Code : 1GA51

R11

ANNAMACHARYA INSTITUTE OF TECHNOLOGY & SCIENCES :: RAJAMPET
(AUTONOMOUS)

III B.Tech I Semester Supplementary Examinations June/July 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. What is Demand? Explain various factors that influence the demand for a computer? 14M
2. Define Elasticity of Demand? Explain its types and significance? 14M
3. From the following particulars calculate?
   a) Breakeven point in terms of sales value and in units
   b) No of units that must be sold to earn a profit of Rs 90,000

Fixed factory overhead cost	= Rs 60,000
Fixed Selling overhead cost	= Rs 12,000
Variable Manufacturing cost per unit	= Rs 12
Variable selling cost per unit	= Rs 3
Selling price per unit	= Rs 24

14M

4. What are the features of perfect competition? How Price and output are determined under perfect competition? 14M
5. Discuss are the characteristics of a Business unit? 14M
6. Explain the components of working Capital? 14M
7. Prepare trading, profit and loss account and Balance sheet as on that date

	Credit Rs	**Debit Rs**
Drawings and capital	=18,000	1,00,000
Furniture	=32,500	
Equipment	=15,000	
Loan payable		15,000
Interest on loan	=900	
Sales		1,00,000
Purchases	= 75,000	
Opening stock	= 25,000	
Trade Expenses	=15,000	
Wages	=2,000	
Insurance	=1,000	
Commission Received		4,500
Sundry Debtors	=28,100	
Cashed bank	=20,000	
Sundry creditors		10,000
Interest received		3,000
	=2,32,000	**=2,32,000**

Adjustments :-

a) closing stock = Rs 60,000
b) Wages outstanding = Rs 500
c) Depreciation on Furniture = 10 %

8. Explain Significance and computation of Liquidity Ratios and activity ratios? 14M

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R11

Code : 1G551

ANNAMACHARYA INSTITUTE OF TECHNOLOGY & SCIENCES :: RAJAMPET
(AUTONOMOUS)

III B.Tech. I Semester Supplementary Examinations June/July 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. In a single-heater regenerative cycle the steam enters the turbine at 30 bar, 400°C and the exhaust pressure is 0.1 bar. The feed water heater is a direct contact type which operates at 5 bar. Find : (i) the efficiency and the steam rate of the cycle, (ii) the increase in mean temperature of heat addition, efficiency and steam rate as compared to the Rankine cycle without regeneration. Pump work may be neglected.

2. With the aid of a neat sketch explain the working of a Locomotive boiler.

3. a) With a chimney of height 45m, the temperature of flue gases with natural draught was 370°C. The same draught was developed by induced draught fan and the temperature of the flue gases was 150°C. Mass of the flue gases formed is 25kg per kg of coal fired. The boiler house temperature is 35°C. Find the efficiency of the chimney and the natural draught produced in mm of water.

   b) The following readings were obtained during a boiler trial of 6 hours duration. Mean steam pressure=12 bar; mass of steam generated=40,000kg; mean dryness fraction = 0.85; mean feed water temperature=30°C; coal used=4000kg; calorific value of coal= 33400kJ/kg. Calculate:

      (i) Factor of equivalent evaporation

      (ii) Equivalent evaporation from and at 100°C,

      (iii) Efficiency of the boiler.

4. Steam at a pressure of 15 bar and dryness fraction 0.97 is discharged through a convergent-divergent nozzle to a back pressure of 0.2 bar. The mass flow rate is 9kg/kWh. If the power developed is 220kW, determine:

      (i) Throat pressure,

      (ii) Number of nozzles required if each nozzle has a throat of rectangular cross-section of 4mmX8mm,

      (iii) If 12% of the overall isentropic enthalpy drop re heats by friction, the steam in divergent portion, find the cross-section of the exit rectangle.

5. The following data refer to a single stage impulse turbine: Isentropic nozzle heat drop=251kJ/kg; nozzle efficiency=90%; nozzle angle=20°; ratio of blade speed to whirl component of steam speed= 0.5; blade velocity coefficient=0.9; the velocity of steam entering the nozzle= 20m/s. Determine:

   (i) The blade angles at inlet and outlet if the steam enters into the blades without shock and leaves the blades in an axial direction,

   (ii) Blade efficiency,

   (iii) Power developed and axial thrust if the steam flow is 8kg/s.

6. A 50% reaction turbine (with symmetrical velocity triangles) running at 400 rpm has the exit angle of the blades as 20° and the velocity of steam relative to the blades at the exit is 1.35 times the mean blade speed. The steam flow rate is 8.33 kg/s and at a particular stage the specific volume is 1.381 m^3/kg. Calculate for this stage:

   (i) A suitable blade height, assuming the rotor mean diameter 12 times the blade height, and

   (ii) The diagram work.

7. A surface condenser deals with 13,000 kg of steam/hour. The leakage air in the system amounts to 1 kg per 2700 kg of steam. The vacuum in the air pump suction is 705 mm of Hg (barometer 760 mm of Hg) and temperature is 34.6°C. Determine the discharging capacity of the wet air pump which removes both air and condensate in m^3/min, taking the volumetric efficiency of the pump as 90%. If the air pump is single-acting and runs at 60 rpm, and piston stroke is 1.25 times the diameter of the pump, find the dimensions of the wet air pump.

8. A single cylinder, double-acting, non-condensing steam engine 200 mm in diameter and 400 mm in stroke develops 30kW at 100 rpm. The clearance is 10% and cut-off is 40% of stroke. The pressure at the point of cut-off is 5 bar. The compression starts at 80% of the stroke during return stroke. The pressure of the steam on compression curve at 90% of the return stroke is 1.5 bar and steam is dry and saturated. Calculate the actual and minimum theoretical possible specific steam consumption on I.P basis. Take the missing quantity of cut-off as 0.0072 kg/stroke.

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Code : 1G553

R11

ANNAMACHARYA INSTITUTE OF TECHNOLOGY & SCIENCES :: RAJAMPET
(AUTONOMOUS)

III B.Tech I Semester Supplementary Examinations June/July 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) What is meant by orthogonal cutting and oblique cutting?
   b) Discuss the various types of chips produced during metal machining?
2. a) Find the angle at which the compound rest should be set up to turn tapes on the work piece having a length of 300mm, Larger diameter 45 mm and smaller diameter 30mm
   b) Explain principle features of single spindle automatic lathe
3. a) Draw a block diagram of a horizontal shaper and write about its important parts.
   b) What in the difference between a push cut shaper and a pull cut shaper
4. a) Sketch a twist dill write its main parts and their function
   b) With a neat sketch explain the working of jig boning machine
5. a) Sketch and explain the direct method of indexing.
   b) What in slab cutters? Explain
6. a) The designation of grinding wheel is 51-A-36-L-5-V-23 explain each letter or numerical stands for.
   b) Discuss the various methods of making grinding wheel
7. a) Compare honing and lapping
   b) With help of neat sketch, disuses the working of a continuous surface broaching machine
8. a) Explain principles of design of jigs and fixtures
   b) Explain 3-2-1 principle with an example.

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Code : 1G554

R11

ANNAMACHARYA INSTITUTE OF TECHNOLOGY & SCIENCES :: RAJAMPET
(AUTONOMOUS)

III B.Tech. I Semester Supplementary Examinations June/July 2014

Design of Machine Elements-I

(Mechanical Engineering)

Time: 3 hours **Max Marks: 70**

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

* * * * *

1. a) Select a suitable material for the following machine components with reason.

   (i) Spindle of Drilling Machine (ii) Connecting Rod

   (iii) Gas Turbine Blade (iv) Bearing Bush 6M

   b) Explain the general principles for the design of castings. 8M

2. a) Explain the following theories of elastic failure.

   (i) Maximum shear stress theory (ii) Distortion energy theory. 6M

   b) A weight of 100 N falls from a height of 60 mm on a collar attached to a bar of 400 mm long. Find the diameter of the bar, if the bar material steel, is having yield strength in tension of 460 MPa. Take the factor of safety as 2 and modulus of elasticity as 2 x 10^5 N/mm^2. 8M

3 a) Explain the following terms:

   (i) Stress concentration (ii) Endurance limit 4M

   b) A solid circular shaft, 15 mm in diameter, is subjected to torsional shear stress, that varies from 0 to 35 N/mm^2 and at the same time, is subjected to an axial stress that varies from -15 to +30 N/mm^2. The frequencies of variation of these stresses 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 factor of safety. 10M

4 a) Explain the various stresses induced in screwed fastenings due to initial tighting. 6M

   b) Two plates of 15 mm thick are connected by a double riveted lap joint with zig-zag riveting. Assume the allowable stress for both rivets and plates as 180 MPa in tensile, 120 MPa in crushing and 60 MPa in shear. Design the joint and find its efficiency. 8M

5. a) A 65 mm diameter solid shaft is to be welded to a flat plate by a fillet weld around the circumference of the shaft. Determine the size of the weld, if the torque on the shaft is 3 kN-m. The allowable shear stress in the weld is 70 MPa. 6M

   b) Explain the procedure for designing an axially loaded unsymmetrical welded joint. 8M

6. a) What is a cotter joint and what are its applications? 4M

   b) Describe the design procedure of a gib and cotter joint. 10M

7. A machine shaft running at 600 rpm is supported on bearings, 700 mm apart. 20 kW power is supplied to the shaft through a 500 mm diameter pulley, located at 250 mm to the right of the right bearing. The power is transmitted from the shaft through a spur gear of 200 mm diameter, which is located at 250 mm to the right of the left hand bearing. The belt drive is at angle of 60^0 above the horizontal. The pulley weight is 700 N. The ratio of the belt tensions is 2.5. The gear has 20^0 involute teeth, and meshes with another gear located directly above the shaft. Determine the shaft diameter, assuming permissible shear stress as 45 MPa. 14M

8. A mild steel shaft has to transmit 70 kW power at 240 rpm. The allowable shear stress in the shaft material is limited to 45 MPa, and the angle of twist is not to exceed 1^o in a length of 20 times the shaft diameter. Determine the shaft diameter, and design a Cast Iron flange coupling of protected type for the shaft.

   Shaft and key are made of same material.

   Permissible shear stress in the Cast Iron flange = 14 MPa;

   Permissible shear stress in the coupling bolts = 30 MPa.

   Permissible crushing stress in the key material = 100 MPa.

   Modulus of rigidity of the shaft material = 0.84×10^5 MPa.

   Draw a neat dimensioned diagram of the coupling. 14M

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Code : 1G555 **R11**

ANNAMACHARYA INSTITUTE OF TECHNOLOGY & SCIENCES :: RAJAMPET
(AUTONOMOUS)

III B.Tech. I Semester Supplementary Examinations June/July 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)

* * * * *

1. a) State Fourier's law of heat conduction. Why is the negative sign used? 6M
   b) Derive general heat conduction equation in cylindrical coordinates. 8M
2. a) Derive an expression for 1- Dimensional, steady state heat conduction state, with internal heat generation for plane wall. 7M
   b) Nichrome, having a resistivity of 100μ-cm is to be used as a heating element in a 10kW heater. The Nichrome surface temperature should not exceed 1220^0C. Other design features include surrounding air temperature is 20^0C, Outside surface coefficient is 1.15 kW/m3k, Thermal conductivity of Nichrome =- 17 W/mk. Find out which diameter Nichrome wire is necessary for a 1 meter long heater. Also find the rate of current flow. 7M
3. a) What are Biot and Fourier numbers? Explain their physical significance. 6M
   b) An aluminum sphere weighing 5.5kg and initially at a temperature of 290^0C is suddenly immersed in a fluid at 15^0C. The convective heat transfer coefficient in 59 W/m2k. Estimate the time required to cool the aluminum to 95^0C. 8M
4. a) Write a brief note on Continuity, Momentum and Energy Equations 6M
   b) Using a linear velocity profile $u/u \propto = y/\delta$, for flow over a flat plate, obtain an expression for the boundary layer thickness as a functions of x. 8M
5. a) Define the local and average skin friction (drag) coefficient for a flat smooth plate at zero incidence. 6M
   b) Water at 50^0C enters a 1.5cm diameter and 3m long tube with a velocity of 1m/s. The tube wall is maintained at a constant temperature of 90^0C. Calculate the heat transfer coefficient and the total amount of heat transferred if the exit water temperature is 64^0C. 8M
6. a) Differentiate between the mechanism of film wise and drop wise condensation. 6M
   b) A wire of 1 mm diameter and 150 mm length is submerged horizontally in water at 7 bar. The wire carries a current of 131.5 A with an applied voltage of 2.15 V. If the surface of the wire is maintained at 180^0C, calculate the heat flux and the boiling heat transfer coefficient. 8M
7. a) Give a comparison of parallel flow and counter flow heat exchangers. Why are counter flow heat exchangers mostly used? 6M
   b) In a tubular condenser, steam condenses at atmospheric pressure on the external surface of the tubes. Cooling water flowing inside the tubes (ID=2.5 cm) which is 10 mm long and the number of tubes is 10. Water enters at 30^0C and leaves at 65^0C. If the flow rate of water is 3600 kg/hr, find out the Effectiveness of condenser, NTU and Overall heat transfer coefficient based on the inner surface area. 8M
8. a) Derive an expression for the shape factor to the radiation heat exchange between two surfaces. 6M
   b) Two parallel gray planes have emissivities of 0.8 and 0.7 and are maintained at 800^0C and 1500^0C. What is the net radiant energy exchange? What would be the reduction in heat transfer if a radiation shield of polished aluminum ($\epsilon = 0.04$) is placed between them? 8M

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Code : 1G552

R11

ANNAMACHARYA INSTITUTE OF TECHNOLOGY & SCIENCES :: RAJAMPET
(AUTONOMOUS)

III B.Tech I Semester Supplementary June/July 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. A four wheeled motor car of mass 2000 kg has a wheel base 2.5 m, track width1.5 m and height of centre of gravity 500 mm above the ground level and lies at 1 meter from the front axle. Each wheel has an effective diameter of 0.8 m and a moment of inertia of 0.8 kg-m^2.The drive shaft, engine flywheel and transmission are rotating at 4 times the speed of road wheel, in a clockwise direction when viewed from the front, and is equivalent to a mass of 75 kg having a radius of gyration of 100 mm. If the car is taking a right turn of 60 m radius at 60 kmph, find the load on each wheel? 14M

2. a) Explain the terms: friction circle and friction axis? 4M

   b) A square threaded bolt of root diameter 22.5 mm and pitch 5mm is tightened by screwing a nut whose mean diameter of bearing surface is 50mm. If coefficient of friction for nut and bolt is 0.1 and for nut and bearing surface 0.16, find the force required at the end of a spanner 500 mm long when the load on the bolt is 10 kN? 10M

3. a) Describe with neat sketch the prony brake dynamometer? 6M

   b) In a winch, the rope supports a load W and is wound round a barrel 450 mm diameter. A differential band brake acts on a drum 800 mm diameter which is keyed to the same shaft as the barrel. The two ends of the bands are attached to pins on opposite sides of the fulcrum of the brake lever and at distance of 25 mm and 100 mm from the fulcrum. The angle of lap of the brake band is 250° and the coefficient of friction is 0.25. What is the maximum load W which can be supported by the brake when a force of 750 N is applied to the lever at a distance of 3000 mm from the fulcrum? 8M

4. A horizontal cross compound steam engine develops 300 kW at 90 r.p.m. The coefficient of fluctuation of energy as found from the turning moment diagram is to be 0.1 and the fluctuation of speed is to be kept within ± 0.5 % of the mean speed. Find the weight of the flywheel required, if the radius of gyration is 2 meters? 14M

5. A Propel governor has equal arms of length 300 mm. The upper and lower ends of the arms are pivoted on the axis of the governor. The extension arms of the lower links are each 80 mm long and parallel to the axis when the radii of rotation of the balls are 150 mm and 200 mm. The mass of each ball is 10 kg and the mass of the central load is 100 kg. Determine the range of speed of the governor? 14M

6. a) Explain the role of reference plane in balancing masses of rotation in different planes? 6M

   b) A,B,C and D are four masses carried by a rotating shaft at radii 100 mm,125 mm, 200 mm and 150 mm respectively. The planes in which the masses revolve are spaced 600 mm apart and the mass of B, C and D are 10 kg, 5 kg, and 4 kg respectively. Find the required mass A and the relative angular settings of the four masses so that the shaft shall be in complete balance? 8M

7. a) Write short notes on primary and secondary balancing? 4M

   b) The following data refer to two cylinder locomotive with cranks at 90°**:**

   Reciprocating mass per cylinder = 300 kg; Crank radius = 0.3 m; Driving wheel diameter =1.8 m; Distance between cylinder centre lines = 0.65m; Distance between the driving wheel central planes = 1.55m. Determine 1.The fraction of the reciprocating masses to be balanced, if the hammer blow is not to exceed 46 kN at 96.5 kmph. 2. The variation in tractive effort and 3.The maximum swaying couple. 10M

8. a) Define the term node and explain how it is obtained. 5M

   b) A 4-cylinder engine and flywheel coupled to a propeller are approximated to a 3–rotor system in which the engine is equivalent to a rotor of moment of inertia 800 kg-m^2, the flywheel to a second rotor of 320 kg-m^2 and the propeller to a third rotor of 20 kg-m^2. The first and the second rotors being connected by 50 mm diameter and 2 meter long shaft and the second and third rotors being connected by a 25 mm diameter and 2 meter long shaft. Neglecting the inertia of the shaft and taking its modulus of rigidity as 80 GN /m^2. Determine 1.Natural frequencies of torsional oscillations, and 2. The positions of the nodes. 9M

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