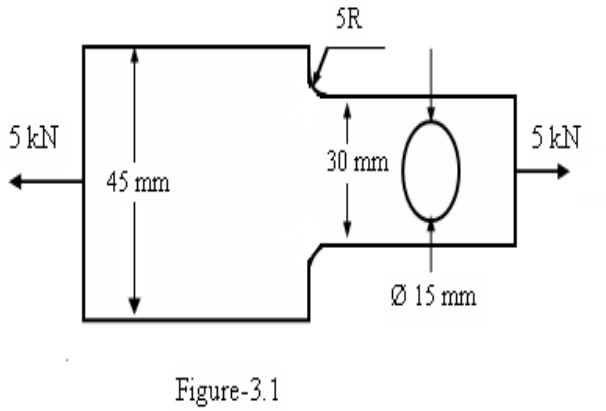

Figure-3.1

Figure 3.1 for question number 3 (b)

Code: 9A03504

R09

III B. Tech I Semester (R09) Supplementary Examinations, May 2012

DESIGN OF MACHINE ELEMENTS I

(Mechanical Engineering)

Time: 3 hours Max Marks: 70

Design books are not permitted in the examination hall.

Answer any FIVE questions
All questions carry equal marks
*****

1 (a) What are the important considerations that govern the choice of a material?
(b) What is meant by ductility, malleability and plasticity?

2 A cantilever of span 500 mm carries a vertical downward load of 6 kN at its free end. Assume yield strength of 350 MPa and factor of safety as 3. Find the economical cross section for cantilever, among: (i) Circular section of diameter'd'. (ii) Rectangular cross section with depth twice the width, and (iii) I-section of depth 5t and flange 4t, where t is the thickness. Specify the dimensions and cross-sectional area of the economic section.

3 (a) What are the criteria of failure for ductile material subjected to:
(i) Static load and (ii) varying load.
(b) A flat plate subjected to a tensile force of 5 kN is shown in figure-3.1. The plate material is grey cast iron FG 200 and the factor f safety is 2.5. Determine the thickness of the plate. Take the stress concentration factor as 1.8 at the hole and as 2.16 for the fillet radius.

4 (a) What are the advantages and disadvantages of riveted joints?
(b) A triple riveted lap joint is to be made between 6.5 mm plates. The allowable stresses are 35 N/mm^2 in tensile, 29 N/mm^2 in shear, and 52.5 N/mm^2 in compression. Calculate the rivet diameter, rivet pitch and back pitch, zig - zag riveting is to be used. Indicate how the joint will fail.

5 Several members are bolted together in such a manner that the deflection per unit load for the bolted members is the same as for the bolt. Determine: (i) if the initial tightening load on the bolt is 40 kN, what axial external load has to be applied to the bolt to cause separation of the bolted members? (ii) What is the resultant bolt load for an external load of 50 kN? (iii) What is the resultant bolt load for an external load of 100 kN?

6 Two rods having 30 mm x 30 mm square cross-section are connected using a gib and cotter. Calculate the leading dimensions of the joint so as to have the strength of the joint same as the strength of the rods in tension. For all the parts of the joint take the allowable stresses as follows:
Tensile Strength = 120 N/mm^2 Shear Strength = 70 N/mm^2 and
Compression strength = 240 N/mm^2.

Contd. in Page 2

7 A machine shaft turning at 600 rev/min, is supported on bearings 1000 mm apart as shown in figure-7.4. 15 KW is supplied to the shaft through a 450 mm pulley located 250 mm to the left of the right bearing. The power is transmitted from the shaft through a 200 mm spur gear located 250 mm to the right of the left hand bearing. The belt drive is at angle of 60^0 above the horizontal. The pulley weighs 800 N to provide some flywheel effect. The ratio of the belt tensions is 3:1. The gear has a 20^0 tooth form and mates with another gear located directly above the shaft. If the shaft material selected has an ultimate strength of 500 MN/m^2 and a yield point of 310 MN/m^2 determine the necessary diameter using the shock and fatigue factors as K_b = 1.5 and K_t = 1.0 in bending and torsion respectively.

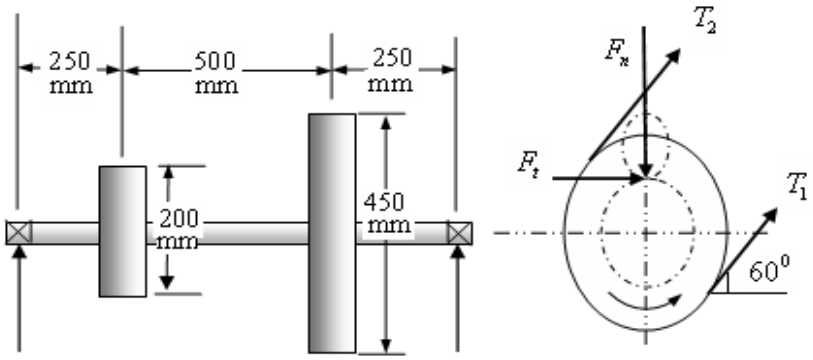

Figure-7.4

8 Design and sketch the dimensioned view of the rigid coupling for heavy duty with the following data:
(i) Power (KW) to Speed (rpm) ratio =1.5;
(ii) Maximum shear strength is 80 N/mm^2, and
(iii) Assume suitable any missing data.

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