Hall Ticket Number :										

Code: 4GA51

R-14

III B.Tech. I Semester Regular Examinations November 2016

Managerial Economics and Financial Analysis

(Common to CE, ME and ECE)

Max. Marks: 70 Time: 3 Hours

Answer *all five* units by choosing one question from each unit (5 x 14 = 70 Marks)

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UNIT–I

1. Define Managerial Economics? Explain its Nature and Scope?

OR

2. What is Law of Demand? Explain its assumptions and exceptions?

UNIT–II

3. Explain Production function with single variable?

OR

4. What is Break-even analysis? Discuss its objectives, assumptions and importance?

UNIT–III

5. Elaborate Price output determination in perfect competition market.

OR

6. Explain various public sector business organizations with suitable examples?

UNIT–IV

7. What is Capital? Explain various sources of raising capital?

OR

8. Distinguish between payback period method and accounting rate of return in capital budgeting?

UNIT–V

9 What is Journal? Explain its importance in book-keeping accounting system?

OR

10 Discuss various liquidity ratios in financial analysis?

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Hall Ticket Number :										

Code: 4G551

R-14

III B.Tech. I Semester Regular Examinations November 2016

Applied Thermodynamics - II

(Mechanical Engineering)

Max. Marks: 70 Time: 3 Hours

Answer *all five* units by choosing one question from each unit (5 x 14 = 70 Marks)

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UNIT–I

1. a) Explain the performance of a Modified Rankine Cycle with the help of a neat T-S and schematic diagram. 7M

   b) Steam is supplied to a steam turbine at pressure of 20 bar and 230^0C. It is then expanded isentropically to a pressure of 1 bar. Determine:

   i) Rankine cycle efficiency **ii)** specific volume of steam at the end of expansion **iii)** carnot efficiency between the same temperature limits. 7M

OR

2. a) Why the carnot cycle cannot be considered as the theoretical cycle for steam power plants even though its efficiency is maximum? 7M

   b) In an ideal Rankine cycle, the steam condition at turbine inlet is 20 bar and 350^0C. The condenser pressure is 0.08 bar. Determine the cycle efficiency. If the steam flow rate is 2000 kg/hr, what is the power output? 7M

UNIT–II

3. a) Explain the working principle of a Babcock& Wilcox boiler with a neat sketch? 7M

   b) A boiler uses 14 kg of air per kg of fuel. The temperature of the hot gasses inside the chimney is 597^0 C and the outside air is 17^0 C. If the draught produced is 26 mm of water. Determine the minimum height of the chimney required. 7M

OR

4. a) Explain the working principle of a Lancashire boiler with a neat sketch? 7M

   b) A chimney has a height of 60 meters. The temperature of air is 27^0 C. Find the draught in mm of water when the temperature of chimney gasses is such as to cause the mass of these gases discharged in a given time to be maximum. 7M

UNIT–III

5. a) Derive the condition for maximum discharge through a convergent-Divergent nozzle. 7M

   b) Find the percentage increase in discharge from a convergent-Divergent nozzle expanding from 8.75 bar dry to 2 bar, when **i)** the expansion is taking place under thermal equilibrium **ii)** the steam is in meta stable state during part of its expansion. Take area of the nozzle is 2500 mm^2. 7M

OR

6. a) Explain the function and types of cooling towers? Mention their merits and demerits. 7M

   b) A gas expands in a convergent-Divergent nozzle from 5 bar to 1.5 bar, the initial temperature being 700^0C and the nozzle efficiency is 90%. All the losses take place after the throat. For 1 kg/s of mass rate of the gas, find the throat and the exit area. Take n=1.4, R=287 KJ/kg-K. 7M

UNIT–IV

7. a) What are the methods of governing a steam turbine? Describe any one method of governing steam turbines? 7M

   b) At a stage of a Reaction turbine, the rotor diameter is 1.4 m and speed ratio is 0.7. If the blade outlet angle is 20^0 and the rotor speed is 3000 RPM. Find the blade inlet angle and diagram efficiency. Also find the percentage increase in diagram efficiency and the rotor speed, if the turbine is designed to run at the best theoretical speed. 7M

OR

8. a) Explain the term "compounding of a steam turbine". What are the different methods? Explain anyone with a neat sketch. 7M

   b) A certain stage of a parson's reaction turbine consists of one row of fixed and moving blades. Mean diameter of the blades=680 mm, Speed of the turbine=3000 RPM, mass of steam passing=13.5 kg/s, steam velocity at exit from fixed blades=143.7 m/s, blade outlet angle= 20^0. Calculate the power developed in the stage and the gross efficiency assuming carry over coefficient as 0.74 and the efficiency of conversion of heat energy into kinetic energy in the blade channels as 0.92. 7M

UNIT–V

9. a) Explain "Heat balance sheet". What important light does it throw on the working of a steam engine? 7M

   b) A steam engine uses 500 kg of dry saturated steam/hr at a pressure of 20 bar and exhaust takes place at a pressure of 0.2 bar with dryness fraction of 0.78. Find Rankine efficiency and relative efficiency of the engine, if it develops 40 KW at full load. 7M

OR

10. a) What are the methods to reduce the cylinder condensation in steam engine? Explain them briefly. 7M

    b) A double acting steam engine with piston diameter 275 mm, stroke length 650 mm and cut-off 50% of stroke length is supplied steam at a pressure of 7 bar. The back pressure is 1.2 bar. Assuming a diagram factor of 0.75, find indicated power of the engine when it runs at 250 RPM. Also find the mechanical efficiency of the engine if its brake power is 100 KW. Neglect clearance. 7M

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Hall Ticket Number :										

R-14

Code: 4G552

III B.Tech. I Semester Regular Examinations November 2016

Dynamics of Machinery

(Mechanical Engineering)

Max. Marks: 70 Time: 3 Hours

Answer *all five* units by choosing one question from each unit (5 x 14 = 70 Marks)

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UNIT–I

1. a) What is friction? Is it a blessing or curse? Justify your answer and give examples? 6M

   b) A Conical pivot bearing 150mm in diameter has a cone angle of 120^0. If the shaft supports an axial load of 20 KN and the coefficient of friction in 0.03, find the power lost in friction when the shaft rotates at 200 rpm. 8M

OR

2. a) How do you classify clutches? 2M

   b) Single plate clutch, having two active surfaces, transmits 10 kW of power and the maximum torque developed is 20 N-m. Axial pressure is not to exceed 100 KN/m^2. Outer diameter of the friction plate is 1.3 times the inner diameter determine these diameters and the axial force excreted by the springs. (μ=0.25) 12M

UNIT–II

3. a) Describe prony brake dynamometer? 4M

   b) The following data refer to a laboratory experiment with rope break:

   Diameter of the flywheel = 1m
   Diameter of the rope = 10mm
   Dead weight of the break = 50kg
   Speed of the engine = 180rpm
   Spring balance reading=120N
   Find the power of the engine? 10M

OR

4. a) What do you mean by spin, precession and gyroscopic planes? 4M

   b) A rear engine automobile is travelling along a curved track of 120 m radius. Each of the four wheels has a moment of inertia of 2.2 kg-m^2 and an effective diameter of 600 mm. The rotating parts of the engine have a moment of inertia of 1.25 kg-m^2. The gear ratio of the engine to the back wheel is 3.2. The engine axis is parallel to the rear axle and the crank shaft rotates in the same sense as the road wheels. The mass of the vehicle is 2050 kg and the centre of mass is 520 mm above the road level. The width of the track is 1.6 m. What will be the limiting speed of the vehicle if all the four wheels maintain contact with the road surface? 10M

UNIT–III

5. a) What is the function of the flywheel? How does it differ from that of a governor? 6M

   b) An engine flywheel has a mass of 6.5 tones and the radius of gyration is 2m. If the maximum and minimum speeds are 120 rpm and 118 rpm respectively. Find maximum fluctuation of energy? 8M

OR

6. a) What is the function of a governor? 4M

   b) In a porter governor, the upper and lower arms are each 250mm long and are pivoted on the axis of rotation. The mass of each rotating ball is 3kg and the mass of the sleeve is 20kg. The sleeve is in its lowest position when the arms are inclined at 30^0 to the governor axis. The lift of the sleeve is 36mm. Find the force of friction at the sleeve, if the speed at the moment is falls from the highest position. Also find the range of speed of the governor. 10M

UNIT–IV

7. a) Explain the method of balancing of two masses revolving in the same plane? 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 200 mm. If the balancing masses revolve at a radius of 100 mm, find their magnitudes and angular positions. 10M

OR

8. a) What do you mean by primary and secondary balance in reciprocating engines? 4M

   b) An inside cylinder locomotive has its cylinder centre lines 0.7 m apart and has a stroke of 0.6 m. The rotating masses per cylinder are equivalent to 150 kg at the crank pin, and the reciprocating masses per cylinder to 180 kg. The wheel centre lines are 1.5 m apart. The cranks are at right angles. The whole of the rotating and 2/3 of the reciprocating masses are to be balanced by masses placed at a radius of 0.6 m. Find the magnitude and direction of the balancing masses. Find the fluctuation in rail pressure under one wheel, variation of tractive effort and the magnitude of swaying couple at a crank speed of 300 r.p.m. 10M

UNIT–V

9. a) What do you mean by whirling of shafts? 4M

   b) A shaft 50 mm diameter and 3 metres long is simply supported at the ends and carries three loads of 1000 N, 1500 N and 750 N at 1 m, 2 m and 2.5 m from the left support. The Young's modulus for shaft material is 200 GN/m^2. Find the frequency of transverse vibration. 10M

OR

10. a) Define the terms: Vibration Isolation and transmissibility 4M

    b) A shaft 1.5 m long, supported inflexible bearings at the ends carries two wheels each of 50 kg mass. One wheel is situated at the centre of the shaft and the other at a distance of 375 mm from the centre towards left. The shaft is hollow of external diameter 75 mm and internal diameter 40 mm. The density of the shaft material is 7700 kg/m^3 and its modulus of elasticity is 200 GN/m^2. Find the lowest whirling speed of the shaft, taking into account the mass of the shaft. 10M

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Hall Ticket Number :										

R-14

Code: 4G553

III B.Tech. I Semester Regular Examinations November 2016

Machine Tools

(Mechanical Engineering)

Max. Marks: 70 Time: 3 Hours

Answer *all five* units by choosing one question from each unit (5 x 14 = 70 Marks)

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UNIT–I

1. The following observations were made in an orthogonal cutting test with a tool of rake angle 10^0

   The chip thickness ratio = 0.37
   Horizontal component of cutting force = 1000N
   Vertical component of cutting force = 1500N

   From Merchant's theory, Calculate the various component of cutting forces, and the co efficient of friction at the chip tool interface. 14M

OR

2. a) Define Tool life? Explain the parameters that control the tool life of single point cutting tool 10M

   b) what are the desirable properties of a cutting tool materials 4M

UNIT–II

3. Explain the methods used for the generation of threads in a lathe 14M

OR

4. a) Describe the method of operation of Swiss type automatic lathe, with application & tool used 10M

   b) How automatic lathes are classified 4M

UNIT–III

5. Show with neat sketches the constructional features of a Twist drill and label the important features 14M

OR

6. Explain compound indexing and differential indexing with neat sketch 14M

UNIT–IV

7. Write short notes on
   a) abrasive types & usage
   b) types of bond & designation of grinding wheel 14M

OR

8. Describe various Broaching machines used in industry 14M

UNIT–V

9. Explain honing and lapping process with neat sketch 14M

OR

10. a) Explain the three types of locators used in fixtures 8M

    b) Explain the reason for using a Diamond pin 6M

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Hall Ticket Number :										

R-14

Code: 4G554

III B.Tech. I Semester Regular Examinations November 2016

Design of Machine Elements-I

(Mechanical Engineering)

Max. Marks: 70 Time: 3 Hours

Answer *all five* units by choosing one question from each unit (5 x 14 = 70 Marks)

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UNIT–I

1. a) Discuss the steps involved in design. 10M

   b) Why brittle materials have limited applications in engineering? 4M

OR

2. a) Discuss the following Theories of failure

      i) Max. Shear Stress theory ii) Distortion energy theory 6M

   b) A bolt is subjected to an axial pull of 10kN and a transverse shear force of 5kN, the yield strength of the bolt is 300MPa. Consider its factor of safety 2.5. Determine the diameter of the bolt using

      i) Max. Normal stress theory

      ii) Max. shear stress theory 8M

UNIT–II

3. a) Define endurance limit? Discuss the factors which affect the endurance limit of the material. 7M

   b) Discuss about Soderberg criteria. 7M

OR

4. a) What is stress concentration? And How to minimize it. 7M

   b) A fuel pump push rod to be designed for a repeated load of 10kN. The material of the rod has yield strength of 400MPa and endurance limit of 250MPa for reversal bending. The endurance strength or fatigue strength of the material is 360MPa at 10^5 cycles. For a factor of safety 2, determine the required diameter of the push rod for finite life of 10^5 cycles and for an infinite life. 7M

UNIT–III

5. a) What do you mean by bolt of uniform strength? 4M

   b) A cylinder head of a steam engine is subjected to a steam pressure of 0.7N/mm^2, it is held in position by means of 12 bolts. A soft copper gasket is used to make the joint leak proof. The effective diameter of cylinder is 300mm. Find the size of the bolt, so that the stress in the bolt is not to exceed 100MPa. 10M

OR

6. a) What is the strength of the riveted joint? 2M

   b) A double riveted butt joint, in which the pitch of the rivets in the outer rows is twice that in the inner rows, connects two 16 mm thick plates with two cover plates each 12 mm thick. The diameter of rivets is 22 mm. Determine the pitches of the rivets in the two rows if the working stresses are not to exceed the following limits: Tensile stress in plates = 100 MPa, Shear stress in rivets = 75 MPa, and bearing stress in rivets and plates = 150 MPa. Make a fully dimensioned sketch of the joint by showing at least two views. 12M

UNIT–IV

7. a) Differentiate a key and a cotter? 2M

   b) Two steel rods are to be connected by means of a steel sleeve and two steel cotters. The rods are subjected to a tensile load of 40kN. Design the joint. Take permissible stress in tension as 60MPa, in shear as 50MPa and in crushing as 90MPa. 12M

OR

8. a) Enumerate different types of keys. 4M

   b) A solid steel machine shaft with safe shear stress of 50MN/m^2 transmits a torque of 1000NM. Find the shaft diameter. A square key having width equal to ¼ of shaft diameter and length equal to 1.5 times the shaft diameter is used. Find the dimensions of the key and check

   The key for its induced shear stress and compressive stresses. Also obtain the factor of safety of the key in shearing and in crushing, allowing an ultimate shear stress of 350MN/m^2 and the stress for compression is 400 MN/m^2. 10M

UNIT–V

9. a) Distinguish axle and shaft. 2M

   b) A line shaft is driven by means of a motor is placed vertically below it. A pulley on the shaft is 1.5m in diameter and has belt tension 5.8kN and 1.2kN on tight side and slack side of belt. Both the tensions may be assumed vertically. The pulley is overhanging on the shaft with a distance of 500mm. Find the diameter of shaft the shear stress is limited to 42Mpa. 12M

OR

10. a) What is the most commonly used material for shafting? 2M

    b) A split sleeve coupling is required to transmit 70kW at 180rpm. The permissible stress in the shafts 40MPa. Assuming that the two halves of the coupling are connected by 8 bolts, determine the diameter of the bolts, if the permissible stress for the bolt material is 70MPa and co-efficient of friction between the shaft and split sleeve is 0.3. 12M

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Hall Ticket Number :										

Code: 4G555 **R-14**

III B.Tech. I Semester Regular Examinations November 2016

Heat Transfer

(Mechanical Engineering)

Max. Marks: 70 Time: 3 Hours

Answer *all five* units by choosing one question from each unit (5 x 14 = 70 Marks)

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UNIT–I

1. a) Derive the Fourier equation in 3D by Cartesian co-ordinate system.

   b) Asbestos layer of 10mm thickness (k=0.116W/mK) is used as insulation over a boiler wall. Consider an area of 0.5m^2 and find out the rate of heat flow as well as the heat flux over this area if the temperatures on either side of the insulation are 300^{0}C and 30^{0}C.

OR

2. a) Explain the concept of combined heat transfer mechanism with the help of examples.

   b) Consider a plane wall 2cm thick, with uniformly distributed heat sources (q_g, W/m^3) inside its volume; its left and right faces are maintained at temperatures T1 and T2, respectively. Steady state temperature distribution in this wall is given by: $T(x)=160-1000x-10^5x^2$. If q_g=40MW/m^3, determine:

   i. Temperatures T_1 and T_2 **ii.** Heat flux at the left face

   iii. Heat flux at the right face **iv.** Heat flux at the centre of the plate

   v. Average temperature of the plate.

UNIT–II

3. a) Derive the equation for heat transfer for composite slab.

   b) A composite wall consists of a 10cm layer of building brick (k=0.7 W/(mC)) and 3 cm thick plaster (k=0.5W/(mC)). An insulation material of k=0.08W/(mC) is to be added to reduce the heat transfer through the wall by 70%. Determine the thickness of the insulating layer.

OR

4. a) Explain the criteria for lumped system analysis.

   b) A steel ball of 5cm diameter initially at a uniform temperature of 450^{0}C is suddenly placed in an environment at 100^{0}C. Heat transfer coefficient h , between the steel ball and the fluid is 10W/(m^2K.). For steel, c_p=0.46kJ/(kgK),ρ=7800kg/m^3,k=35 W/mK. Calculate the time required for the ball to reach a temperature of 150^{0}C. Also, find the rate of cooling after 1 hr. Show graphically how the temperature of the sphere falls with time.

UNIT–III

5. a) Explain the method of Buckingham π-theorem and its limitations.

   b) A refrigerated truck is moving at a speed of 85 km/hr where ambient temperature is 50^{0}C. The body of the truck is of rectangular shape of size 10m(L) x 4m(W) x 3m (H). Assume the boundary layer is turbulent and the wall surface temperature is at 10^{0}C. Neglect heat transfer from vertical front and backside of truck and flow of air is parallel to 10m long side. Calculate heat loss from the four surfaces. For turbulent flow over flat surfaces: $Nu=0.036.Re^{0.8}.Pr^{0.33}$ .Average properties of air at 30^{0}C: ρ=1.165kg/m^3, Cp=1.005kJ/kgK, v=16.10^{-6}m^2/s, Pr=0.701

OR

6. a) Derive the governing equation and its solution by integral method in free convection.

   b) A furnace door, 1.5m high and 1m wide, is insulated from inside and has an outer surface temperature of 70^{0}C. If the surrounding ambient air is at 30^{0}C, calculate the steady state heat loss from the door.

UNIT–IV

7. a) Draw the flux plot and explain different regimes in it.

   b) A steam condenser consists of a square array of 400 horizontal tubes, each 6mm in diameter. The tubes are exposed to exhaust steam arriving from the turbine at a pressure of 0.1 bar. If the tube surface temperature is maintained at a temperature of 25^0C by circulating cold water through the tubes, determine the heat transfer coefficient and the rate at which the steam is condensed per unit length of tubes for the entire array. Assume laminar film condensation and that there are no condensable gases mixed with steam.

OR

8. a) Obtain the relation between intensity of radiation and emissive power.

   b) The net radiation from the surface of two parallel plates maintained at temperatures T1 and T2 is to be reduced by 79 times. Calculate the number of screens to be placed between two surfaces to achieve this reduction in heat exchange, assuming the emissivity of screens as 0.05 and that of surfaces as 0.8.

UNIT–V

9. a) Derive an equation for LMTD for counter flow heat exchanger.

   b) In a double pipe counter flow heat exchanger, 10,000 kg/h of oil (Cp=2.095 kJ/kgK) is cooled from 80^0C to 50^0C by 8000 kg/h of water entering at 25^0C. Determine the area of heat exchanger for an overall u=300 W/(m2K). Take Cp for water as 4.18 kJ/kgK.

OR

10. a) Derive NTU-Effectiveness relation for counter flow heat exchanger.

    b) Consider a heat exchanger for cooling oil which enters at 180^0C, and cooling water enters at 25^0C. Mass flow rates of oil and water are: 2.5 and 1.2 kg/s, respectively. Area for heat transfer =16m^2. Specific heat data for oil and water and overall u are given: Cp_{oil}=1900 J/kgK; Cp water=4184 J/kgK;u=285 W/m^2K. Calculate outlet temperatures of oil and water for parallel and counter flow HX.

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