Code: 9A03501

1

III B. Tech I Semester (R09) Regular Examinations, November 2011
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 Discuss with the help of T-s diagram, the effect of the variation of the following variables on efficiency and power output.
(i) inlet pressure
(ii) initial temperature and initial pressure maintaining constant
(iii) condenser pressure.

2 With the help of neat sketch, explain an injector for feeding water to the boiler drum. Why it is not used for large capacity boilers? Explain its location in boiler installation.

3 Explain the significance of critical pressure ratio in a steam turbine. Obtain analytically its value in terms of the index of expansion.

4 (a) Describe the use of combined velocity triangle of an impulse turbine.
(b) What is compounding? Give their merits, demerits and uses.

5 Further prove that the moving and fixed blades should have the same shape for a 50% reaction.

6 (a) What is the necessity of a condenser in a steam power plant? What are its functions?
(b) What are the reasons for inefficiency in surface condensers?

7 Describe with a neat sketch the working of a constant-pressure combustion gas turbine cycle.

8 (a) Give the differences between jet thrust and propeller thrust.
(b) What are the propulsive devices in aircrafts and missiles?

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Code: 9A03501

2

III B. Tech I Semester (R09) Regular Examinations, November 2011
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 In a jet propulsion unit, the compressor pressure ratio is 3.5. The temperature rise during the compression is 1.2 times that of isentropic compression. The maximum temperature of the cycle is 753 K. the gases are expanded in the nozzle to 283 K and 1.01325 bar. Calculate the power required to drive the compressor per kg of air, thrust developed, air-fuel ratio, if calorific value of fuel is 43000kJ/kg.

2 Classify the surface condensers and explain with neat sketches the following:
(i) down-flow type (ii) regenerative type (iii) evaporative type

3 Discuss the effects of compressor inlet temperature and turbine inlet temperature on specific output and thermal efficiency of the open cycle gas turbine at different pressure ratios.

4 Prove that for a 50% reaction turbines, $\alpha = \varphi$ and $\theta = \beta$.

5 (a) What is the function of a boiler chimney? What are the limitations of chimney draught?
(b) The equivalent evaporation of a boiler is found to be 22500 kg/hr. Steam is produced at 20 bar pressure and 250ºC. The feed water temperature is 36 ºC.1850 kg of coal/hr having a calorific value of 30,000kJ/kg is utilized. Estimate the actual evaporation of the boiler in kg/hr and efficiency.

6 (a) Discuss the various irreversibilities on nozzle efficiency with the help of a T-s diagram.
(b) The dry saturated steam at a pressure of 5 bar is expanded isentropically in a nozzle to a pressure of 0.2 bar. Find the velocity of steam leaving the nozzle.

7 (a) What are the methods which can lead to increase in thermal efficiency of Rankine cycle?
(b) In a Rankine cycle the steam at inlet to turbine is saturated at a pressure of 30 bar and the exhaust pressure is 0.25 bar. Determine:
(i) the pump work (ii) turbine work (iii) Rankine efficiency
(iv) condenser heat flow (v) dryness at the end of expansion

8 What is compounding? Describe various ways of compounding impulse turbines and give their merits and demerits.

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Code: 9A03501

3

III B. Tech I Semester (R09) Regular Examinations, November 2011
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 Prove that the net efficiency of a simple turbine is given by
$\eta_{net} = \eta_{stage} X \eta_N X \eta_{mech}$

2 A surface condenser is designed to handle 12000 kg of steam per hour. The steam enters at 0.8 kPa, 0.9 dry. The condensate leaves the condenser at the corresponding saturation temperature. Calculate the rate of cooling water, if cooling water temperature rise is limited to 12ºC.

3 A steam turbine develops 185 kW with a consumption of 16.5 kg/kwhr. The pressure and temperature of steam entering the nozzle at 12 bar and 220ºC. The steam leaves the nozzle at 1.2 bar. The diameter of the nozzle at throat is 7 mm. Find the number of nozzles.

4 A Parson reaction turbine running at 400 rpm with 50% reaction develops 75 kW per kg of the steam. The exit angle of the blade is 20º and the steam velocity is 1.4 times the blade velocity. Determine: (i) blade velocity
(ii) blade inlet angle

5 (a) Discuss the effect of the variables given below on the efficiency and power output of a Rankine cycle; (i) inlet pressure and temperature (ii) condenser pressure.
(b) An adiabatic steam turbine receives dry saturated steam at 1.0 MN/m^2 and discharges at 0.1 MN/m^2. The steam flow rate is 3 kg/s and the moisture at exit is negligible. If the ambient temperature is 300K find the rate of entropy production and power lost.

6 A gas turbine plant consists of two stage compressor with perfect intercooler and a single turbine. If the plant works between the temperature limits of 300 K and 1000 K and 1 bar and 16 bar; find the net power of the plant per kg of air. Take specific heat at constant pressure as 1 kJ/kgK.

7 a What is a propellant? How are propellants classified?
b What are the desirable properties of a liquid propellant for a rocket engine?

8 a What do you understand by the evaporative capacity of a boiler?
b What are the various types of artificial draught systems used in steam boilers indicating the main advantages?

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Code: 9A03501

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III B. Tech I Semester (R09) Regular Examinations, November 2011
THERMAL ENGINEERING II
(Mechanical Engineering)

Time: 3 hours Max Marks: 70

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

1 Draw the layout of a gas turbine plant which has two stage compression with complete intercooling. The high pressure turbine develops power enough only to drive the high pressure compressor. The low pressure turbine drives both the LP compressor and the load. Indicate the ideal process of this plant on a T-s diagram.

2 At a particular stage of 50% reaction turbine, the pressure is 1.4 bar and steam is 0.9 dry. The inlet and outlet angles are 35º and 25º respectively. The blade velocity is 67 m/s. Determine the blade height, if the ratio of drum diameter to blade height is 8.0 for a mass flow rate of 4.5 kg/s. Also find the power developed.

3 Steam is supplied to a turbine at 30 bar and 350ºC. The turbine exhaust pressure is 0.08 bar. The main condensate is heated regeneratively in two stages by steam bled from the turbine at 5 bar and 1.0 bar respectively. Calculate masses of steam bled off at each pressure per kg of steam entering the turbine and the theoretical thermal efficiency of the cycle.

4 Explain the working of Stirling boiler with the help of neat sketch. What are the advantages of using bent tubes over straight tubes?

5 (a) Write short notes about Wilson's line.
(b) A nozzle is to be designed to expand steam at the rate of 0.10 kg/s from 500 kPa, 210 C to 100 kPa. Neglect inlet velocity of steam. For a nozzle efficiency of 0.9, determine the exit area of the nozzle.

6 (a) Define axial discharge. What are the conditions for axial discharge?
(b) The velocity of steam at inlet to simple impulse turbine is 1000 m/s and the nozzle angle is 20º. Mean blade speed is 400 m/s and the blades are symmetrical. The massflow rate of steam is 0.75 kg/s. Calculate the bladeangles, axial thrust and diagram efficiency.

7 (a) What are the principal requirements of a steam condensing plant in power generation unit? Explain.
(b) What are the advantages obtained by incorporating the condenser in a steam power plant? Explain.

8 (a) Describe the bypass turbojet engine. When this type of engine is used.
(b) What are the field applications of pulse jet engines?

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Code: 9A03502

III B. Tech I Semester (R09) Regular Examinations, November 2011
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) Explain the gyroscopic effect of pitching and rolling of a ship in the sea water.
(b) An aeroplane makes a complete half circle of 60m radius to the left when flying at 200kmph.The rotary engine and propeller at the aeroplane weigh 4000N with a radius of gyration 30cm the engine runs at 2500rpm CW, when viewed from real. Find the gyroscopic couple on the air-craft and state its effect on it. Show the gyroscopic effect by a sketch.

2 (a) Discuss about the friction between lubricating surfaces.
(b) Explain the following: (i) Limiting angle of friction.
(ii) Angle of repose.

3 (a) Explain function of absorption type dynamometer.
(b) Distinguish between brakes and dynamometer.

4 A single cylinder horizontal engine runs at 120rpm. The length of stroke is 400mm. The mass of the revolving parts assumed concentrated at the crank pin is 100kg and mass of reciprocating parts is 150kg. Determine the magnitude of the balancing mass required to be placed opposite to the crank at a radius of 150 mm which is equivalent to all the revolving and $2/3^{rd}$ of the reciprocating masses. If the crank turns 300 from the inner dead centre, find the magnitude of the unbalanced force due to the balancing mass.

5 (a) Derive an expression for the height of proell governor.
(b) Calculate the minimum speed of proell governor, which has equal arms each 200mm and are pivoted on the axis of rotation. The mass of each ball is 4kg and the central mass on the sleeve is 20kg. The extension arms of the lower links are each 60mm long and parallel to the axis when the minimum radius of the ball is 100mm.

6 (a) What is the necessity of the balancing?
(b) Explain why two balancing weights are required to balance the weights rotating in different planes, compared to single balance weight required to balance weights rotating in one plane.

7 Discuss the unbalanced forces and couples acting in a four cylinder-in-line engines and the method of balancing them.

8 (a) What is meant by vibration isolation? Explain.
(b) Describe a three-rotor vibratory system and find the ratio of their amplitudes.
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Code: 9A03502

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III B. Tech I Semester (R09) Regular Examinations, November 2011
DYNAMICS OF MACHINERY
(Mechanical Engineering)

Time: 3 hours Max Marks: 70

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

1 (a) Write short notes on “Gyroscopic Couple”.
(b) A horizontal axle AB 200cms long is pivoted at its centre. It carries a weigh of 42N at B & a rotor weighing 100N at A. The rotor rotates at 1200rpm in clock wise direction looking from the front. Calculate the angular velocity of precision taking the radius of gyration of the rotor to be 60cms.

2 (a) Define “Friction”. Explain with the examples, whether friction is fried or to human.
(b) Derive an expression for the horizontal force ‘F’, necessary to move a load ‘W’ up a plane, which is inclined at an angle ‘a’ to the horizontal.

3 (a) Describe with neat sketch the lope brake dynamometer.
(b) Describe with a sketch a torsion dynamometer and explain the calculation involved in finding the power transmitted.

4 A three cylinder single acting engine has its crank angle at 120°. The turning moment diagram for each cycle is a triangle for the power stroke with a maximum torque of 60Nm at 60° after the dead centre of the corresponding crank. There is no torque on the return stroke. The engine runs at 400 rpm. Determine the:
(i) Power developed.
(ii) Co-efficient of fluction of speed if the mass of the fly wheel is 10kg and radius of gyration is 88mm.
(iii) Co-efficient of fluction of energy.

5 The arms of the porter governor are of equal-lengths and both are pivoted on the same vertical line. Derive an expression to find the height of the porter governor neglecting friction.

6 (a) Explain the method of balancing of different masses revolving in the same plane.
(b) Distinguish the static balance and dynamic balance with appropriate examples.

7 Derive the following expressions, for an un coupled two cylinder locomotive engine:
(a) Variation in tractive force.
(b) Swaying couple.
(c) Hammer blow.

8 (a) Distinguish between longitudinal, transverse and forsional vibration.
(b) What are the basic elements of vibratory system? What is the degree of free dom?

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Code: 9A03502

3

III B. Tech I Semester (R09) Regular Examinations, November 2011
DYNAMICS OF MACHINERY
(Mechanical Engineering)

Time: 3 hours Max Marks: 70

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

1 (a) What are the special characteristics of a gyroscope? Explain with the help of a diagram.
(b) Discuss the effect of gyroscopic couple on a two wheeled vehicle when taking a turn.

2 (a) State the law of dry friction.
(b) A screw jack is used to raise a load of 50KN. The pitch of single start square threads used for the screw is 24mm. The mean diameter is 72mm. Determine the force to be applied at the end of 1.2m long handle when the load is lifted with constant velocity and rotate with the spindle.Take co-efficient of friction is 0.2.Also find the mechanical efficiency of the jack.

3 (a) Distinguish between a brake and a dynamometer.
(b) Describe with the help of a neat sketch the principles of an internal expanding shoe. Derive the expression for the breaking torque.

4 A single cylinder four stroke cycle engine develops 15Kw power of 330rpm. The maximum fluctuation of the energy is 80% of the indicated energy per cycle. The engine is connected through a gearing to a machine having a speed of 726rpm the moment of inertia of rotating parts of the engine is 104kg-m^2 and that of the machine is 9.5kg-m^2.
Determine the weight of additional flywheel that will be required to keep the overall range of speed variation to 75% mean speed. Radius of gyration of the fly wheel is 0.45m.

5 With a neat sketch, explain the working of Wilson-Hartnell governor.

6 (a) Why is balancing necessary for rotors of high speed engines?
(b) Four masses A, B, C and D carried by a rotating shaft at radii 80mm,100mm,160mm and 120mm respectively are completely balanced. Masses B, C and D 8kg, 4kg and 3kg respectively. Determine the mass A and the relative angular positions of the four masses if the planes are spaced 500mm apart.

7 The following data relate to a single cylinder reciprocating engine.
Mass of reciprocating parts = 40kg.
Mass of revolving parts = 30kg at 180mm radius.
Speed = 150 rpm, stroke length is 350mm. If 60% of the reciprocating parts and all the revolving parts to be balanced, determine the :
(a) Balanced mass required at a radius of 320mm.
(b) The unbalanced force when the crank has turned 450 from the top dead centre.

8 (a) What is meant by vibrations? How are they caused?
(b) Describe the method of finding the natural frequency of torsional vibrations for a three rotor system.

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III B. Tech I Semester (R09) Regular Examinations, November 2011
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) Explain what is meant by applied torque and reactive torque.
(b) What is the effect of gyroscopic couple on the stability of 4 wheeler while negotiating a curve? In what way does this effect along with that of the centrifugal force limit the speed of the vehicle.

2 (a) What is a friction circle? Derive an expression for its radius.
(b) A screw jack has a square thread of mean diameter 6cm and pitch 0.8cm. The co-efficient of friction at the screw thread is 0.09. A load of 3KN is to be lifted through 12cm. Determine the torque required and the work done in lifting the load through 12cm. Find the efficiency of the jack also.

3 (a) Describe with sketches one form of torsion dynamometer and explain in detail the calculations involved in finding the power transmitted.
(b) In a vertical belt transmission dynamometer the diameter of the driving pulley rotating at 1500rpm is 80mm. The centre distance of the intermediate pulleys from the fulcrum is also 80mm each. The weighing pan on the lever is at a distance as 250mm. Find the power transmitted when a mass of 20kg is required in the pan, including its own mass.

4 Write short notes on the following:
(i) Turning moment diagram.
(ii) Piston-effort.
(iii) Co-efficient of fluctuation of speed.

5 (a) How does a porter governor differs from that of a watt governor?
(b) A simple watt governor rotates at 75rpm. Calculate its vertical height and the change if the speed increases to 80rpm. Also calculate the height at 75rpm, if the weight of the ball is 20N and that of the arm 5N.

6 (a) Explain the role of reference plane in balancing masses of rotation in different planes.
(b) Describe reasons in detail for partial balancing of reciprocating masses.

7 (a) Write a short note on primary and secondary balancing.
(b) Explain why only a part of the unbalanced force due to the reciprocating masses is balanced by revolving masses.

8 (a) Explain the terms: (i) Under damping.
(ii) Critical damping.
(iii) Over damping.
(b) Derive an equation for the transverse vibration of a uniformly loaded shaft.

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Code: 9A03503

III B. Tech I Semester (R09) Regular Examinations, November 2011
MACHINE TOOLS
(Mechanical Engineering)

Time: 3 hours Max Marks: 70

Answer any FIVE questions
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*****

1 (a) What are the types of tool materials in metal cutting? Discuss their importance.
(b) Derive the expressions for chip reduction co-efficient in single point tool. State the assumptions made.

2 (a) Explain with neat sketch how thread cutting operation is done on by lathe.
(b) Illustrate the uses of steady rest and follower rest.

3 (a) Discuss the advantages of planner over shaper and slotter.
(b) What are the differences between a capstan lathe and turret lathe?

4 (a) What is the function of a tap drill?
(b) Explain with a neat sketch the construction and working principle of a radial drilling machine.

5 Explain the working principle of a universal milling machine with help of neat sketch and indicating the various controls and constructional features.

6 (a) How is grinding different from other machining operations? Explain its applications in view of its capabilities.
(b) Discuss various variables of grinding process.

7 (a) How a broaching machine is specified?
(b) Write a short note on the following:
(i) Lapping process
(ii) Structure of a grinding wheel.

8 (a) What are the various types of jigs? Explain the applications of each type.
(b) What are the main differences between a jig and fixture?

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Code: 9A03503

III B. Tech I Semester (R09) Regular Examinations, November 2011
MACHINE TOOLS
(Mechanical Engineering)

Time: 3 hours Max Marks: 70

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

1 (a) Discuss the various forces encountered in metal cutting.
(b) Explain the benefits achieved in metal cutting with the use of cutting fluids.

2 (a) Define: Speed, Feed, Depth of cut and machining, time for plain turning operation.
(b) List and explain any five operations that can be done on the engine lathe.

3 What types of operations can be performed in a shaper efficiently? List and explain with neat sketch.

4 (a) With help of neat block diagram describe the main parts and working of the floor type horizontal boring machine.
(b) Explain briefly different types of drilling machines and their features.

5 (a) Describe the process of generating a helical glove on a milling machine.
(b) What are the common materials for milling cutters?

6 With simple sketches explain:
(i) Traverse cylindrical grinding machine.
(ii) Plunge- centre type grinding machine.
(iii) Profile- cylindrical grinding.

7 (a) What is broaching? What are its advantages? What are principle types of broaching machine?
(b) What is lapping? How it is done? How many types of lapping operation are there?

8 (a) What are the important points to watch with respective to clamping?
(b) How are jigs classified? Give a broad classification of drilling jig.

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III B. Tech I Semester (R09) Regular Examinations, November 2011
MACHINE TOOLS
(Mechanical Engineering)

Time: 3 hours Max Marks: 70

Answer any FIVE questions
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*****

1 (a) Discuss the various types of chips produced during metal cutting.
(b) Enumerate the difference between orthogonal cutting and oblique cutting.

2 (a) What are the different types of Lathe attachments? Discuss them briefly.
(b) Why lathe beds are made of cast iron? Explain.

3 (a) What are various operations performed on shaper? Explain in detail.
(b) What is planer? Illustrate and describe its working principle.

4 (a) Write a short notes on Lip, Helix and rake angles in drilling.
(b) What are the probable effects of incorrect drill feed rates?

5 (a) Distinguish between universal milling machine and plain milling machine.
(b) What are the various types of milling cutters that are used in milling?

6 What are the various types of surface grinding machines? Describe any two of their principle, advantages and limitations.

7 Write short notes on:
(i) Lapping.
(ii) Honing.
(iii) Broaching.

8 (a) What are the main differences between a jig and fixture?
(b) Write short notes on:
(i) Clamps.
(ii) Clamping.

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III B. Tech I Semester (R09) Regular Examinations, November 2011
MACHINE TOOLS
(Mechanical Engineering)

Time: 3 hours Max Marks: 70

Answer any FIVE questions
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*****

1 What are the important angles that are to be maintained in an orthogonal cutting tool? For each of the angle explain its influence on the machining performance.

2 (a) What are the different types of taper turning methods? Explain any one of the method with neat sketch.
(b) What are the differences between automatic lathe and capstan lathe?

3 (a) What is difference between a vertical shaper and slotter?
(b) Describe various feed movement mechanisms in slotting machine.

4 (a) Explain briefly different types of drilling machines and their features.
(b) What happence to drill point when drill speed is too high?

5 Explain with the help of line diagram the construction and working principle of a vertical milling machine. State the advantages and disadvantages along with applications.

6 (a) How is the abrasive selected for a grinding operation? Indicate the reasons for selection.
(b) What are the advantages and disadvantages of centre less grinding?

7 (a) Explain different types lapping process.
(b) Explain clearly, a honing tool with neat sketches.

8 (a) What are the elements of jigs and fixture and explain briefly.
(b) State the differences in the function and design of jigs and fixtures.

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Code: 9A03504

III B. Tech I Semester (R09) Regular Examinations, November 2011
DESIGN OF MACHINE ELEMENTS I
(Mechanical Engineering)

Time: 3 hours Max Marks: 70

Answer any FIVE questions
All questions carry equal marks
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1 (a) What are the properties to be considered in selecting the materials in the design of machine parts? Discuss.
(b) Classify the various types machine design.

2 A hot rolled steel shaft is subjected to a torsional moment that varies from 330 N.m clockwise to 110 N.m counter clockwise and an applied bending moment at a critical section varies from 440N-m to-220 N-m. The shaft is of uniform cross-section and no key way is present at the critical section. Determine the required shaft diameter. The material has an ultimate strength of 550MN/m^2 and yield strength of 410MN/m^2.Take the endurance limit as half the ultimate strength, factor of safety of 2, size factor of 0.85 and surface finish factor of 0.62.

3 (a) Discuss fatigue and endurance limit.
(b) Explain the following methods of reducing stress concentration:
(i) Drilled holes. (ii) Using large fillet radius.

4 A double riveted lap joint is made between 15mm thick plates. The rivet diameter and pitch are 25mm and 75mm respectively. If the ultimate stresses are 400MPa intension, 320 MPa in shear and 640 MPa in crushing, find the minimum force per pitch which will rupture the joint. If the above joint is subjected to a load such that the factor of safety is two, find out the actual stresses developed in the plates and the rivets.

5 (a) Define the following terms related to screw fastenings:
(i) Stress area (ii) Major diameter
(iii) Minor diameter.
(b) A punching press is required to punch a maximum hole size of 20mm diameter in a material having ultimate shear strength of 300N/mm^2. If the thickness of the sheet is 5mm design the screw and the nut.

6 (a) Describe the purpose of gib in cotter joint. What are the applications of cotter joints?
(b) Design a knuckle joint to transmit 140KN, with permissible stresses in tension; shear and compression are 75MPa; 60MPa and 150MPa respectively.

7 (a) Explain about various types of stresses acting on a rotating shaft.
(b) Explain the effect of key way on the strength of a shaft.

8 Describe with the help of neat sketches, the types of various shaft couplings, mentioning the uses of each type.

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Code: 9A03504

III B. Tech I Semester (R09) Regular Examinations, November 2011
DESIGN OF MACHINE ELEMENTS I
(Mechanical Engineering)

Time: 3 hours Max Marks: 70

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

1 Explain the stress-strain diagram indicating various points on it.

2 (a) Differentiate between endurance limit and endurance strength.
(b) Determine the diameter of a circular rod made of ductile material with fatigue strength of 280 MPa and yield strength of 350 MPa. The member is subjected to a varying axial load from 700KN to-300KN. Assume k_t=1.8 and F.S = 2.0.

3 (a) Write a note on influence of various factors of the endurance limit of ductile material.
(b) Determine the diameter of circular rod made of ductile material with a fatigue strength (completely stress reversal) σ_e= 280MPa and a tensile yield strength of 350 MPa. The member is subjected to a varying axial load from 700KN to-300KN. Assume k_t=1.8 and F.S =2.

4 (a) Enumerate the different types of riveted joints.
(b) Two plates 16mm thick are joined by a double riveted lap joint. The pitch of each row of rivets is 90mm. The rivets are 25mm in diameter. The permissible stresses are 140MPa intension, 80MPa in shear and 160MPa in crushing. Find the efficiency of the joints.

5 Discuss stresses subjected to bolted joints.
(i) When tightened only.
(ii) When externally loaded.
(iii) Combined initial load with external loads.

6 (a) Discuss the function of coupling. Give at least three practical applications.
(b) Give the classification of couplings.

7 (a) What is the advantage and limitation of hollow shaft over solid shaft?
(b) Explain about shaft rigidity and shaft strength.

8 Design a muff coupling to connect two shafts transmitting 40Kw at 120 rpm. The permissible shear and crushing stress for the shaft and key material (mild steel) are 30MPa and 80MPa respectively. The material of muff is cost-Iron with permissible shear stress of 15MPa. Assume that the maximum torque transmitted is 25percent greater than mean torque.

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Code: 9A03504

III B. Tech I Semester (R09) Regular Examinations, November 2011
DESIGN OF MACHINE ELEMENTS I
(Mechanical Engineering)

Time: 3 hours Max Marks: 70

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

1 (a) What is the procedure adopted in the design of machine elements?
(b) How do you classify materials for engineering use?

2 (a) Explain stress concentration in detail and various methods to reduce stress concentration in machine members.
(b) Explain various types of theories of failure.

3 (a) Explain the soderberg method for combination of stress.
(b) A stepped shaft has maximum diameter 45mm and minimum diameter 30mm. The fillet radius is 6mm. If the shaft is subjected to an axial load of 10KN, find the maximum stress induced taking stress concentration in account.

4 Design a triple rivetted lap joint, to join two plates of 6mm thick. The permissible stresses are σ_t= 80 MP_a, σ_c=100 MP_a and T=60 MP_a. Calculate the rivet diameter, rivet pitch and distance between the rows of rivets. Use zig-zag riveting. Draw a neat sketch of joint.

5 (a) Enumerate various stresses due to intial tightening of screwed fartmers.
(b) The cylinder head of effective diameter 300mm for a steam engine is subjected to 1.2 MPa. It is held in position by means of 12 studs. A soft copper gasket is used to make joint leak proof. Determine the size of blots or studs, so that the stress should not exceed 100 MPa.

6 (a) Discuss the function of coupling. Give at least three practical applications.
(b) Differentiate between a cotler and a key.

7 (a) Explain the reasons for preferring hollow shafts over solid shafts.
(b) Explain the details of shaft design based on:
(i) Torsional rigidity. (ii) Lateral rigidity.

8 Design and draw a muff coupling to transmit 50HP at 120 rpm. The shaft and key are made of the same material having allowable shear stress of 30N/mm^2 and compressor stress of 80N/mm^2.The flange is made, as cast iron with allowable shear stress is 15N/mm^2.

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Code: 9A03504

III B. Tech I Semester (R09) Regular Examinations, November 2011
DESIGN OF MACHINE ELEMENTS I
(Mechanical Engineering)

Time: 3 hours Max Marks: 70

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

1 (a) What are the manufacturing considerations to be considered by design?
(b) State the advantages and drawbacks of cast-iron as an engineering material.

2 (a) Briefly explain shear stress and shear strain.
(b) Calculate the diameter of solid shaft to transmit 50KW at 180rpm. If the angle of twist in a length of 4 meters is not to exceed 0.4°. The allowable stress in the material is 70MP_a and modulus of rigidity is 84 GPa.

3 (a) Discuss the factors affecting endurance limit.
(b) Determine the diameter of a circular rod made of ductile material with a fatigue strength (complete reversal), σ_e =265 MPa and tensile yield strength of 350 MPa. The member is subjected to a varying axil load from w_{min} = -300KN to w_{max} = 700KN and has a stress concentration factor is 1.8. Use factor of safety as z.

4 (a) Explain the following terms in connection with riveted joints:
(i) Pitch (ii) Back pitch
(iii) Diagnal pitch (iv) Margin.
(b) What do you understand by the term riveted joint? Explain the necessity of such a joint.

5 (a) List out the advantages and disadvantages of screw joints.
(b) A mild steel cover plate is to be designed for an inspection hole in the shell of a pressure vessel. The hole is 120mm in diameter and the pressure inside the vessel is 6N/mm^2.Design the cover plate along with the bolts. Assume the allowable tensile stress for mild steel on 60 MP_a and for bolt material as 40 MP_a.

6 (a) Describe the design procedure of sleeve & cotler joint.
(b) Design a cotler joint with two gibs to transmit an axial force of 130KN. The permissible stresses are 165 MP_a in tension; 100MP_a in shear and 180MP_a in crushing.

7 (a) Differentiate between torsional rigidity design and lateral rigidity design of shafts.
(b) What are the causes of failure of shaft?

8 Design a bushed pin type flexible coupling for connecting two shafts when HP to be transmitted is 50; speed of the shaft 100rpm; diameter of the shaft 50mm. The bearing pressure in the rubber bush and allowable stress in the pins are to be limited to 0.45N/mm^2 respectively. Sketch the coupling.

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Code: 9A03505

III B.Tech I Semester (R09) Regular Examinations, November 2011

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) Distinguish free and forced convections with examples.

(b) A black plate(e=1) of dimensions 1mx1mx0.025m is maintained at its top a temperature of 227℃.The top surface of the plate is exposed to environment at 27℃ and convective heat transfer coefficient between the plate and environment is low/m^2k.
Calculate the temperature at the bottom of the plate. Assume k for plate 60 w/mk.
(Hint: $Q_{condu}=Q_{rad}+Q_{conv}$).

2 (a) Explain the electrical analogy of heat transfer. Illustrate the concept of electrical analogy considering a multilayer composite wall.

(b) Consider a 4mx6mx0.3m thick brick wall whose k=0.8 w/mk. The temperature of inner and outer surfaces of the wall are measured to be 45℃and 25℃ respectively. Find the rate of the heat transfer through the wall.

3 (a) What is meant by Newtonian cooling or heating? Under what conditions is it applicable? Give some examples.

(b) A spherical steel ball of 2 cm diameter is coaled in a controlled ambience from 600℃ to 50℃ in 1o minutes. If the body is a cube of 2cm of same material what would be the time required for cooling to achieve the same temperature at the end of cooling process.

4 (a) Obtain an expression for velocity profile in laminar flow through a pipe and shown that the average velocity is half of the maximum velocity.

(b) Determine the drag force exerted on the flat plate of 4m long when air is flowing over it with a velocity of 10m/s and at 27℃. Width of the plate is 1m and assume the flow is fully turbulent from leading edge. Also find the velocity boundary layer thickness at the edge.

5 (a) Explain the development of hydrodynamic and thermal boundary layers on a vertical plate in natural convection.

(b) Calculate the heat transfer rates by free convection over a 0.3m high vertical plate maintained at a uniform temperature T_W=80℃ to an ambient Tα=24℃ containing air at 1.0 and 3.0 atm.

6 (a) Derive the expression for condensing heat transfer coefficient for a vertical plate under laminar conditions.

(b) Water at 100℃ is boiled with the help of Ni-Cr heating wire having surface area $5x10^{-2}m^2$ immersed in it and maintained at 114.3℃. Calculate the heat flux and rate of evaporation. Assume nucleate flux and rate of evaporation. Assume nucleate boiling and the constant for water Ni-Cr as 0.013 boiling and the constant for water Ni-Cr as 0.013.

7 (a) Derive the expression for LMTD in a parallel flow double pipe heat exchanger.

(b) In a condenser R_{12} condenser at 35℃ where the cooling fluid air is heated from 25℃ to 30℃. Determine the LMTD.
(a) assuming parallel flow. (b)counter flow (c)cross flow.

8 (a) State and prove kirchoff's low. What are the limitations to use it?

(b) A black body is maintained at 200℃. Calculate
(a) Total emissive power.(b) wavelength at which maximum monochromatic power occurs and (c) maximum monochromatic emissive power.

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Code: 9A03505

III B.Tech I Semester (R09) Regular Examinations, November 2011
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) State and explain Fourier's law of conduction.
(b) A steel ball of density 7800kg/^{3} and specific heat 0.47 kj/kgk having 10 cm diameter at 300℃ is placed in atmosphere at 30℃. Calculate the initial rate of cooling in ℃/sec. Assume convective heat transfer coefficient h=15w/m^{2}k. Neglect heat loss by radiation.

2 (a) Derive an expression for heat flow through a composite cylinder with film heat transfer coefficients on inside and outside surfaces of the cylinder.
(b) A long aluminium cylinder 5.0 cm in diameter and initially at 200℃ is suddenly exposed to a convection environment at 70℃ and h=525 w/m^2 k. Calculate the temperature at a radius of 1.25 cm, 1 min after the cylinder is exposed to the environment.

3 (a) Distinguish between steady state conduction and unsteady state conduction.
(b) A long aluminium cylinder 5.0cm in diameter and initially at 200℃ is suddenly exposed to a convection environment at 70℃ and h=525 w/m^{2}k. Calculate the temperature at a radius of 1.25 cm, 1 min after the cylinder is exposed to the environment.

4 (a) Define eddy diffusivity of momentum. What is the role or eddy diffusivity of momentum? What is the role of eddy diffusivity of heat in turbulent heat transfer?
(b) The velocity profile for boundary layer over a flat plate is given by $\frac{u_x}{u_\alpha} = \frac{3}{2}\left[\frac{y}{\delta x}\right] - \frac{1}{2}\left[\frac{y}{\delta x}\right]^3$ where $\delta x = \sqrt{\frac{280}{13}.\frac{\nu_x}{u_\alpha}}$. (a) Develop the expression for friction coefficient. (b)Find the expression for average drag coefficient over length L.

5 (a) Explain Reynolds analogy and cal burn analogy.
(b) Air at a temperature of 30℃ flows over a flat plate of length 1m and width 2m with a velocity of 3m/s. Determine the direction of air i-e, along its length or width that will create maximum drag force.

6 (a) What do you understand by film boiling? Explain different regimes for boiling of water through a vertical tube.
(b) Saturated steam at 90℃ condenser on the outer surface of a 2.5-cm diameter 1.2-m long horizontal pipe which is maintained at a uniform temperature of 80℃. Calculate (a) average heat transfer coefficient.(b) the total rate of steam condensation.

7 (a) Define the heat capacity ratio.
(b) Define the NTU and explain its significance.
(c) Water flows through a stainless steel tube (k=54 w/mk) of 1.3 cm ID and 1.6 OD and length 5m with a velocity of 1.5m/s. Water enters at 15℃ on the outer surface of tube steam condenser with a heat transfer coefficient of 12000 w/m^{2}k. Calculate the inside heat transfer coefficient and overall heat transfer coefficient based on outer surface.

8 (a) Distinguish between black colour and radiation black bodies.
(b) State lambert's cosine law and its significance.
(c) A 3mm thick glass window transmits 90 percent of the radiation between λ=0.3 & 3μm and is essentially opaque for other wave lengths. Determine the rate of radiation through a 2mx2m glass window from a black body source at 5000k.

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Code: 9A03505

III B.Tech I Semester (R09) Regular Examinations, November 2011
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) Explain emissivity of a body.
(b) Alloging a metal decreases its 'k', why? Explain.
(c) The deep freeze in a refrigerator having surface area $0.5m^2$ is maintained at -12°C. If the temperature of air in the cabin is at 10°C and having convective heat transfer coefficient of 5 w/m^2k, calculate the heat lost by air due to convection.

2 (a) Derive the expression for temperature distribution in a cylinder under steady state conduction.
(b) The heat generated in the circuitry on the surface of a silicon chip(k=130 w/m^0k) is conducted to the ceramic substrate to which it is attached. The chip is 6mmx6mm in size and 0.5 mm thick and dissipates 3 w of power. Determine the temperature difference between the front and back surfaces of the chip in steady operation.

3 (a) Define semi infinite body.
(b) Derive the expression for temperature variation in a semi-infinite body without any surface resistance.
(c) In a quenching process, a copper plate of 3mm thick is heated up to 350°C and then suddenly it is dipped a water bath and cooled to 25°C. Calculate the time required for the plate to reach the temperature of 50°C . The heat transfer coefficient on the surface of the plate is 28 w/m^2k. The plate dimensions may be taken as length 40 cm and width 30 cm. Take properties of copper as c=380j/kg k, e=8800 kg/m^3, k=385 w/mk.

4 (a) What is meant by hydraulic mean diameter?
(b) What do you understand by entrance length? Explain both hydrodynamic and thermal entrance lengths.
(c) For flow over a flat plate, find the point of transition from leading edge when the following fluids flow with a velocity of 3m/s at 30°C (a) water (b) air (c) nitrogen (d) engine oil.

5 (a) What is meant by bulk mean temperature? Where do you use it?
(b) How do you assess pressure drop for flow through a pipe.
(c) Atmosphere air at 30° flows over a flat plate of $(3x1)m^2$ maintained at 70°C with a velocity of 10m/s. Calculate the distance from the leading edge at which transition occurs. Find the thickness of the hydrodynamic boundary layer and thermal boundary layer at 0.5m from the edge.

6 (a) Explain different types of boiling.
(b) Sixty-four tubes of 25mm dia are arranged in a square array and are exposed to saturated steam at 100°C.Calculate the rate of condensation of steam per hour if the tube surface is maintained at 90°C . Take length of each tube as 1.5m.

7 (a) Define effectiveness of heat exchanger.
(b) Write is LMTD correction factor? When is it applicable?

Contd. in page 2

7 (c) In a double pipe heat exchanger cold oil passes@ 1kg/s through the annulus, heated by water flowing through the inner tube @ 0.2kg/s. The inside pipe inner radius and outer radius are 0.9cm and 1.25 cm respectively. The inside radius of outer pipe is 1.7cm. Assuming thermal conductivity of inside pipe as 40 w/mk. Calculate the overall heat transfer coefficient based on outer surface area per meter length of the tube. Use the following properties at their bulk mean temperature:
Water : ρ =980 kg/m^3, c_p=4.18^{0}kj/kg k, k=0.657 w/mk, p_r=2.6, v=4.18x10^{-7} m^2/s.
Oil: : ρ =850 kg/m^3, c_p=1.9 kj/kg k, k=0.14 w/mk, p_r=86, v=7.43 x10^{-6}m^2/s.

8 (a) Define intensity of radiation.
(b) Explain green house effect.
(c) The filament of a 40 w bulb is radiating into a black enclosure at 70°C. The filament is a wire of 0.1 mm diameter and 3cm length . Assume filament as a black body find the temperature of the filament.

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Code: 9A03505

III B.Tech I Semester (R09) Regular Examinations, November 2011
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) State and explain Fourier's law of conduction.
(b) The roof of a building 20mx16m consists 15cm thick concrete slab of k=0.67 w/mk. If the top and bottom surface temperature are 40°C and 32°C , find the heat flux and heat transfer rate through the ceiling.

2 (a) Derive the general conduction equations systems and hence deduce the expression for temperature distribution through a plane wall.
(b) Consider a 1.2mx2m glass window of 6mm thick having k=0.75 w/mk, which is exposed to environment at 20°C with a convective heat transfer coefficient of 10 w/m^2k. If the inner surface temperature of the glass is at 5°C. Find the outer surface temperature and rate of heat leak into the room.

3 (a) Define Fourier number and state its significance.
(b) A household electric iron has a steel base weighing 1kg. The ironing surface area is 0.025 m^2 and is heated from inside surface with a 250 w heating element. Initially the iron is at a uniform temperature of 20°C with a heat transfer coefficient of 50 w/m^2k. Calculate the temperature of iron base after 5 minutes from staring. What will be the equilibrium temperature of the iron if the control does not work. Take :ρ =7800 kg/m^3, c=0.45 kj/kg k and k=70 w/mk. Assume environment is at 20°C.

4 (a) Define turbulent prandtl number.
(b) Distinguish between natural and forced convective heat transfers.
(c) Engine oil at 60°Cflow with a mean velocity of 0.15 m/s through a circular tube of 2.5cm dia. Calculate (a) Flow Reynolds number.(b) Hydrodynamic entrance length (c) friction factor (d) pressure drop over a 100 m length of tube.

5 (a) Compare the heat transfer from horizontal cylinder to vertical cylinder.
(b) A hot plate of 15cm^2 area is maintained at a temperature of 200°C and exposed to still air at 30°C temperature. When the smaller side of the plate is held vertical, convective heat transfer rate is 14% higher than when bigger side of the plate is held vertical. Determine dimensions use the following relelation: Nu=0.59 (Gr Pr) 0.2m.

6 (a) How to promote drop-wise condensation? State some methods.
(b) Saturated steam at atmospheric pressure and 100°C condenser on a vertical plate of 1m height and 0.2m width. The surface temperature of the plate is maintained at 80°C . Calculate (a)The condensing heat transfer coefficient at 0.3m.(b) The film thickness at 0.3m from top (c) the average heat transfer coefficient and (d) the rate of steam condensation . Assume laminar flow.

7 (a) Derive the expression for LMTD in counter flow double pipe heat exchanger.
(b) A double pipe heat exchanger is used to cool the lubricating oil from 90°Cto 40°C using water available at 10°C . The mass flow rate of the oil is 0.15 kg/s with specific heat 2.13 kj/kg and that of water is 0.3 kg/s. Determine the heat transfer area required if u=50 w/m^2k for (a)parallel flow arrangement (b) counter flow arrangement.

8 (a) Define absorptivity, reflectivity and transitivity of radiant energy.
(b) 300 watts of energy is incident on a glass plate per unit area out of which 200 watts is transmitted and 20 watts is absorbed. Calculate the absorptivity, transitivity and reflectivity of the glass plate.

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Code: 9AHS401

III B.Tech I Semester (R09) Regular Examinations, November 2011
MANAGERIAL ECONOMICS & FINANCIAL ANALYSIS
(Common to Civil Engineering, Bio-Technology, Mechanical Engineering, Electrical & Electronics Engineering & Electronics & Computer Engineering)

Time: 3 hours Max Marks: 70

Answer any FIVE questions
All questions carry equal marks

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1 Define demand. Explain the various factors that influence the demand for a car?

2 What is elasticity of demand? Briefly various types of elasticity of demand.

3 Define B.E.P. How do you determine it? Show graphical presentation of B.E.A?

4 Explain important features of perfect competition market and how price is determined under perfect market?

5 What is sole trade form of organization? Explain the features, advantages and limitations of sole trader?

6 Consider the case of the company with the following 2 investment alternatives (A and B), each costing Rs. 9 lakhs each. The details of the cash in flows are given below:

Cash in flows	(Rs. In lakhs)	
	A	B
Year 1	3,00,000	6,00,000
Year 2	5,00,000	4,00,000
Year 3	6,00,000	3,00,000

The cost of capital is 10% per year. Which one do you choose under?
a) NPV method b) IRR method.

7 Explain the following:
a) Types of accounts with suitable examples.
b) Double-entry book keeping.
c) Journal.

8 What is meant by ratio analysis? Explain its objectives and importance in financial analysis.

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Code: 9AHS401

III B.Tech I Semester (R09) Regular Examinations, November 2011
MANAGERIAL ECONOMICS & FINANCIAL ANALYSIS
(Common to Civil Engineering, BioTechnology, Mechanical Engineering, Electrical & Electronics Engineering & Electronics & Computer Engineering)

Time: 3 hours Max Marks: 70

Answer any FIVE questions
All questions carry equal marks

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1 Define the "Law of Demand". What are its assumptions and exceptions?

2 Define elasticity of demand. Explain the factors governing it.

3 Explain the following:
a) Explicit cost and implicit cost.
b) Fixed cost and variable cost.
c) Opportunity cost.

4 Explain how price is determined in case of perfect competition. Illustrate.

5 Explain the features of sole trade form of organization. Discuss the advantages and limitations of sole trader.

6 What are the components of working capital? Explain each of them.

7 During January 2010, Naveen transacted the following business

Date		Rs.
1	Commenced business with cash	40,000
2	Purchased goods on credit from shyam	30,000
3	Received cash from murthy as advance goods ordered by him	3,000
4	Paid wages	500
5	Goods returned to shyam	200
6	Goods sold to kamal	10,000
7	Goods returned by kamal	500
8	Paid into bank	500
9	Goods sold for cash	750
10	Bought goods for cash	1,000

Journalize the above transactions and prepare cash accounts.

8 What are the limitations of ratio analysis? Does ratio analysis real measurements the financial performance of a company?

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Code: 9AHS401

III B.Tech I Semester (R09) Regular Examinations, November 2011
MANAGERIAL ECONOMICS & FINANCIAL ANALYSIS
(Common to Civil Engineering, BioTechnology, Mechanical Engineering, Electrical & Electronics Engineering & Electronics & Computer Engineering)

Time: 3 hours Max Marks: 70

Answer any FIVE questions
All questions carry equal marks

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1 Define managerial economics. Explain its nature and scope.

2 What is demand forecasting? Explain various factors governing demand forecasting.

3 Define B.E.P. How do you determine it show graphical presentation of B.E.A?

4 Define market. Explain how the markets are classified?

5 Explain the need of public sector enterprise in India. Do you think public sector enter prises as a whose have fulfilled that need.

6 Consider the case of the company with the following two investment alternatives (A and B) each costing Rs. 9 lakhs each. The details of the cash in flows are given below:

Cash in flows	(Rs. In lakh)	
	A	B
Year 1	3,00,000	6,00,000
Year 2	5,00,000	4,00,000
Year 3	6,00,000	3,00,000

The cost of capital is 10 % per year. Which one do you choose under
a) NPV method
b) IRR method.

7 Explain the following:
a) Double-entry book keeping.
b) Journal.
c) Cashbook.

8 What is meant by ratio analysis? Discuss its objectives and limitations.

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Code: 9AHS401

III B.Tech I Semester (R09) Regular Examinations, November 2011

MANAGERIAL ECONOMICS & FINANCIAL ANALYSIS

(Common to Civil Engineering, BioTechnology, Mechanical Engineering, Electrical & Electronics Engineering & Electronics & Computer Engineering)

Time: 3 hours Max Marks: 70

Answer any FIVE questions

All questions carry equal marks

*****

1 What is managerial economics? Explain its focus areas.

2 Enumerate the factors involved in demand forecasting. State the purpose of forecasting, both short-term and long-term.

3 With the following information calculate
   a) P/V Ratio.
   b) Fixed cost.
   c) B.E.P
   d) Profit on estimated sales of Rs.1, 25,000.

	Period–I (Rs)	Period–II(Rs)
Sales	1,00,000	1,20,000
Profit	15,000	23,000

4 Compare and contrast between perfect competition and monopoly.

5 What are the reasons for joint stock company being popular as a form of organization?

6 Define “Accounting Rate of Return” (ARR) and ‘Pay Back Period’ method? Compare and contrast between two with suitable examples.

7 In the books of Hari and CO. Prepare trading, Profit & Loss Account and balance sheet for the year ending 31st march 2010, from the following particulars.

		Rs.
1	Opening stock	5,000
2	Salaries	500
3	Sales	70,400
4	Motar car	25,000
5	Travelling exep.	700
6	Cash in hand	5,000
7	Capital	30,000
8	Interest	1800
9	Bills recievables	4000
10	Wages	2000
11	Furniture&Fixtures	3600
12	Sundry debitors	14,000
13	Lighting	350
14	Printing&Stationary	100
15	Postage	50
16	Sales returns	6000
17	Purchases	25,000
18	Commission paid	1500
19	Bank balance	10,000
20	Advertisement	1000
21	Sundry creditors	5200

Adjustments:

1	Closing stock	40,000
2	Outstanding salaries	150

8 Explain and illustrate the types and significance of
   a) Liquidity Ratio’s.
   b) Solvency Ratios.

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