[03 – 3204]

III/IV B.E. DEGREE EXAMINATION

SECOND SEMESTER – APRIL 2011

MECHANICAL ENGINEERING

FLUID MECHANICS

Time: Three hours Maximum : 70 marks

Answer Part A and any FOUR questions from Part B & All questions carry equal marks.

Part A must be answered at one place and assume any missing data.

1. (a) Classify fluids.

(b) What are manometers? How are monometers classified?

(c) What is meant by local acceleration?

(d) Differentiate between a laminar flow and a turbulent flow and a turbulent flow.

(e) Give the Darcy – Wiesbach equation and which losses are accounted for by this equation?

(f) Define stagnation point.

(g) What is sonic velocity ? On what factors does it depend?

2. (a) What is the total pressure on a inclined surface immersed in liquid at angle form the free surface immersed in liquid at angle form the free surface? Also find the centre of pressure for this surface.

(b) A flow is given by $V = 2x^3 i - 2x^2 yj$. Clarify (i) flow is steady or unsteady and (ii) flow is two or three-dimensional. Find velocity, local acceleration and convective acceleration at point (2, 1, 3).

3. (a) What is a pitot or channel? How is it used to measure velocity of flow at any point in a pipe or channel?

(b) Water is flowing through a pipe having diameters 600 mm and 400 mm at the bottom and upper end respectively. The intensity of pressure at the bottom end is 350 kN/m^2 and the pressure at the upper end is 100 KN/m Determine the difference in datum if the rate of flow through the pipe is 60 litres/sec.

4. (a) Derive Hagen-Poiseuille equation.

(b) A horizontal pipe, 10 cm in diameter, is joined by sudden enlargement to a 15 cm diameter pipe. Water is flowing through it at the rate $2m^3$/min. Find the loss of head due to abrupt expansion and the pressure difference in the pipes.

5. The velocity distribution in the boundary layer is given by $\frac{u}{U} = \left(\frac{y}{\partial}\right)^{\frac{1}{7}}$ calculate the following:

   (a) Displacement thickness,

   (b) Momentum thickness

   (c) Shape factor

   (d) Energy thickness.

6. Assuming that thrust T of a screw propeller is dependent upon the diameter d, speed of advance v, fluid density ρ, revolution per second N, and coefficient of viscosity μ. Using Blukingham-π theorem prove that the thrust can be represented by $T = \rho d^2 v^2 \phi(\mu / \rho v d, dN / v)$.

7. A pipe line of 600 mm diameter is 1.5 Km long. To increase the discharge another line of the same diameter is introduced parallel to the first in the second half of the length. If f=0.01 and head at inlet is 300 mm. Calculate the increase in discharge. Neglect minor losses.

8. (a) State the fundamental equations which govern the compressible fuid flow.

   (b) A gas with a velocity of 350 m/sec is flowing through pipe at section where pressure is 78 kN/m2 absolute and temperature 30oc. The pipe changes in diameter and at this section, the pressure is 117 kN/m^2 absolute. Find the velocity of the gas at this section if the flow of the gas is adiabatic. Take R = 287 J/kg K and γ.

[03 – 3210]

III/IV B.E. DEGREE EXAMINATION

SECOND SEMESTER – APRIL 2011

MECHANICAL ENGINEERING

FLUID MECHANICS

Time : Three hours Maximum : 70 marks

Answer Part A and any FOUR questions from Part B & All questions carry equal marks.

Part A must be answered at one place and assume any missing data.

1. (a) Define Vortex Motion.
   (b) Define Momentum equation.
   (c) What is Darey's Weisbach friction factor?
   (d) Define Energy thickness.
   (e) What is a Hydraulic diameter?
   (f) Define Continuity equation.
   (g) Define Compressible flow.
2. (a) Derive an expression for rotation and vorticity in terms of velocities in x, y, and z directions.
   (b) What is flow net? What is the conditions of flow net to be a set of square?
3. (a) What is an orifice? Explain.
   (b) Derive an expression for a discharge through a large rectangular orifice.
4. (a) A pipe has a diameter of 350 mm and right angle bent in the horizontal plane. If $0.3m^3/s$ water is flowing, find the forces acting on the bend; the pressure at the inlet and outlet are 300 and 270 kN/m^2 respectively.
   (b) Derive an expression for the flow through orifice meter.
5. (a) Derive an expression for the velocity of laminar flow through an open channel.
   (b) What is the Reynolds expression for turbulence shear stress?
6. Write notes on the following:
   (a) Limits in incompressibility
   (b) Boundary layer separation.
   (c) Laminar sub layer.
7. Write notes on the following:
   (a) Navier Stokes equation and its solution.
   (b) Favourable and adverse pressure gradient.
8. (a) Write a note on flow of compressible fluid through nozzles.
   (b) Write a note on velocity potential function, stream function and vortex flow.

[03 – 3206]

III/IV B.E. DEGREE EXAMINATION

SECOND SEMESTER – APRIL 2011

MECHANICAL ENGINEERING

DESIGN OF MACHINES ELEMENTS - 1

Time: Three hours Maximum : 70 marks

Answer Part A and any FOUR questions from Part B & All questions carry equal marks.

Part A must be answered at one place and assume any missing data.

1. (a) What is BIS classification of steels? Give examples.

(b) What are the various modes of failures in riveted joints?

(c) Differentiate between shafts, spindles and axles.

(d) What are the various types of stresses induced in a flywheel rim?

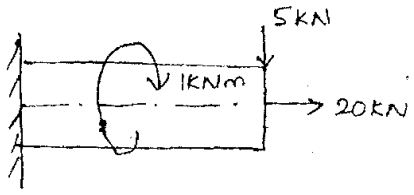
(e) What is Wahl factor? Why is it used?

(f) Why are flexible couplings popular?

(g) What is collar friction?

2. (a) Residual compressive stresses are the best friend of fatigue failures. Is this statement correct or wrong? Explain.

(b) Find the diameter of the bar an shown in fig using any three theories of failure. The bar is made of plain carbon steel C-40 having S_{ut} = 400 mPa and S_{yt} = 300 mPa.



3. A circular bat of 600 mm length is supported freely at i5 two ends. It is acted upon by a central concentrated cyclic load having a minimum value of 20 KN and a maximum value of 50 KN. Determine the diameter of the bar by taking a FOS = 1.5, size factor an 0.85 and surface finish factor of 0.90.

Take S_{yt} = 500 mPa

Sut = 650 mPa.

$K_t = 2$

Q = 0.85.

4. A 50 KN capacity screw jack consists of a square threaded steel screw meshing with a bronze not. The nominal diameter is 60 mm and the pitch is 9 mm. the permissible bearing pressure at the thread in $10\,N/mm^2$. Calculate.

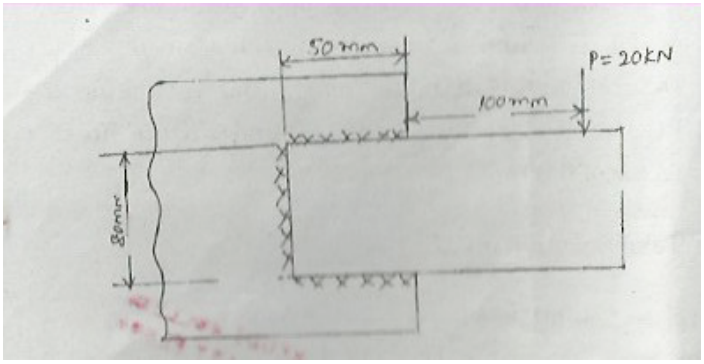
   (a) The length of the nut, and

   (b) The transverse shear stress in the nut.

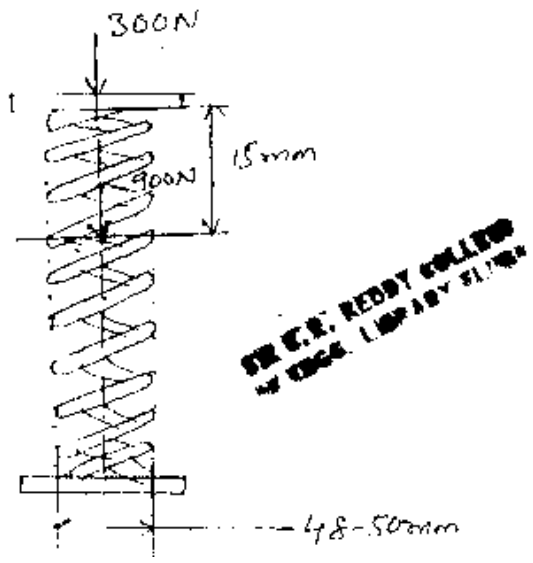
5. A bracket carrying a load of 20 KN is to be welded as shown in fig. Calculate the size of the weld if the working shear stress is not to exceed 70 mPa.

6. Design a cast Iron flywheel used for a four stroke 1.c engine developing 200 KW at 300 rpm. Hoop stress developed in the flywheel is 4.8 N/mm2, total fluctuation of speed is limited to 2.8% of the mean speed. Work done during the power stroke is y3 more than the average work done during whole cycle. The maximum torque on the shaft is 1.8 times the mean torque. Density of cast iron is 7250 kg/m^3.

7. (a) What modification in soderberg diagram is required when it is used for design of helical spring?



   (b) A helical spring is acted upon by a varying load of 300 N to 900 N respectively as shown in fig. The deflection of spring will be round 15 mm and outside diameter of the spring should be within 48-50 mm. Design the spring with the above data.



8. Design and typical rigid. Flange coupling for connecting a motor and a centrifugal pump shafts. The coupling needs to transmit 15 KW at 1000 rpm. The allowable shear stresses of the shaft, key and bolt materials are 60 mPa, 50 mPa and 25 mPa respectively. The shear modulus of the shaft material my be taken as 84 Gpa. The angle of twist of the shaft should be limited to 1 degree in 20 times the shaft diameter.

[03 – 3211]

III/IV B.E. DEGREE EXAMINATION

SECOND SEMESTER – APRIL 2011

MECHANICAL ENGINEERING

DESIGN OF MACHINE ELEMENTS - 1

Time: Three hours Maximum : 70 marks

Answer Part A and any FOUR questions from Part B & All questions carry equal marks.

Part A must be answered at one place and assume any missing data.

1. (a) What factors to be analysed when designing a machine element?

(b) What consideration to be made when selecting a material ?

(c) In what ways, splines are superior to keys.

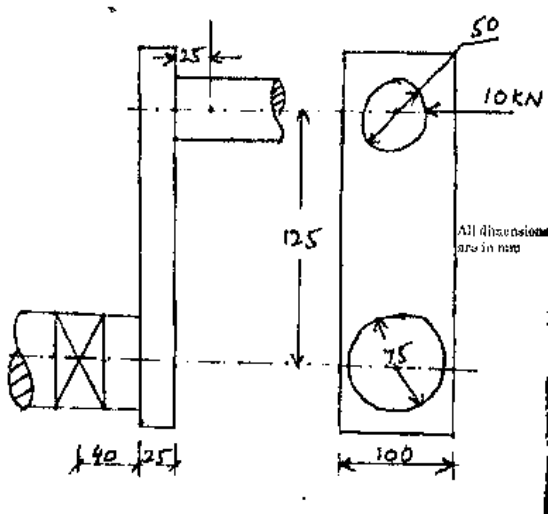
(d) Differentiate fine thread and coarse thread.

(e) What is a spring and how they are classified?

(f) List out various theories of failures.

(g) What information do you obtain from Soderberg diagram?

2. An overhang crank, as shown in fig carries a tangential load of 10 KN at the centre of the crank pin. Find the maximum principal stress and maximum shear stress at the centre of the crank shaft bearing.

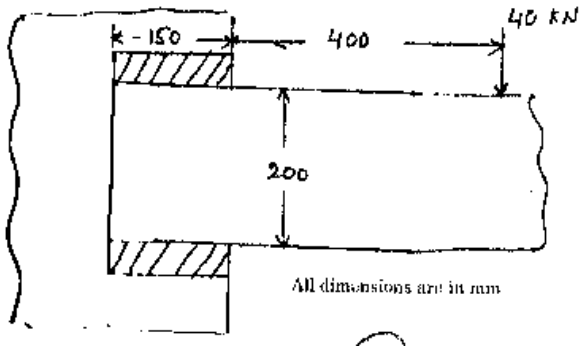


3. A hot roller steel shaft in subjected to a torsional moment that varies from 330 Nm clockwise to 110 Nm counter clockwise and an applied banding moment at a critical section varies from 440 NM to – 220 Nm. The shaft is of uniform cross section and no keyway is present at the critical section. Determine the required shaft diameter. The material has an ultimate strength of 550

MN/m^2 and a yield strength of 410 MN/m^2. Take the endurance limit as half the ultimate strength, factor of safety of 0.85 and a surface finish factor of 0.62.

4. (a) What are the assumption made in the design of welded joint.

(b) A bracket, carries a load of 40 KN as shown in fig. Calculate the size of weld, if the allowable shear stress is not to exceed 80 MPa.



5. (a) What are the advantages and disadvantages of screwed joint?

(b) The nominal diameter of a triple threaded square screw is 50 mm. While the pitch is 8 mm. It is used with a collar having outer diameter of 100 mm and inner diameter as 65 mm. The coefficient of friction at the thread surface as well as at the collar surface can be taken as 0.15 KN. Using uniform wear theory for collar friction, calculate:

(i) Torque required to raise load and lower the load.

(ii) force required to lower the load. If applied at a radius of 500 MM.

6. A solid steel shaft is supported on two bearings 1.8 m apart and rotates at 250 rpm. A 20^o involute gear D 300 mm diameter in keyed to the shaft at a distance of 150 mm to the left on the right hand bearing. Two pulleys B and C are located on the shaft at distances of 600 mm and 1350 mm respectively to the right of left hand bearing. The diameters of the pulley B and C are 750 mm and 600 mm respectively. 30 KW is supplied to the gear, out of which 18.75 KW is taken off at the pulley C and 11.25 KW from the pulley B. The drive from B is vertically downwards while from C is downward at an angle of 60^o to the horizontal. In both cases the belt tension ratio is 2 and the angle of lap is 180^o. The combined fatigue and shock factors for torsion and bending may be taken as 1.5 and 2 respectively.

Design a suitable shaft taking working stress to be 42 MPa in shear and 84 MPa is tension.

7. (a) Make a note on protective coatings and equalized stress in spring leaves.

(b) A helical spring made of C 50 steel has an outside diameter of 80 mm and a wire diameter of 12 mm. The spring has to support a maximum axial load of 1000 N. Determine the max shear stress and total deflection if the spring has 10.5 coils, with ends ground flat. Determine also the factor of safety. Take $G = 8.9 \times 10^4 \, N/mm^2$. .

8. (a) Discuss the function of a coupling. Give at least three practical application.

(b) Design a marine type flange coupling to transmit 400 KW at 150 rpm. Allowable stress for the steel are 70 N/mm^2 in tension; 140 N/mm^2 in compression and 50 N/mm^2 in shear sketch the coupling.

[03 – 3202]

III / IV B.E. DEGREE EXAMINATION

SECOND SEMESTER – APRIL 2011

MECHANICAL ENGINEERING

MANUFACTURING TECHNOLOGY – III

Time: Three hours Maximum : 70 marks

Answer Part A and any FOUR questions from Part B & All questions carry equal marks.

Part A must be answered at one place and assume any missing data.

1. (a) How is CNC different from NC?

   (b) What is CAPP?

   (c) What is backlash?

   (d) What is the use of a rotary table?

   (e) What is sampling length?

   (f) Specifications of CMM.

   (g) Backlash for a spur gear.

2. What are multi spindle automatic machines? How do you classify them?

3. Describe any CNC horizontal machining centre using a diagram.

4. Explain the working of a MCU of a CNC machine.

5. Explain about maximum and minimum limits.

6. Explain Three – wire method.

7. Explain Optical Bevel Protractor with a neat sketch.

8. Explain the various acceptance tests used for testing laser equipments.

[03 – 3212]

III/IV B.E. DEGREE EXAMINATION

SECOND SEMESTER – APRIL 2011

MECHANICAL ENGINEERING

MANUFACTURING TECHNOLOGY - III

Time: Three hours Maximum : 70 marks

Answer Part A and any FOUR questions from Part B & All questions carry equal marks.

Part A must be answered at one place and assume any missing data.

1. (a) What is a machining centre?
   (b) What is CAPP?
   (c) How is interchangeability important?
   (d) What is the purpose of a CMM?
   (e) What are acceptance tests for machine tools?
   (f) Specifications of CMM.
   (g) Backlash for a spur gear.
2. (a) What is FMS? What are its benefits?
   (b) What is automation? State some methods to achieve partial or complete automation of machine tool?
3. (a) Explain the basic elements of Robotic system with neat diagram.
   (b) Describe any vertical machining centre with a neat diagram.
4. (a) Name the various factors affecting the accuracy of a sine bar.
   (b) With the help of a neat sketch explain the construction, working and applications of tool Maker's microscope.
5. (a) Explain the terms 'interchangeability' and 'selective assembly'.
   (b) Differentiate between Uni-lateral and Bi-lateral tolerance systems with neat sketchs.
6. (a) Explain Two-wire method.
   (b) What do you understand by constant chord caliper?
7. (a) Explain with the help of diagram of principle of sine bar.
   (b) Describe with a sketch the principle and working of Angle Dekkor.
8. Write short notes on any FOUR of the following.
   (a) NC coordinate system.
   (b) APT programming.
   (c) Selective assembly.
   (d) Turret lathe.
   (e) Limits and fits.
   (f) Radial drill.

[03 – 3205]

III/IV B.E. DEGREE EXAMINATION

SECOND SEMESTER – APRIL 2011

MECHANICAL ENGINEERING

INDUSTRIAL ENGINEERING AND MANAGEMENT

Time: Three hours Maximum : 70 marks

Answer Part A and any FOUR questions from Part B & All questions carry equal marks.

Part A must be answered at one place and assume any missing data.

1. Write a short answer to the following :
   - (a) Organisation design.
   - (b) Authority.
   - (c) Process layout.
   - (d) Grievance handing.
   - (e) TQM.
   - (f) Plant location.
   - (g) Quality assurance.
2. (a) Explain management. State the nature of management.
   (b) Explain the functions of management.
3. (a) Explain the various types of plant layouts.
   (b) What are the different types of material handling devices?
4. (a) Explain the salient features of industrial dispute act.
   (b) Explain process planning methods.
5. (a) Explain the principles of motion economy.
   (b) Explain the objectives of plant maintenance.
6. (a) Describe the objectives and functions of production planning and control.
   (b) Explain the various work measurement techniques.
7. (a) Explain the various buying techniques.
   (b) Explain control charts of variables and attributes.
8. (a) Explain the functions under PPC.
   (b) Write about store records.

[03-3213]

III/IV B.E. DEGREE EXAMINATION

SECOND SEMESTER – APRIL 2011

MECHANICAL ENGINEERING

INDUSTRIAL ENGINEERING AND MANAGEMENT

Time: Three hours Maximum : 70 marks

Answer Part A and any FOUR questions from Part B & All questions carry equal marks.

Part A must be answered at one place and assume any missing data.

1. Write a short answer to the following:

   (a) Organization Design

   (b) Authority

   (c) Process layout

   (d) Grievance handling

   (e) TQM

   (f) Plant location

   (g) Quality Assurance.

2. Explain management. State the nature of management.

3. Explain the various types of plant layout.

4. Explain the salient features of Industrial dispute act.

5. Explain the principles of motion economy.

6. Describe the objectives and functions of production planning and control.

7. Explain the various buying techniques.

8. Explain the functions under PPC.

[03 – 3214]

III/IV B.E. DEGREE EXAMINATION

SECOND SEMESTER – APRIL 2011

MECHANICAL ENGINEERING

ENGINEERING THERMODYNAMICS – III

Time: Three hours Maximum : 70 marks

Answer Part A and any FOUR questions from Part B & All questions carry equal marks.

Part A must be answered at one place and assume any missing data.

1. (a) What are the essential difference between the two basic types of reciprocating IC engine?

(b) Define

(i) Indicated thermal efficiency and

(ii) Volumetric efficiency.

(c) What is the effect compression ratio and turbulence on knock in a diesel engine.

(d) What are the basic qualities of a good CI engine fuel?

(e) State how are the air compressors classified.

(f) State the fundamental difference between the jet propulsion and rocket propulsion.

(g) How are nuclear power plants classified?

2. (a) Explain any a four stroke cycle engine is more efficient than a two stroke cycle engine when a two stroke cycle engine has one power stork in each revolution and a 4-S cycle engine has one power stroke everly two revolution.

(b) Show that for maximum work to be done per kg of air in an otto cycle between upper and lower limits of absolute temperature T_1. and T_3 , the temperature at the and of compression T_2 and at the end of expansion T_4 are equal and are given by $T_2 = T_4 = \sqrt{T_1 T_3}$.

3. (a) Discuss the difference between ideal and actual value timing diagram of a petrol engine.

(b) Discuss the requirement of a good combustion for SI engine.

4. (a) Describe briefly an axial flow compressor.

(b) A single stage double acting air compressor is required to deliver 14 m^3 of air per minute at 1.013 bar and 15^oC. The delivery pressure is 7 bar and the speed 300 rpm. Take the clearance volume as 5%of the swept volume with the compression and expansion index of n = 1.3.

Calculate

(i) Swept volume of the cylinder

(ii) indicated power.

5. (a) What are the merits and demerits of gas turbine over IC engine?

(b) Discuss briefly the methods employed for improvement of thermal efficiency of open cycle gas turbine plant.

6. (a) Explain briefly the construction and operation of a nuclear reactor.

(b) Discuss the problem of health hazard from nuclear radiation.

7. (a) Explain the different types of solar collects with sketches.

(b) Enumerate the advantages and disadvantages of concentrating collector over that plate collectors.

8. Write short notes on :

(a) Delay period and its importance

(b) Surging and chocking

(c) Wind milk.

[03 – 3216

III/IV B.E. DEGREE EXAMINATION

SECOND SEMESTER – APRIL 2011

MECHANICAL ENGINEERING

Elective – II (B) : AUTOMOBILE ENGINEERING

Time: Three hours Maximum : 70 marks

Answer Part A and any FOUR questions from Part B & All questions carry equal marks.

Part A must be answered at one place and assume any missing data.

1. (a) Which is the general mechanism used in steering?

   (b) What is the function of Air filters?

   (c) What are the different types of clutches?

   (d) What is synchromesh in gearing?

   (e) What is the function of a differential ?

   (f) State the applications of rear axle floating used in automobile.

   (g) What is wheel alignment?

2. (a) Explain with the help of a neat sketch, the working of a differential of a ear wheel.

   (b) Explain the various types of automobiles based on the drives.

3. (a) Explain the working of a VCR engine.

   (b) Draw the sketch of a typical automotive reactive muffler and explain its working.

4. (a) Explain the working of a centrifugal clutch.

   (b) Explain the working of a fluid coupling.

5. (a) Explain gear reduction.

   (b) Explain an epicycle gear train.

6. (a) What is the function of a propeller shaft in a vehicle? Explain.

   (b) Explain about semi – integral frame.

7. (a) With the help of a neat sketch, describe the constructional features of a radial tyre.

   (b) Explain the principal of working of a hydraulic brake.

8. (a) What is break down maintenance?

   (b) What are the various types of lubricants used in vehicles?

   (c) What procedure is to be followed for the maintenance of a battery?

[03 – 3207]

III/IV B.E. DEGREE EXAMINATION

SECOND SEMESTER – APRIL 2011

MECHANICAL ENGINEERING

AUTOMOBILE ENGINEERING

Time : Three hours Maximum : 70 marks

Answer Part A and any FOUR questions from Part B & All questions carry equal marks.

Part A must be answered at one place and assume any missing data.

1. (a) What are the types of power transmission in an automobile?

   (b) what do you mean by stroke in an engine?

   (c) What is the function of a fuel pump?

   (d) What is engine tuning?

   (e) What are superchargers?

   (f) What is the function of a spark plug?

2. Which type of petrol pump is most commonly used in modern cars? Describe its functioning

3. Explain how the variation of the strength of air fuel mixture is accomplished in modern carburetors.

4. Explain the following :

   (a) Thermosython system

   (b) Forced cooling system.

5. Explain the various emissions coming out of an engine.

6. With the help of a neat sketch, explain the construction and operation of a constant mesh gearbox.

7. Sketch and explain the construction and working principle of the Recirculating Ball type steering gear.

8. Write about the various preventive maintenance steps to be taken for a petrol vehicle

[03 – 3201]

III/IV B.E. DEGREE EXAMINATION

SECOND SEMESTER – APRIL 2011

MECHANICAL ENGINEERING

THEORY OF MACHINES – II

Time: Three hours Maximum : 70 marks

Answer Part A and any FOUR questions from Part B & All questions carry equal marks.

Part A must be answered at one place and assume any missing data.

Draw neat sketches wherever applicable.

1. Answer the following.

   (a) Define (i) normal pitch, and (ii) axial pitch relating to helical gears.

   (b) What are the special advantages of epicyclic gear trains?

   (c) State the advantages of involute profile as a gear tooth profile.

   (d) Draw the displacement, velocity and acceleration diagrams for a follower when it moves with uni-form acceleration and retardation.

   (e) What are n-line engines? How are they balanced?

   (f) Define, in short, free vibrations, forced vibrations and damped vibrations.

   (g) What is meant by torsionally equivalent length of a shaft as referred to a stepped shaft?

2. A four – wheeled trolley car of mass 2500 kg runs on rails, which are 1.5 m apart and travels around a curve of 30 m radius at 24 km/hr. The rails are at the same level. Each wheel of the trolley is 0.75 m in diameter and each of the two axles is driven by a motor running n a direction opposite to that of the wheels at a speed of five times the speed of rotation of the wheels. The moment of inertia of each axle with gear and wheels is 18 kg-m2. Each motor with shaft and gear pinion has a moment of inertia of 12 $kg - m^2$. The centre of gravity of the car is 0.9 m above the rail level. Determine the vertical force exerted by each wheel on the rails taking into consideration the centrifugal and gyroscopic effects. State the centrifugal and gyroscopic effects on the trolley.

3. Two mating involute spur gear of 20^o. pressure angle have a gear ratio of 2. The number of teeth on the pinion is 20 and its speed is 250 r.p.m. The module pitch of the teeth is 12 mm. If the

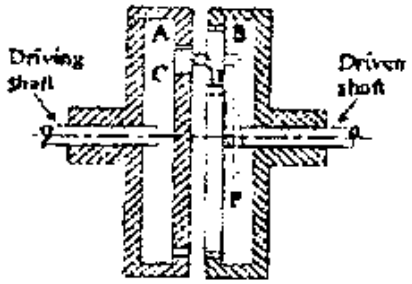
addendum on each wheel is such that the path of approach and the path of recess on each side are half the maximum possible length, find

(a) the addendum for pinion and gear wheel;

(b) the length of the arc of contact; and

(c) the maximum velocity of sliding during approach and recess. Assume pinion to be the driver.

4. An epicyclic train is shown in Fig. Internal gear A is keyed to the driving shaft and has 30 teeth. Compound wheel C and D of 20 and 22 teeth respectively are free to rotate on the pin fixed to the arm P which is rigidly connected to the driven shaft. Internal gear B which has 32 teeth is fixed. If the driving shaft runs at 60 r.p.m. clockwise, determine the speed of the driven shaft. What is the direction of rotation of driven shaft with reference to driving shaft?



5. (a)Derive the expressions for Hammer blow for an uncoupled two cylinder locomotive engine.

(b) A three cylinder radial engine driven by a common crank has the cylinders spaced at 120^{o}. The stroke is 125 mm, length of the connecting rod 225 mm and the mass of the reciprocating parts per cylinder 2 kg. Calculate the primary and secondary forces a crank shaft speed of 1200 r.p.m.

6. A machine of mass 75 kg is mounted on springs of stiffness 1200 KN/m and with an assumed damping factor of 0.2. A piston within the machine of mass 2 kg has a reciprocating motion with a stroke of 80 mm and a speed of 3000 cycles/min. Assuming the motion to be simple harmonic.

Find :

(a) the amplitude of motion of the machine

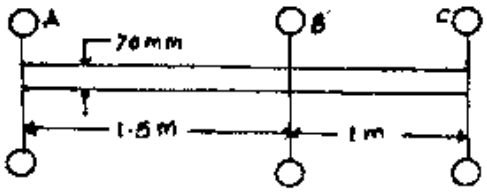
(b) its phase angle with respect to the exciting force

(c) the force transmitted to the foundation, and

(d) the phase angle of transmitted force with respect to the exciting force.

7. In a symmetrical tangent cam operating a roller follower, the least radius of the cam is 30 mm and roller radius is 17.5 mm. The angle of ascent is 75^{o} and the total lift is 17.5 mm. The speed of the cam shaft is 600 r.p.m. Calculate : (a) the principal dimensions of the cam; (b) the acceleration of the following at the beginning of the lift, where straight flank mergers into the circular nose and at the apex of the circular nose. Assume that there is not dwell between ascent and descent.

8. A single cylinder oil engine drives directly a centrifugal pump. The rotating mass of the engine, flywheel and the pump with the shaft is equivalent to a three rotor system as shown in Fig. The M.M.O.I. of the rotors. A, B and C are 0.15, 0.3 and 0.09 $Kg-m^2$. Find the natural frequency of torsional vibration. The modulus rigidity of the shaft material is 84 kN/mm2.



[03 – 3203]

III/IV B.E. DEGREE EXAMINATION

SECOND SEMESTER – APRIL 2011

MECHANICAL ENGINEERING

DESIGN OF MACHINE ELEMENTS – II

Time: Three hours Maximum : 70 marks

Answer Part A and any FOUR questions from Part B & All questions carry equal marks.

Part A must be answered at one place and assume any missing data.

1. (a) What are the draw backs of the worm gear drives?

(b) What is a zerol bevel gear?

(c) Explain any two causes of bearing failure.

(d) Why roller bearings generate more noise than ball bearings?

(e) Explain different types liners used in I.C. Engines.

(f) Differentiate between angle ply and cross ply composites with neat sketches.

(g) Draw a neat sketch of 6 x 19 wire rope.

2. (a) What do you understand by boundary lubrication in journal bearings?

(b) The following data refer to a journal = 100 mm

Length of the journal = 175 mm Load = 28 kN

Speed = 250 rpm C/D = 0.001

Determine the coefficient of friction and heat generated.

3. (a) A roller bearing is selected to withstand a radial load of 40 kN with life of 1200 hrs running at 600 rpm. What toad rating would you look for in searching from manufacturers catalogue if it specifies loud at speed 500 rpm and life 3000 hrs.

(b) Select a suitable rolling bearing for a 55 mm diameter shaft. The bearing should be capable of withstanding 3 kN radial and 1.5 kN axial load at 750 rpm. The bearing is to have a desired rated life of 2000 hrs at a reliability of 94%. There is a light shock load and inner ring rotates.

4. (a) Does the accuracy of gear profile influence the spur gear design? Explain.

(b) A pair of mating carefully cut spur gears have 20_o full depth teeth of 4 mm module. The number of teeth on pinion and gear are 38 and 115 respectively. The face width is 40 mm. If the pinion and gear are made of Steel with core hardness of 200 and surface harness of 300, Calculate the safe power that can be transmitted when the pinion is to run at 1200 rpm

5. (a) What is the function of a crank shaft?

(b) Explain the different stresses induced in crank pin.

(c) Explain the different stresses induced in crank Web.

(d) How crank shaft bearings are Lubricated?

6. In a multi disc clutch, the radial width of the friction material is to be $1/5^{th}$ of the maximum radius. The coefficient of friction is 0.25.

(a) How many discs are required to transmit 60 kW at 3000 rpm? The maximum diameter of the clutch is limited to 250 mm. Axial force is not to exceed 600 N.

(b) What is the mean contact pressure on each contact surface?

7. A crane hook of rectangular cross section 30 mm wide, 60 mm deep has an inner radius of curvature of 90 mm, the load line is at 80 mm from inside of the section.

Determine the maximum fibre stresses induced if it carries a load of 30 kN.

8. A double shoe brake with the following specifications is capable of absorbing a torque of 1.5 kN-m. the diameter of brake drum is 400 mm. angle of contact of contact of each shoe is 110^o. the coefficient of friction is 0.4. Design the brake drum and find the spring force necessary to set the brake.

a= 250 mm, b = 300 mm and c = 150 mm. for CCW rotation : $F_{\theta 1}$ is downwards and $F_{\theta 2}$ is upwards .

[03 – 3208]

III/IV B.E. DEGREE EXAMINATION

SECOND SEMESTER – APRIL 2011

MECHANICAL ENGINEERING

POWER PLANT ENGINEERING

Time: Three hours Maximum : 70 marks

Answer Part A and any FOUR questions from Part B & All questions carry equal marks.

Part A must be answered at one place and assume any missing data.

1. (a) Draw a general purpose boiler and explain the functions of each part of a boier.

   (b) Explain the terms:

      (i) Heat exchanger

      (ii) Flue chamber

      (iii) Boiler accessories.

   (c) Describe how you measure the performance of a diesel engine.

   (d) Explain the terms :

      (i) Run-off flow

      (ii) Percolation

      (iii) Penstock.

   (e) Write about radiation hazards.

   (f) What are gas cooled reactors?

   (g) Define the terms :

      (i) Solar collectors
      (ii) Capacity factor
      (iii) Diversity factor

2. Explain the following terms in detailed manner :

   (a) Oil supply system

   (b) Lubricating system

   (c) Air supply for starting

   (d) Cooling system

3. Explain the governing system of a gas turbine plant.

4. Define the following terms in detailed ways with neat sketches

   (a) Spillways
   (b) Surge tank
   (c) Hydrology
   (d) Transpiration.

5. Explain the functioning of a nuclear power plant. Explain its working with the help of neat sketches.
6. Explain the working of air cooled reactors with the help of neat sketches.
7. Describe the following terms in detailed ways :
   (a) Solar radiation
   (b) Wind mills
   (c) Energy storage
   (d) Thermo – electric MHD.
8. Explain the various factors governing the capacity of power plants.

[03 - 3204]

III / IV B.E. DEGREE EXAMINATION

SECOND SEMESTER – APRIL 2012

MECHANICAL ENGINEERING

FLUID MECHANICS

Time: Three hours Maximum : 70 marks

Answer Part A and any FOUR questions from Part B & All questions carry equal marks.

Part A must be answered at one place and assume any missing data.

1. (a) What is viscosity of a fluid?
   (b) State hydrostatic law.
   (c) Why mercury is used as manometric liquid?
   (d) What are the advantages of model testing?
   (e) Where can we use Reynolds model law?
   (f) What do you understand from rotation and vorticity of fluid particle?
   (g) What are conditions which help the flow to be laminar?
2. (a) Explain the terms path line, streak line, stream line and stream tube.
   (b) Derive the continuity equation in three dimension.
3. (a) An open circular cylinder of 15 cm diameter and 100 cm long contains water upto a height of 70 cm. Find the speed at which the cylinder is to be rotated about its vertical axis, so that the axial depth becomes zero.
   (b) Derive an equation for discharge of a venturimeter.
4. (a) Derive Hagen Poisecuille formula.
   (b) A nozzle of diameter 20 mm is fitted to a pipe of a diameter 40 mm. Find the force exerted by the nozzle on the water which is flowing through the pipe at the rate of $1.2 m^3$ / minute.
5. (a) Obtain expression for head loss in a sudden expansion in the pipe.
   (b) A pipe line of 0.6 m diameter is 1.5 km long. To increase the discharge, another line of the same diameter is introduced parallel to the first in the second half of the length. Neglecting minor losses, find the increase in discharge if 4f = 0.04. The head at inlet is 300 mm.
6. (a) What are the methods of dimensional analysis? Describe the Rayleight's method for dimensional analysis.
   (b) In the model test of a spilway the discharge and velocity of flow over the model were $2\text{m}^3/\text{s}$ s and 1.5m/s respectively. Calculate the velocity and discharge over the prototype which is 36 times the model size.
7. (a) What do you mean by separation of boundary layer? What is the effect of pressure gradient on boundary layer separation.
   (b) For the velocity profile $\frac{\mu}{\nu} = 2\left(\frac{y}{\delta}\right) - \left(\frac{y}{\delta}\right)^2$, find momentum thickness and energy thickness.
8. A gas is flowing through a horizontal pipe at a temperature of $4^o C$. The diameter of the pipe is 8 cm and at a section 1 – 1 in this pipe, the pressure is 30.3 N/cm^2 (gauge). The diameter of the pipe changes from 8 cm to 4 cm at the section 2-2, when the pressure is 20.3 N/cm^2 (guage). Find the velocities of the gas at these section assuming an isothermal process. Take R = 287. 14 Nm/KgK, and atmospheric pressure is 10 N/cm^2.

[03 – 3211]

III/ IV B.E. DEGREE EXAMINATION

SECOND SEMESTER – APRIL 2012

MECHANICAL ENGINEERING

DESIGN OF MACHINE ELEMENTS – I

Time: Three hours Maximum : 70 marks

Answer Part A and any FOUR questions from Part B & All questions carry equal marks.

Part A must be answered at one place and assume any missing data.

1. (a) State the major stresses developed in a helical spring.
   (b) Give the object of machine design.
   (c) What tapper is usually given to cotters? What is meant by the draw of cotter?
   (d) How a key way affects the stress induced in a shaft?
   (e) Sketch laminated spring with full nomenclature.
   (f) Name the different modes of failure.
   (g) Define welding and give its uses.
2. Design a typical rigid flange coupling for connecting a motor and a centrifugal pump shafts. The coupling needs to transmit 15 kw at 1000 rpm. The allowable shear stresses of the safety key and volt materials are 60 Mpa; 50 Mpa and 25 Mpa respectively. The shear modulus of the shaft material may be taken as 84 Gpa. The angle of twist of the shaft should be limited to one degree in 20 times the shaft diameter. Also sketch the coupling.
3. (a) Sketch and explain different type of welded joints.
   (b) Determine the diameter of a circular rod made of ductile material with a fatigue stress (complete stress reversal) $\sigma_e = 265$ Mpa and a tensile yield strength of 350 Mpa. The member is subjected to a varying axial load from – 300 x 10^3 N to 700 x 10^3 N and has a stress concentration factor of 1.8. use factor of safety as 2.0.
4. (a) Explain Nipping and shot peening.
   (b) A steam engine cylinder of size 0.3 m x 0.4 m operates at 1.5 MN/m^2 pressure. The cylinder head is connected by means of 8 volts having yield point stress of 350- MN/m^2 and endurance limit of 240 MN/m^2. The volts are tightened with an initial preload of 1.5 times the stream load. The joint is made leak proof using soft copper gasket which renders effect of external load to be half. Determine the size of volt if factor of safety is two. Assume stress concentration factor as three.
5. (a) Explain stress concentration and methods of reducing it.
   (b) A circular column made of carbon steel having an ultimate strength of 44 kN/cm^2 is to have a length of 2.7 m and is to support an eccentric load of 72 kN at a distance of 7.5 cm from centre line. Factor of safety = 2.2. Find the outside diameter of the column if the column is hollow and inner diameter is 0.8 times outside diameter.
6. (a) Explain the mechanism of fatigue failure.
   (b) Design a suitable diameter for a circular shaft required to transmit 90 kw at 180 rpm. The shear stress in the shaft is not to exceed 70 Mpa and the maximum torque exceed the mean by 40. Also find the angle of twist in length of 2 m. Take G = 90 Gpa.
7. (a) Define load, stress and strain. Discuss the various types of stresses and strains.
   (b) Explain clearly about static failure theories.
8. Write notes on different design models, welding inspection and spring materials.

[03 – 3212]

III/IV B.E. DEGREE EXAMINATION

SECOND SEMESTER – APRIL 2012

MECHANICAL ENGINEERING

MANUFACTURING TECHNOLOGY – III

Time : Three hours Maximum : 70 marks

Answer Part A and any FOUR questions from Part B & All questions carry equal marks.

Part A must be answered at one place and assume any missing data.

1. (a) What is positioning in a CNC machine?

   (b) What is backlash in gears?

   (c) What is robot?

   (d) State the difference between measuring instrument and a gauge.

   (e) What are the essentials of a good comparator?

   (f) Name the acceptance tests for machine tools.

   (g) What are the features of stylus instruments?

2. Describe vertical turning centres. Explain their features, limitations and applications.

3. What is a machine control unit in a CNC machine? How does it work? Explain.

4. Explain clearly the various acceptance tests used for testing laser equipments.

5. List the types of comparators. Explain the working, applications and limitations of any two.

6. Give the working principle of NC machines. Also indicate its advantages.

7. Describe clearly how the different parameters of screw threads are measured.

8. Explain in full about measurement and checking of squareness, flatness and roundness.

[03 – 3202]

III /IV B.E. DEGREE EXAMINATION

SECOND SEMESTER – APRIL 2012

MECHANICAL ENGINEERING

MANUFACTURING TECHNOLOGY – III

Time: Three hours Maximum : 70 Marks

Answer Part A and any FOUR questions from Part B & All questions carry equal marks.

Part A must be answered at one place and assume any missing data.

1.	(a)	What are the applications of turning centres?
	(b)	Define NC – programming.
	(c)	What are Fixed and floating zero methods for specifying zero points?
	(d)	Differentiate between primary texture and secondary texture.
	(e)	Name the two conditions upon which the tolerance size depends.
	(f)	What are the various areas affected by FMS?
	(g)	What is the principle of an electric comparator?
2.	(a)	Explain the terms hole basis system and shaft basis system. Enumerate the difference between them.
	(b)	Name and sketch three main types of fits.
3.	(a)	What are the elements of screw thread which control the quality of the thread?
	(b)	Explicate with a neat sketch the working principle of “Differential screw micrometer”>
4.	(a)	Explicate the principle of sine bar for angular measurement.
	(b)	What are the advantages of optical instruments over conventional measuring instruments?
5.	(a)	Discuss the salient features of machining centers. State some of its advantages over the conventional NC – machine tool.
	(b)	Discuss the several word functions in Numerical Control systems.
6.	(a)	List the various computer programming languages used for developing a NC part program and discuss the importance of each.
	(b)	What are the most common aberrations found in optical projectors?
7.	(a)	Explain the working of CMM.
	(b)	What are the advantages and limitations of stylus probe?
8.	(a)	Describe the pitch measurement of internal and external screw threads by various methods.
	(b)	Explain the various alignment tests on milling machine.

[03-3213]

III / IV B.E. DEGREE EXAMINATION

SECOND SEMESTER – APRIL 2012

MECHANICAL ENGINEERING

INDUSTRIAL ENGINEERING AND MANAGEMENT

Time: Three hours Maximum : 70 marks

Answer Part A and any FOUR questions from Part B & All questions carry equal marks.

Part A must be answered at one place and assume any missing data.

(7 x 2 = 14)

1. Write short notes on :

   (a) Peter F.Drucker.

   (b) Motivation.

   (c) Lockout.

   (d) Production cycle.

   (e) Store record.

   (f) Time study.

   (g) Scheduling.

2. Define 'Management'. What are the important function of management?

3. What are the significant provisions of the industrial Disputes Act, 1947?

4. Outline the different typesa of layouts.

5. Briefly explain about different types of plant maintenance.

6. What are the objectives of purchasing department?

7. What are Double sampling plans?

8. Classify the following inventory using ABC analysis. A = Annual Consumption in number of units, P = Price per unit in Rupees.

Item Code	A	B	C	D	E
A	325	2500	200	3500	250
P	150	225	315	200	145
Item Code	F	G	H	I	J
A	300	400	150	800	500
P	2300	155	382	180	240

[03 – 3205]

III/ IV B.E. DEGREE EXAMINATION

SECOND SEMESTER – APRIL 2012

MECHANICAL ENGINEERING

INDUSTRIAL ENGINEERING AND MANAGEMENT

Time: Three hours Maximum : 70 marks

Answer Part A and any FOUR questions from Part B & All questions carry equal marks.

Part A must be answered at one place and assume any missing data.

1. Write a short answer to the following:

   (a) Labour turnover.

   (b) Production Cycle.

   (c) Forecasting.

   (d) Motivation.

   (e) Store records.

   (f) Collective bargaining.

   (g) Process Planning.

2. (a) What are the principles of management?

   (b) Explain the types of organisation and committees.

3. (a) Explain the causes for industrial disputes.

   (b) Explain the stages in product design and development.

4. (a) Explain the principles of material handling.

   (b) What are the economies of plant location?

5. (a) Discuss the significance of plant maintenance.

   (b) What is work study? Explain the concept of productivity.

6. (a) What factors are to be considered in selection of material handling equipment?

   (b) Write a note on the Factories Act, 1948.

7. (a) What are the objectives of purchasing department?

   (b) Explain the stop watch procedure of time study.

8. (a) Explain the essentials in receipt and issue of materials.

   (b) What are single and double sampling plans?

[03 – 3214]

III/ IV B.E. DEGREE EXAMINATION

SECOND SEMESTER – APRIL 2012

MECHANICAL ENGINEERING

ENGINEERING THERMODYNAMICS – III

Time: Three hours Maximum : 70 marks

Answer Part A and any FOUR questions from Part B & All questions carry equal marks.
Part A must be answered at one place and assume any missing data.

1. (a) Draw the indicator diagrams of diesel and Atkinson cycles.
   (b) What is meant by mean effective pressure and its relevance?
   (c) What is adiabatic efficiency?
   (d) What is the sue of a carburettor?
   (e) What is delay period?
   (f) Define mechanical efficiency and air standard efficiency.
   (g) Draw a typical closed cycle gas turbine plant.
2. Discuss n detail about wind energy and wind mills.
3. (a) Derive the expression for indicated thermal efficiency and volumetric efficiency of an I.C. engine.
   (b) An engine 200 mm bore and 300 mm stroke works on otto cycle. The clearance volume is 16×10^5 mm^3. The initial pressure and temperature are 1 atm and 60^oC C. If the maximum pressure is limited to 24 atm find:
      (i) Air standard efficiency and
      (ii) Mean effective pressure.
4. (a) Explain the phenomenon of different stages of combustion in a diesal engine.
   (b) What is the effect of excessive clearance on the performance of an air compressor?
5. (a) Give the classification of reactors and explain any one.
   (b) Explain in detail about Rockets.
6. Explain axial flow compressor and semi closed cycle of gas turbine plant.
7. (a) Working from first principles derive an expression for work done on air in a reciprocating compressor in terms of pressure ratio.
   (b) List the uses of compressed air.
8. (a) Explain the techniques for improving the gas turbine plant efficiency.
   (b) Why intercooling is required in multistate compression?

[03 – 3216]

III/ IV B.Tech. DEGREE EXAMINATION

SECOND SEMESTER – APRIL 2012

MECHANICAL ENGINEERING

Elective II – AUTOMOBILE ENGINEERING

Time: Three hours Maximum : 70 marks

Answer Part A and any FOUR questions from Part B & All questions carry equal marks.

Part A must be answered at one place and assume any missing data.

1. (a) What is the functioning of thrust bearing in a clutch?
   (b) Why do we provide gear box in a vehicle.
   (c) What is the function of automobile components?
   (d) What is the material for clutch facing?
   (e) What is a counter gear?
   (f) What is adaptive transmission control?
   (g) What is brake dip?
2. (a) Explain the reason for cooling an IC engine.
   (b) Discuss the pump circulation cooling system thoroughly and compare the same with thermosyphon system.
3. (a) What is the function of a clutch? Discuss the various factors affecting the torque transmission in a clutch.
   (b) Compare hydraulic, mechanical, electrical and vacuum methods of operating clutches. Describe a hydraulically operated clutch in detail with the help of simple diagrams.
4. (a) Explain clearly the necessity of a transmission in a vehicle.
   (b) Describe in detail various types of gear selector mechanisms used in automobiles. Discuss also the advantages and disadvantages of each and state what the modern trend is.
5. Compare the various types of gearings used for the final drive. Discuss the advantages and disadvantages of each such type. Describe in particular the types of vehicles in which each of these gearings is used.
6. Discuss n detail:
   (a) Fibre composite leaf springs
   (b) Electronically controlled shock absorbers
   (c) Hydraulic suspension
   (d) Daimler – Benz suspension
   (e) Hydragas interconnected suspension system
   (f) Delphi Magneride.
7. (a) Make a simple sketch showing hydraulically, operated two shoe – leading brake assembly and describe its operation. Compare the same with the trailing shoe type.
   (b) Explain the detail the necessity and principle of working of an antilock brake system. Describe its main components and discuss various types of such systems in use.
8. (a) Discuss the advantages of electronic ignition system compared to the conventional electrical ignition systems.
   (b) Describe briefly the methods to perform the checks for
      (i) Quantity of lubricating oil in the engine
      (ii) Engine coolant level
      (iii) Fluid level in windshield washer
      (iv) Brake fluid level in the master cylinder.

[03 – 3207]

III/ IV B.E. DEGREE EXAMINATION

SECOND SEMESTER – APRIL 2012

MECHANICAL ENGINEERING

AUTOMOBILE ENGINEERING

Time: Three hours Maximum : 70 marks

Answer Part A and any FOUR questions from Part B & All questions carry equal marks.

Part A must be answered at one place and assume any missing data.

1. (a) Draw a neat sketch of simple carburetor.

   (b) Name different types of cooling systems.

   (c) Give the advantages of disc brakes.

   (d) Sketch devis steering mechanism.

   (e) List the disadvantages of magnetic clutch.

   (f) List the main components of used in automobile.

   (g) State the functions of piston rings.

2. (a) Explain abut the splash and pressure lubrication system.

   (b) Explain the advantages of four wheel drive

3. (a) Explain the operation of battery coil ignition with a circuit diagram.

   (b) Describe the working of dynamo.

4. Describe briefly the different types of steering gears with neat sketches.

5. (a) Explain in detail about rigid axle suspension system.

   (b) Describe the operation of MPFI system with neat diagram.

6. Explain the different types of clutches with neat sketches.

7. Sketch and explain the different types of combustion chambers for petrol and diesel engines.

8. Discuss in detail about trouble shooting and maintenance of automobiles.

[03 – 3201]

III/ IV B.E. DEGREE EXAMINATION

SECOND SEMESTER – APRIL 2012

MECHANICAL ENGINEERING

THEORY OF MACHINES - II

Time : Three hours Maximum : 70 marks

Answer Part A and any FOUR questions from Part B & All questions carry equal marks.

Part A must be answered at one place and assume any missing data.

Draw neat sketches wherever applicable.

1. (a) Classify cam followers. Draw neat sketches.

   (b) What is meant by degree of freedom?

   (c) Defi9ne gynoscopic couple and precessional motion.

   (d) Explain module and pressure angle.

   (e) What do you understand by primary and secondary balancing?

   (f) Draw a neat sketch of compound epicyclica gear train.

   (g) What are in line engines? How are they balanced?

2. The propeller of an aero-engine has a weight of 550 N and a radius of gyration of 0.75 m. The propeller shaft rotates at 2000 rpm clockwise viewing from the trail end and makes a complete half circle of 300 m radius at a speed of 300 kmph. Find the gyroscopic couple on the aircraft and state its effect on it. What will of the effect if the aircraft turns to its right instead of to its left? Also find the extra pressure on the bearings if the distance between the two bearings of the propeller is 0.75 m.

3. (a) Discuss the balancing of V-engines.

   (b) A single cylinder reciprocating engine has a speed of 240 rpm; stroke 300 mm ; mass of reciprocating parts 50 kg ; mass of revolving parts of 150 mm radius 37 kg. If two kinds of the reciprocating parts and all the resolving parts are to be balanced, find the balance mass required at a radius of 400 mm and the residual unbalanced force when the crank has rotated 60 o from the top dead centrer.

4. (a) Explain simple ; compound ; reverted and epicyclic gear trains with neat sketches.

   (b) in a pair of 20o involute gears in mesh ; the are of approach and arc of recess are each equal to the circular pitch. Determine the addendum on the pinion and wheel. Number of teeth on gear and pinion are 40 and 20 respectively. Module is 5 cm. Also check for interference.

5. A shaft 50 mm diameter and 3 m long is simply supported at the ends and carries three loads 1000 ; 15000 and 900 N at 1 ; 1.8 and 2.3 m from the left support. Find the frequency of transverse vibration . E = 200 GN/ m^2.

6. A mass of 10 kg which is hung from a spiral spring of stiffness of 80 N/cm. The vibrations are damped by a dashpot which exerts a linear damping force of 100 N/m/sec. Find the frequency of free vibrations ; frequency of damped vibrations and the time required to reduce the amplitude of vibrations to $1/5^{th}$ of the original value. Derive the formulae used if any.

7. (a) Derive the conditions for constant velocity ratio of toothed gearing.

   (b) Make a critical note on cams with specified contours.

8. Write notes on Energy method ; Rayleigh's method and Dunkerley's method.

[03 – 3210]

III/IV B.E. DEGREE EXAMINATION

SECOND SEMESTER – APRIL 2013

MECHANICAL ENGINEERING

FLUID MECHANICS

Time: Three hours Maximum : 70 marks

Answer Question 1 and any FOUR questions from Part B & All questions carry equal marks.

Question 1 must be answered at one place and assume any missing data.

1. (a) Define Newton's law of viscosity.

(b) Give two important examples of phenomenon of surface tension.

(c) What are manometers?

(d) Define convective acceleration.

(e) Where do the centre of pressure and the centre of gravity lie in horizontally submerged bodies? Draw the diagram.

(f) What do you mean by boundary separation?

(g) Define mach cone and mach angle.

2. (a) Classify different types of fluids.

(b) A triangular plate of 1 meter base and 1.5 meter altitude is immersed in water. The plane of the plate is inclined at 30^0 to the free surface and the base is parallel to and at a depth of 2mts from the surface. Find the total pressure of the plate and the position of center of pressure.

3. (a) Define the equation of continuity. Obtain an expression for continuity equation for a three dimensional flow.

(b) A pipe of diameter 4o cms carries water at a velocity of 25 m/sec. The pressure at points A and B are 3 kgf/cm^2 and 2.3 kgf/cm^2 respectively and datum head are 28m and 30 m respectively. Find the loss of head between A and B.

4. (a) Define the following dimensionless numbers:

(i) Reynold's number

(ii) Froudes number

(iii) mach number

(b) The resisting force F of a plane during flight can be considered as dependent upon the length of aircraft 1, velocity v, air viscosity μ, air density ρ and bulk modulus of air K. Express

the functional relationship between these variables and the resisting force using dimensional analysis.

5. Water enters a reducing pipe horizontally and comes out vertically in the downward direction. If the velocity is 5 m/s and pressure is 80 KPa(guage) and the diameter at the entrance and exit sections are 30 cm and 20 cm respectively, calculate the components of the reactions acting on the pipe.

6. (a) How is the pipe coefficient *f* dependent on the Reynolds number?

(b) Derive the Hagen-poiseulle equation for pipes.

7. (a) Explain the concept of boundary layer.

(b) Given the velocity profile $\frac{u}{v} = 2\left(\frac{y}{\delta}\right) - \left(\frac{y}{\delta}\right)^2$

find the displacement thickness, momentum thickness and energy thickness.

8. (a) Prove that the velocity of sound in a compressible fluid is given by C= $\sqrt{\frac{dp}{d\rho}}$

Further prove that it is also given by C= $\sqrt{\frac{k}{\rho}}$

(b) Find the sound velocity through the air where air pressure and temperature are 1.013 bar and 290k. Take R= 287 Nm/kg.K and γ= 1.4

[03 – 3211]

III/IV B.E. DEGREE EXAMINATION

SECOND SEMESTER – APRIL 2013

MECHANICAL ENGINEERING

DESIGN OF MACHINE ELEMENTS-I

Time: Three hours Maximum : 70 marks

Answer Question 1 and any FOUR questions from Part B & All questions carry equal marks.

Question 1 must be answered at one place and assume any missing data.

1. (a) Give the main factors influencing design.

(b) Define welding giving its uses.

(c) What type of stresses are induced in a key?

(d) What are the various types of helical spring ends?

(e) What are mechanical properties of steel?

(f) What are the advantages of power screws?

(g) List the various non metallic materials used in engineering practice.

2. (a) What are the different advantages and disadvantages of screwed joints?

(b) At the bottom of a mine shaft a group of 10 identical close wiled helical springs one set in parallel to absorb the shock caused by the falling of the cage in case of a failure. The loaded cage weighs 7.5 tonnes, while the counter weight has a weight of 1.5 tonnes. If the loaded cage falls through a height of 50 m from rest find the maximum stress induced in each spring if it is made of 5cm diameter steel rod. The spring index is 6 and the number of active turns in each spring is 20. Modules of rigidity in each spring is 0.8×10^4 Kgf/cm^2

3. (a) Compare steel and C.I. for machine construction.

(b) A circular column of carbon steel having an ultimate strength of 44 kN/cm^2 to have a length of 2.7 m and is to support an eccentric load of 72 kN at a distance of 7.5 cm from centerline. F.S =2.2. Find the outside diameter of the column if the column is hollow and inner diameter is 0.8 times outer diameter.

4. (a) Explain stress concentration and methods of reducing it.

(b) Design a cotter joint to connect two rods to transmit a load of 30 kN. Allowable stresses in tension, shear and crushing are 20, 15 and 50 N/mm^2 respectively.

5. (a) Indicate the procedure to be adopted for design of power screws drive.

(b) Design a marine type flange coupling to transmit 400 kw at 50 rpm. Allowable stresses for steel used are 70 W/ mm^2 in tension; 140 n/mm^2 in compression and 50 n/mm^2 in shear, sketch the coupling.

6. (a) Give the procedure to be adopted for the design of welded joints.

(b) Design a rectangular key for a shaft of 50 mm diameter. The shearing and crushing stresses in the key are limited to 40 and 70 n/mm^2.

7. Explain soderberg; goodman and modified goodman diagrams and design considerations in fatigue.

8. Write notes on:

(a) manufacturing considerations in design

(b) knuckle joint and

(c) multi leaf spring

[03 – 3206]

III/IV B.E. DEGREE EXAMINATION

SECOND SEMESTER – APRIL 2013

MECHANICAL ENGINEERING

DESIGN OF MACHINE ELEMENTS-I

Time: Three hours Maximum : 70 marks

Answer Question 1 and any FOUR questions from Part B & All questions carry equal marks.

Question 1 must be answered at one place and assume any missing data.

1. (a) Define factor of safety and endurance limit.

(b) State the function of a spring

(c) In what way hollow shafts are superior to solid shafts?

(d) What is a zib-headed key?

(e) Explain nippling.

(f) What is BIS classification of steels? Give examples.

(g) Briefly discuss the method of reducing stress concentration.

2. (a) Differentiate between transmission shaft, machine shaft, axle and spindle.

(b) Amotor drives a line shaft by a vertical belt drive. The pulley on line shaft is 1.5 m dia and tight side and slack side tensions are 5.5 kN on th belt. The pulley is overhang from centre of bearing by 400 mm. Find the diameter of shaft if allowable shear stess is $45N/mm^2$. If the speed of pulley is 200 rpm, what is the power transmitted?

3. Explain the importance of Wahl's factor in spring design. Asemi elliptical leaf spring consists of two extra full length leaves and six graduated lever, including the master leaf. Each leaf is 7.5 mm thick and 50 mm wide. The center to center distance between the two eyes is 1m. The leaves are prestressed in such a way that when the solid is maximum, stress induced in all the leaves are equal to 350 N/ mm^2. Determine the maximum force the spring can withstand.

4. (a) What are the factors to be considered for the selection of materials for the design of machine elements? Discuss.

(b) Determine the diameter of a circular rod made of ductile material with a fatigue stress (complete stress reversal) σ_e = 265 MPa and a tensile yield stress of 350 MPa. The member is subjected to a varying axial load from -300x10^3 N to 700x10^3 N and has a stress concentration factor = 1.8. Use factor of safety as 2.0.

5. (a) Explain how factor of safety is defined for different materials and different load conditions.

(b) Design a marine type flange coupling to transmit 400KW at 150 rpm. Allowable stresses for the steel used are 70N/mm^2 in tension, 140 N/mm2 in compression and 50 N/mm^2 in shear. Sketch the coupling.

6. (a) State and explain the methods available for calculating safe value of a fluctuating stress.

(b) Determine the tension in a 12 x 1.75 mm bolt when a torque of 30 Nm is acting. The coefficient of friction is 0.15 between the thread and collar. The outer diameter of the collar is 18 mm.

7. (a) What are the flexible couplings and what are their applications? Illustrate your answer with suitable examples and sketches.

(b) Discuss the manufacturing considerations and statistical considerations with reference to design of machine elements.

8. (a) Sketch the stress flow lines in different types of welded joints.

(b) A solid circular shaft 25mm diameter acting as a cantilever of 100mm length is welded to a support by means of a fillet weld all around. A vertical point load of 5 kN is acting at the free end. Determine the leg dimensions of the weld if the permissible shear stress is 95 N.mm^2.

[03 – 3202]

III/IV B.E. DEGREE EXAMINATION

SECOND SEMESTER – APRIL 2013

MECHANICAL ENGINEERING

MANUFACTURING TECHNOLOGY-III

Time: Three hours Maximum : 70 marks

Answer Question 1 and any FOUR questions from Part B & All questions carry equal marks.

Question 1 must be answered at one place and assume any missing data.

1. (a) Define DNC.

(b) Definr fundamental deviation

(c) Define comparator

(d) Backlash for a spur gear

(e) Define flatness

(f) Define waviness

(g) State the various qualities of CMM

2. Define the essential parts of a turret lathe. How does it differ from Engine lathe?

3. Describe any CNC horizontal machining centre using a diagram.

4. What is meant by tape format? Briefly describe the common tape formats you know.

5. Why is it necessary to give a tolerance on an engineering dimension? Give an example of both unilateral and bilateral tolerance.

6. What is meant by a gear tooth thickness? Describe briefly how do you measure it with the help of a gear tooth vernier.

7. Describe any of the optical comparators. Describe an expression for its magnification.

8. Explain the various acceptance tests used for testing of lathe.

[03 – 3212]

III/IV B.E. DEGREE EXAMINATION

SECOND SEMESTER – APRIL 2013

MECHANICAL ENGINEERING

MANUFACTURING TECHNOLOGY-III

Time: Three hours Maximum : 70 marks

Answer Question 1 and any FOUR questions from Part B & All questions carry equal marks.

Question 1 must be answered at one place and assume any missing data.

1. (a) What do you understand by NC coordinate syatem?

(b) What is backlash of spurgear?

(c) What is FMS and DNC?

(d) What are the features of stylus instruments?

(e) Explain tolerance and fits.

(f) What are the features of APT?

(g) What is the use of rotary table?

2. What are the ingrediants of FMS? Explain. What are its importance ;limitations and area affected by it?

3. Explain clearly the functions and working of machine control units in a CNC machine.

4. Explain the steps involved in measuring the parameters of screw threads with neat sketches.

5. Describe the working; applications and limitations of optical lever comparator and pneumatic comparator.

6. Explain the various acceptance tests used for testing radial drill and laser equipment.

7. Write a critical note on milling centers; robots and CAD/CAM.

8. Explain computer assisted part programming with an example involving simple contours and positioning.

[03 – 3212]

III/IV B.E. DEGREE EXAMINATION

SECOND SEMESTER – APRIL 2013

MECHANICAL ENGINEERING

INDUSTRIAL ENGINEERING AND MANAGEMENT

Time: Three hours Maximum : 70 marks

Answer Question 1 and any FOUR questions from Part B & All questions carry equal marks.

Question 1 must be answered at one place and assume any missing data.

1. Write a short notes on

(a) Henry Fayol

(b) Lockout

(c) Routing

(d) Cranes

(e) Performance rating

(f) Store record

(g) Motion study

2. Define 'organisation'. Briefly write about the principles and types of organisations.

3. Briefly write about Herzberg's theory on motivation.

4. What are the different types of layouts?

5. What are the principles of material handling?

6. Outline the objective of plant maintenance.

7. What are the techneques of inventory control?

8. Seven jobs are performed first on machine A and then on machine B. Time in hours taken by each job on each machine is given below. Determine the optimum sequence of jobs and the maximum time elapsed.

	Job						
	1	2	3	4	5	6	7
Machine A	5	1	9	4	10	8	4
Machine B	2	6	7	8	3	6	3

[03 – 3212]

III/IV B.E. DEGREE EXAMINATION

SECOND SEMESTER – APRIL 2013

MECHANICAL ENGINEERING

INDUSTRIAL ENGINEERING AND MANAGEMENT

Time: Three hours Maximum : 70 marks

Answer Question 1 and any FOUR questions from Part B & All questions carry equal marks.

Question 1 must be answered at one place and assume any missing data.

1. Write a short notes on

(a) Management thought

(b) Trade unions

(c) containarisation

(d) promotion

(e) work sampling

(f) scheduling

(g) feedback

2. (a) Define management. What are the principles of management?

(b) Explain the principles of organization.

3. (a) Explain the theories of motivation in brief.

(b) Highlight the features of industrial disputes Act, 1947.

4. (a) Explain the types of production.

(b) What are the objectives and types of plant maintenance?

5. (a) Explain the concept of productivity.

(b) Write bout performance rating and allowances.

6. (a) What are the basic steps in method study?

(b) Discuss the different types of material handling devices .

7. (a) Describe the buying techneques under material management.

(b) Explain the different types of layouts for setting up a plant.

8. (a) What are the measures observed for settlement of industrial disputes?

(b) What do you understand by control charts of variables and attributes?

[03 – 3214]

III/IV B.E. DEGREE EXAMINATION

SECOND SEMESTER – APRIL 2013

MECHANICAL ENGINEERING

ENGINEERING THERMODYNAMICS-III

Time: Three hours Maximum : 70 marks

Answer Question 1 and any FOUR questions from Part B & All questions carry equal marks.

Question 1 must be answered at one place and assume any missing data.

1. (a) Define scavenging

(b) Define octane number and Cetane number

(c) Define chemical delay

(d) What happens if pressure ration is increased in a single stage compressor with clearance ratio?

(e) What happens if pressure ration in increased in gas turbine cycle with regeneration?

(f) What is the difference between fertile and fissionable material

(g) Working principle of MHD

2. (a) Draw and explain a typical valve timing diagram for a four stroke SI engine, what are the engine parameters which influence valve timing.

(b) The following details were noticed in a test on a 4 stroke 4 cylinder diesel engine. Bore diameter is 100 mm, stroke is 120 mm, engine speed is 1600 rpm and fuel consumption is 0.2 kg/min. It is observed that the difference in tension on either side of the brake pulley is 40 kg and brake drum circumference is 3000 mm. If the mechanical efficiency is 80%, find

(i) Brake thermal efficiency

(ii) Indicated mean effective pressure

(iii) Brake specific fuel consumption

Assume lower calorific value of diesel as 43 MJ/kg.

3. (a) Define carburetion. Explain with a simple sketch working of a simple carburetor.

(b) What is abnormal combustion? Explain abnormal combustion phenomenon in a CI engine.

4. (a) Explain with a simple diagram, stages of combustion in a SI engine.

(b) What are divided combustion chambers, explain with a simple sketch construction and working of divided chambers.

5. (a) From fundamentals of degree of reaction, prove $\alpha_1 = \beta_2$, $\alpha_2 = \beta_2$ for an axial compressor.

(b) A three stage compressor is used to compress air from 1.0 bar to 35 bar. The compression in all stages follow PV1.25 = C. The temperature of air is at the inlet to the compressor is 300 K.

Neglecting the clearance and assuming perfect intercooling, find out the indicated power required in kW to deliver 15 m3 of air per minute measured at inlet conditions and intermediate pressures also. Take R= 0.287 kJ/kgK.

6. (a) In a gas turbine plant, air is compressed from 1 bar and 15^0 c through a pressure ratio of 4:1. It is then heated to 650^0 c in a combustion chamber and expanded back to atmospheric pressure of 1 bar in a turbine. Calculate the cycle efficiency and work ration if a perfect heat exchanger is used. The isentropic efficiencies of the turbine and compressor are 80% and 80% respectively.

(b) Explain with a simple sketch, construction and working of rocket propulsion system.

7. (a) Explain with a neat sketch working of CANDU reactor.

(b) Explain briefly the methods available for moderation of neutrons and how moderation of neutrons is done in a reactor.

8. (a) What are the solar collectors, explain how power can be generated using solar energy.

(b) Explain with a simple sketch, working of a wind mill with description of its principle parts.

[03 – 3207]

III/IV B.E. DEGREE EXAMINATION

SECOND SEMESTER – APRIL 2013

MECHANICAL ENGINEERING

AUTOMOBILE ENGINEERING

Time: Three hours Maximum : 70 marks

Answer Question 1 and any FOUR questions from Part B & All questions carry equal marks.

Question 1 must be answered at one place and assume any missing data.

1. (a) What are the advantages of four wheel drive?

(b) What is the purpose of a starter?

(c) List the different types of steering gears.

(d) Give the disadvantages of disc brakes.

(e) What do you understand by rigid axle suspension system.

(f) List the advantages of magnetic clutch

(g) Name the different types of cooling systems

2. (a) Explain the working of a simple carburetor using a neat sketch.

(b) Sketch and describe the working of a petrol filter.

3. Explain the different types of cooling systems with neat sketch.

4. (a) Describe the third gear position in a sliding box with a neat sketch.

(b) Explain different types of piston rings with neat sketches.

5. Explain clearly the main components used in automobile.

6. (a) List out the functions to be performed by the transmission system of an automobile.

(b) List the advantages and disadvantages of centrifugal clutch.

7. Explain in detail about the different types of suspension systems with neat sketch.

8. Write notes on combustion chambers, firing order and flywheel.

[03 – 3216]

III/IV B.E. DEGREE EXAMINATION

SECOND SEMESTER – APRIL 2013

MECHANICAL ENGINEERING

AUTOMOBILE ENGINEERING

Time: Three hours Maximum : 70 marks

Answer Question 1 and any FOUR questions from Part B & All questions carry equal marks.

Question 1 must be answered at one place and assume any missing data.

1. (a) What is the function of piston ring?

(b) What is the use of a muffler?

(c) How does a spark plug work?

(d) What is a torque converter?

(e) What is a centrifugal clutch?

(f) What is wheel alignment?

(g) What type of brakes are used in heavy vehicles?

2. (a) What is engine turning? Explain.

(b) What are the factors on which life of an automobile depends?

3. (a) Explain the combustion phenomenon in SI engines.

(b) Explain the working of a flywheel?

4. (a) Explain the working of a carburetor.

(b) What are super chargers? Explain.

5. (a) Explain the working principle and construction of a dynamo.

(b) What are the requirements of an ignition system of an IC engine?

6. (a) What is a frame? What are its functions?

(b) Explain the working of a fluid flywheel.

7. (a) Explain the working of an epicyclic gear train.

(b) What are the functions of a propeller shaft?

8. (a) Explain the elements of a suspension system.

(b) Explain slow steering and fast steering.

(c) What are the various types of lubricants used in vehicles?

[03 – 3208]

III/IV B.E. DEGREE EXAMINATION

SECOND SEMESTER – APRIL 2013

MECHANICAL ENGINEERING

POWER PLANT ENGINEERING

Time: Three hours Maximum : 70 marks

Answer Question 1 and any FOUR questions from Part B & All questions carry equal marks.

Question 1 must be answered at one place and assume any missing data.

1. (a) Explain transpiration and spillways.

(b) State the principle of working of an oil supply system.

(c) What do you mean by radiation shielding.

(d) Define perculation and surge tank.

(e) Explain rating of power plants.

(f) Give typical applications of steam and gas turbines.

(g) What do you understand by radio-activity?

2. Describe in detail about solar energy, solar radiation, wind mills and thermo electric MHD.
3. Explain clearly about the cost of power plant, cost of erection, cost of production and operating and maintenance expenses.
4. Explain the working of nuclear power plant with the help of neat sketches.
5. Describe coal handling, storing, preparation and supply with reference to steam power plants.
6. Discuss in detail about air supply for starting, lubricating oils and system of lubrication for diesel power plants.
7. Give the classification and comparison of different types of gas turbine power plants.
8. Describe governing, selection of site and lubrication with reference to hydro electric power plants.

[03 – 3201]

III/IV B.E. DEGREE EXAMINATION

SECOND SEMESTER – APRIL 2013

MECHANICAL ENGINEERING

THEORY OF MACHINES-II

Time: Three hours Maximum : 70 marks

Answer Question 1 and any FOUR questions from Part B & All questions carry equal marks.

Question 1 must be answered at one place and assume any missing data.

1. (a) What do you understand by the term "interference" as applied to gears?

(b) What do you understand by "gear train"? Discuss the various types of gear trains?

(c) Why a follower is preferred to that of a knife-edged follower?

(d) Explain clearly the terms "static balancing" and "dynamic balancing".

(e) What are in-line engines? How they are balanced?

(f) Define the terms "free vibrations", "forced vibrations" and "damped vibrations".

(g) Explain critical speed of a shaft.

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

(b) An aeroplane runs at 600km/h. The rotor of the engine weighs 4000 N with radius of gyration of I meter. The speed of rotor is 3000 rpm in anti clockwise direction when seen from rear side of the aeroplane. If the plane takes a loop upwards in a curve of 100 meters radius, find (i) gyroscopic couple developed, (ii) effect of reaction gyroscopic couple developed on the body of aeroplane.

3. A cam rotating clockwise with a uniform speed is to give the roller follower of 20 mm diameter with the following motion:

(i) Follower to move outwards through a distance of 30mm during 120^0 of cam rotation.

(ii) Follower to dwell for 60^0 of cam rotation.

(iii) Follower to return to its initial position during 90^0 cam rotation and

(iv) Follower to dwell for remaining 90^0 of cam rotation.

The minimum radius of the cam is 45mm and the line of stroke of the follower is offset 15mm from the axis of cam and the displacement of the follower is to take place with simple harmonic motion on both the outward and return stroke. Draw the cam profile.

4. (a) Derive an expression for minimum number of teeth required on the pinion in order to avoid interference in involute gear teeth when it meshes with wheel.

(b) Derive an expression for the length of an arc of contact in a pour of meshed spur gears.

5. (a) Why balancing of rotating parts is necessary for high speed engines?

(b) Four masses m_1, m_2, m_3, m_4 are 200kg, 30kg, 240kg and 260kg respectively. The corresponding radii of rotation are 0.2m, 0.15m, 0.25m and 0.3m respectively and the angles between successive

masses are 45^0, 75^0 and 135^0. Find the position and magnitude of the balance mass required, if the radius of rotation is 0.2m.

6. A coil of spring stiffness 4W/mm supports vertically a mass of 20 kg at the free end. The motion is resisted by oil dash pit. It is found that the amplitude at the beginning of fourth cycle is 0.8 times the amplitude of the previous vibration. Determine the damping force per unit velocity. Also find the ratio of frequency damped and undamped vibrations.
7. (a) Discuss the effect of inertia of a shaft on a free torsional vibrations.

   (b) The flywheel of a engine driving a dynamo has a mass of 180kg and a radius of gyration of 30mm. The shaft at the flywheel end has an effective length of 250mm and 50mm diameter. The armature mass is 120kg and its radius of gyration is 22.5mm. The dynamo shaft is 43mm diameter and 200mm effective length. Calculate the position of node and frequency of torsional oscillation ; $C=83KN/mm^2$
8. Write a short notes on

   (i) Torsionally equavalant shaft

   (ii) “Dynamic magnifier” and “ Transmissibility”

   (iii) Epicyclic gear train

(03-3206)

III/IV B.E. DEGREE EXAMINATION
SECOND SEMESTER – APRIL 2014
MECHANICAL ENGINEERING
DESIGN OF MACHINE ELEMENTS-1

Time : Three hours Maximum : 70 marks

Answer Part A and any FOUR questions from Part B & All questions carry equal marks.

Part A must be answered at one place and assume any missing data.

1. (a) what is stress concentration?

   (b) What is notch sensitivity?

   (c) What is the difference between a cotter and key?

   (d) What is the soderberg method of combination of stresses?

   (e) Why are flexible coupling popular?

   (f) What type of stresses are included in shafts?

   (g) What is nipping in a leaf spring?

2. (a) briefly explain shear stress and shear strain.

   (b) Discuss the effects of the following factors on endurance limit.

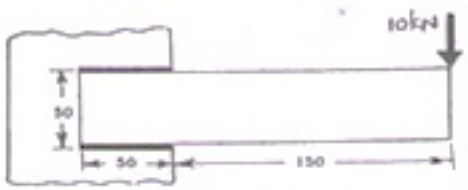
      (1) Load factor

      (2) surface finish factor

3. Calculate the diameter of the solid shaft to transmit 50KW at 180 rpm. If the angle of twist in a length of 4 meters is not to exceed 0.4^0. The allowable stress in the material is 70 MPa and modulus of rigidity is 84 GPA.

4. A bolt is subjected to direct tensile load of 20 KN and a shear load of 15KN. suggest the suitable size of the bolt according to various theories of failure, if the yield stress in simple tension is 360 MPa. A factor of safety of 3 should be used. Take Poisson's ratio as 0.25.

5. Determine the size of the bolts and the thickness of the arm for the bracket as shown in the figure below, if it carries a load of 40KN at an angle of 60^0 to the vertical. The material of the bracket and the bolt is same for which the safe stresses can be assumed as 70, 50 and 105 MPa in tension, shear and compression respectively.



Dimensions in 'mm'.

6. Design a bushed pin type flexible coupling for connecting two shafts when HP to be transmitted=50; speed of the shaft= 100 rpm; diameter of the shaft = 50 mm. The bearing pressure in the rubber bush and allowable stress in the pins are to be limited to 0.45 N/mm^2 and 25 N/mm^2 respectively. Sketch the coupling.

7. A flat sunk key is used to connect a gear to be 45 mm diameter shaft. The standard cross section of the key is 144mm×9 mm.The shaft and the key are made of steel 30C8 (=400N/mm^2) and the factor of safety is 2.5. Find the required length of the key, if the shaft is loaded to transmit the maximum shear stress theory of failure and take yield strength in compression as 1.5 times of yield strength in tension.

8. A semi elliptical laminated spring is to carry of load of 500 N and consists 8 level 46 mm wide, two of the leaves being of full length. The spring is to be made 1000mm between the eyes and is held at the center by a 60mm wide band. Assume that the spring is initially stresses so as to induce an equal stress of 500 N/mm^2 when fully loaded. Design the spring.

(a) Thickness of leaves

(b) Eye diameter

(c) Length of leaves

(d) Maximum deflection and camber Assume E= 2.1×10^5 N/mm^2 .

(03-3211)

III/IV B.E. DEGREE EXAMINATION
SECOND SEMESTER – APRIL 2014
MECHANICAL ENGINEERING
DESIGN OF MACHINE ELEMENTS-1

Time : Three hours Maximum : 70 marks

Answer Part A and any FOUR questions from Part B & All questions carry equal marks.

Part A must be answered at one place and assume any missing data.

1. (a) What are preferred numbers? State their advantages.

   (b) Discuss various methods of reducing stress concentration.

   (c)What is the difference between endurance limit and fatigue strength of the material?

   (d)What are the failures of a riveted joint?

   (e)What are the different stresses induced in screwed in fastenings?

   (f)What are flexible couplings and what are their applications?

   (g)What are composite springs? Explain their purpose.

2. (a) Explain the procedure involved in the design of machine component.

   (b) Explain the following properties

      (1) Toughness

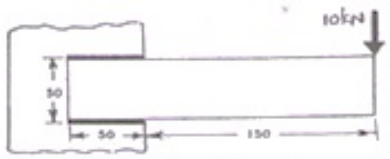
      (2) Resilience

      (3) Malleability.

3. Determine the diameter of solid shaft to transmit 60KW at 180 rpm if the angle of the twist is not to exceed 0.5^0 on a length of 3.5m. Assume modulus of rigidity as 84 GPA.

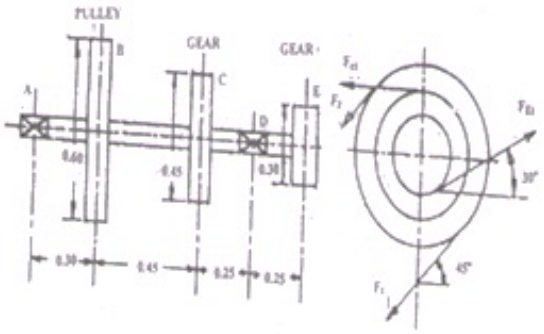
4. Design a longitudinal joint for a 1.25m diameter steam boiler to carry steam pressure of $2.5N/mm^2$.The ultimate strength of boiler plate may be 420MPa.Take joint efficiency as 80% sketch the joint with all dimensions.[adopt the suitable factor of safety and any other required data].

5. A bolt is subjected to direct tensile load of 20 KN and a shear load of 15KN. suggest the suitable size of the bolt according to various theories of failure, if the yield stress in simple tension is 360 MPa. A factor of safety of 3 should be used. Take Poisson's ratio as 0.25.



Dimensions in 'mm'.

6. Derive the expression for the shaft combined with torsion and bending stresses. A 0.6 m diameter pulley B driven by a horizontal belt drive transmit power through a solid shaft from below at an angle 45^0,as shown in figure 2.A 0.45 m gear C delivers 40 percent of power horizontally to right. A 0.3 m gear E delivers the remaining power downwards towards of the left of an angle 30^0 below horizontal. Gears and pulleys are keyed to shaft. The power transmitted is 22.5 KW at 360 rev/min.A nickel steel with yield point of 504 MPa and an ultimate stress of 700MPa specified for the shaft. The total load is gradually applied. Determine the diameter of the shaft.



All dimensions in meters

7. ACME threads are used in a lead screw of a lathe. ACME threads has 50 mm outer diameter 8 mm pitch. The axial pressure required form lead screw is 2500 N. the collar subjected to thrust in carriage has 110mm outer diameter and 5 mm inner diameter and lead screw rotates at 30 rpm.take μ=0.15 for screw and 0.12 for collar

Determine:

(a) Power required to drive the screw

(b) Efficiency of lead screw

8. How the surge in the springs can be eliminated? A truck spring has 12 numbers of leaves, two of which are full length leaves. The spring supports are 1.05 m apart and the central band is 85 mm wide. The central load is to be 5.4 KN with permissible stress of 280 MPa. Determine the thickness and width of steel spring leaves. The ratio of total depth to the width of spring is 3. Also determine deflection of spring.

(03-3214)

III/IV B.E. DEGREE EXAMINATION
SECOND SEMESTER – APRIL 2014
MECHANICAL ENGINEERING
ENGINEERING THERMODYNAMICS- III

Time : Three hours Maximum : 70 marks

Answer Part A and any FOUR questions from Part B & All questions carry equal marks.

Part A must be answered at one place and assume any missing data.

1. (a) Draw the valve timing diagram of a four stroke petrol engine.

   (b) What is the significance of delay period in CI engine?

   (c) Write the main advantages of reciprocating air compressors.

   (d) Discuss the concept of reheating in gas turbines.

   (e) List down the fuels in nuclear power plant

   (f) Define solar constant

   (g) Explain cetane number.

2. (a) Derive the expression for air standard efficiency of Atkinson cycle.

   (b) A six cylinder, 4-stroke SI engine having a piston displacement of 700 cm per cylinder developed 78 KW at 30 rpm and consumed 27 kg of petrol per hour. The calorific value of petrol is 44 MJ/kg. Estimate

   (1) The volumetric efficiency of the engine, if the air –fuel ratio is 12 and intake air is at 0.9bar, 32^0c.

   (2) The break thermal efficiency and

   (3) The break torque. For air R=0.287 KJ/kg-k.

3. (a) explain the stage of combustion in SI engines

   (b) With a neat sketch explain the working of indirect injection chamber of CI engine.

4. (a) derive the equation for work done of a single acting reciprocating air compressor neglecting

   (b) The axial flow compressor having eight stages and with 50% reaction design compresses air in the pressure ratio of 4:1. The air enters the compressor at 20^0c and flows through with a constant speed of 90m/s. The rotating blades of a compressor rotate with a mean speed of 180m/s. isentropic efficiency of the compressor may be taken as 82%.

Calculate.

(1) Work done by the machine and (2) blade angles assume v=1.4 and c_p=1.005kJ/kg-k

5. (a) with a neat sketch and t-s diagram explain the working of a turboprop engine.

(b) A gas turbine unit receives air at 1 bar and 300K and compresses it adiabatically to 6.2 bars. The compressor efficiency is 88%. The fuel has a heating valve of 44186 kJ/kg and the fuel-air ratio is 0.017 kJ/kg of air. The turbine internal efficiency is 90%.calculate the work of turbine and compressor per kg of air compressed and thermal efficiency. For products of combustion, and cp=1.147kJ/kg-k and ɤ=1.333

6. (a) discuss the materials used for moderators used for moderators and coolants of a nuclear power plant

(b) What are the different methods of nuclear waste disposal? Explain the disposal of low level solid waste.

7. (a) discuss the site selection of a windmill and explain the working of horizontal axis wind machine

(b) What is the seebeck effect? Describe the working of a thermoelectric power generator.

8. Write short notes on the following:

(a) Open and divided combustion chambers of IC engine

(b) Vane type blower

(c) Effect of operating variables on thermal efficiency of gas turbine.

(03-3210)

III/IV B.E. DEGREE EXAMINATION
SECOND SEMESTER – APRIL 2014
MECHANICAL ENGINEERING
FLUID MECHANICS

Time : Three hours Maximum : 70 marks

Answer Part A and any FOUR questions from Part B & All questions carry equal marks.

Part A must be answered at one place and assume any missing data.

1. a) State Newton's law of viscosity.
   b) Distinguish between rotational and irrotational flows.
   c) Write three dimensional Continuity equation
   d) What is kinematic similarity?
   e) What is Boundary separation?
   f) List out expressions for any four minor losses in pipes.
   g) What do you understand by stagnation pressure?

2. a) Derive expression for magnitude and location of total pressure force acting on an inclined plane subjected to hydrostatic pressure.
   b) Two large plane surfaces are 20mm apart and the gap contains oil of dynamic viscosity 0.60 Pa.s. A thin plate of cross Sectional area $0.50m^3$ is to be pulled through the gap at a constant velocity of 0.60 m/s. The location of the plate will have to be such that it is 8 mm from one of the surfaces Neglecting edge effects, estimate the force required for pulling the plate as above.

3. a) Differentiate between forced vortex and free vortex flow.
   b) Differentiate between stream line and streak line.
   c) Oil of specific gravity 0.8 flo0ws in apipe 300 mm diameter of the rate of 120 litre/s and the pressure at a point A is 24.525 kPa. The point A is 5.0 m above the point B. Calculate the pressure at B where the diameter is 250 mm if fluid is flowing from A to B. The loss of energy between A and B is $0.1\ V^2_A/2g$.

4. a) What is a venturimeter ? Derive an expression for the discharge through a venturimeter.
   b) A horizontal venturimeter with inlet and throat diameters 30 cm and 15 cm respectively is used to measure the flow of water. The reading of differential manometer connected to the inlet and the throat is 20cm of mercury. Determine the rate of flow taking $C_d = 0.98$

5. a) Derive Hagen – Poiseuille equation for head loss in steady laminar flow through pipe.

b) Find the head lost due to friction in a pipe of diameter 300 mm and length 50 m, through which water is flowing at a velocity of 3m/s. The friction factor of the pipe is 0.02.

6. a) Derive an expression for momentums thickness and energy thickness.

b) A flat plate 1.2 m wide and 1.5 m long is towed lengthwise through still air with a velocity of 1.2 m/s. Assuming the boundary layer to be fully laminar, estimate its thickness and shear stress at the trailing edge. Mass density and kinematic viscosity of the air are 1.216 kg/m^3 and 0.15 x 10^{-4} m^2/s respectively.

7. a) State Buckingham's π – theorem.

b) The efficiency η of a fan depends on density ρ, dynamic viscosity μ of the fluid, angular velocity ω , diameter D of the rotor and the discharge Q. Express η in terms of dimensionless parameters.

8. a) Derive an expression for Bernoulli's equation when process is adiabatic.

b) A gas with a velocity of 300 m/s is flowing through a horizontal pipe at a section where pressure is 6 x 10^4 N/m^2 (absolute) and temperature is 40oC. The pipe changes in diameter and at this section the pressure is 9 x 10^4 N/m^2 (absolute). Find the velocity of the gas at this section if the flow of the gas is adiabatic.

(03-3205)

III/IV B.E. DEGREE EXAMINATION
SECOND SEMESTER – APRIL 2014
MECHANICAL ENGINEERING
INDUSTRIAL ENGINEERING AND MANAGEMENT

Time : Three hours Maximum : 70 marks

Answer Part A and any FOUR questions from Part B & All questions carry equal marks.

Part A must be answered at one place and assume any missing data.

1. Write short notes on the following:
   a) Henry Fayol
   b) Indiscipline
   c) Labour transfer
   d) Scheduling
   e) Routing
   f) Single sampling plan
   g) Performance rating
2. a) What are the functions of management?
   b) Briefly write about principles of organization

3. a) Describe Herzberg's theory on Motivation
   b) What are the types of production?

4. a) What are the objectives of plant maintenance?
   b) briefly write about techniques of Buying

5. Loading a component in a machine takes 5 times and unloading time in 3 minutes. The machine time is estimated as 15 minutes. The time for staring and stopping the machine is negligible. Inspecting the component takes 3 minutes. The walking time between the machines is 1 minute. Draw a man-machine chart showing one man operating two machines

6. a)What are the different types of plant playout?
   b) What are the principles of material handling?

7. a) Briefly write about the important provisions of the factories Act, 1948.
   b) Identify the reasons for strikes and lockouts.

8. In the following table are given the number of defectives found on 15 consecutive production days in daily samples of 100 items. Draw a p-chart

Production day	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
No. of defectives	10	5	10	12	11	9	19	4	12	27	25	9	12	15	8

III/IV B.E. DEGREE EXAMINATION
SECOND SEMESTER – APRIL 2014
MECHANICAL ENGINEERING
INDUSTRIAL ENGINEERING AND MANAGEMENT

Time : Three hours Maximum : 70 marks

Answer Part A and any FOUR questions from Part B & All questions carry equal marks.

Part A must be answered at one place and assume any missing data.

1. Write short notes for the following :
   a) Principles of organization.
   b) Settlement of industrial disputes.
   c) Economics of plant location.
   d) Types of layout.
   e) Micro motion study
   f) Control charts of variables
   g) Inventory control
2. Explain the principle management and growth of management thought
3. Describe the functions of personnel management and briefly explain the theories of motivation
4. Explain the importance and fuctions of production planning and control.
5. Describe the importance, objectives and types of plant maintenance.
6. Describe importance and steps in method study and explain the process charts and principles of motion economy
7. Explain the importance of materials management and objectives of purchasing department
8. Elucidate the importance of materials handling and its principles and selection of materials handling equipment

(03-2312)

III/IV B.E. DEGREE EXAMINATION
SECOND SEMESTER – APRIL 2014
MECHANICAL ENGINEERING
MANUFACTURING TECHNOLOGY - III

Time : Three hours Maximum : 70 marks

Answer Part A and any FOUR questions from Part B & All questions carry equal marks.

Part A must be answered at one place and assume any missing data.

1. Answer the following in brief:
   a) What are the control modes in NC?
   b) What is word address format?
   c) What is meant by interchangeability?
   d) Explain the terms circular pitch and pressure angle related to gear.
   e) List out various types of comparators.
   f) Explain about angle gauges.
   g) Explain about CMM operation.

2.
   a) Explain with block diagram of DNC and mention its features and advantages.
   b) What is FMS and classify the FMS?Explain FMS techniques with example.

3.
   a) Write the significance of subroutine in programming.Explain with illustration.
   b) Distinguish between computer aided programming and manual part programming.

4.
   a) Explain about fits and tolerances.
   b) Explain briefly about measurement of various features of spur gear.

5.
   a) Distinguish between mechanical comparator and optical comparator.
   b) Discuss briefly:
      i. Optical dividing heads and rotary tables.
      ii. Slip gauges

6.
   a) Explain angle Deckkor with a neat sketch
   b) Explain briefly about measurement of flatness and roundness with suitable sketches.

7.
   a) Explain briefly about various stylus instruments for surface roughness measurement with necessary diagrams.
   b) What are the different acceptance tests required for testing of laser equipment?Explain.

8. Write short notes on any FOUR of the following:
   a) Computer graphics.
   b) Specification of robot
   c) APT language
   d) Profiles used for spur gears.
   e) Pneumatic comparator
   f) Radial drill

(03-2302)

III/IV B.E. DEGREE EXAMINATION
SECOND SEMESTER – APRIL 2014
MECHANICAL ENGINEERING
MANUFACTURING TECHNOLOGY - III

Time : Three hours Maximum : 70 marks

Answer Part A and any FOUR questions from Part B & All questions carry equal marks.

Part A must be answered at one place and assume any missing data.

1. a) What are the advantages of DNC over CNC system?
   b) What are the various functions of post processor?
   c) What are the applications of microcontrollers in CNC machines?
   d) Distinguish point to point and continous path CNC control
   e) State the precations to be taken while using a surface plate.
   f) What are interferometers?
   g) Define surface roughness.

2. a) What is Numerical control machine? Explain the classification of N.C machine. What are the basic components of NC machine?
   b) Explain linear interpolation function.

3. a) Explain the different statements used in APT programme.
   b) What is your opinion about future of numerical control?

4. a) Define terms clearance, interference, allowance fit. Draw a conventional diagram for explicit representation of these terms on a shaft and a hole pair.
   b) Explain the classification of plain limit gauges. Sketch and explain any two types of plug gauges.

5. a) Explain the three wire method of measuring effective diameter of screw thread.
   b) State and explain the "Taylor's principle of Gauge Design".

6. a) Describe the general case of slip gauges before and after use. Build up slip gauges from M87 set for measurement of 29.758 mm.
   b) Describe the calibration of slip gauges by Eden – Rolt million comparator.

7. a) What are the most common abbreviations found in optical projector ? Explain how they are caused? How can you overcome these?
   b) What are the possible causes of errors in coordinate measuring machine CMM?

8. a) Describe the principle of Taylor – Hobson Talysurf surface roughness instrument.
   b) Distinguish between ' geometrical ' and 'practical' tests on machine tools.

(03-3201)

III/IV B.E. DEGREE EXAMINATION
SECOND SEMESTER – APRIL 2014
MECHANICAL ENGINEERING
THEORY OF MACHINES - II

Time : Three hours Maximum : 70 marks

Answer Part A and any FOUR questions from Part B & All questions carry equal marks.

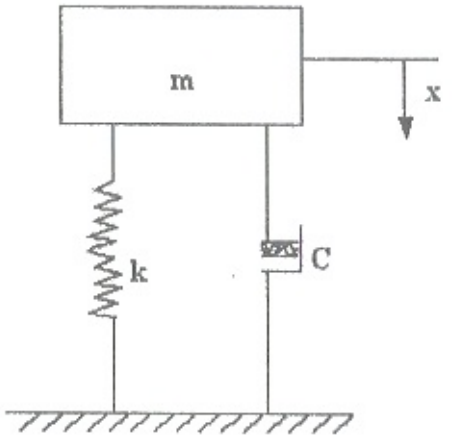
Part A must be answered at one place and assume any missing data.

1. (a) Why a straight line describes the tooth profile of the rack?
   (b) Define inflection point related to cam.
   (c) Explain the gyroscopic effect of rolling of a ship in the sea water.
   (d) Define law of gearing.
   (e) What is the necessity of balancing.
   (f) What is called a mode of vibration?
   (g) What is critical damping of an SDOF?
2. (a) Write short notes on "Gyroscopic couple" as to how they are produced, their magnitude and direction with respect to the spin and torque axes.
   (b) A horizontal axle AB 200 cms long is pivoted at its centre. It carries a weight of 42N at B and a rotor weighing 100N at A. The rotor rotates at 1200 rpm in clockwise direction looking from the front. Calculate the angular velocity of precision taking the radious of gyration of the rotor to be 60 cms.
3. (a) Prove that the transmission ratio of two involute gears does not depend on the centre distance between them.
   (b) An 18-tooth spur pinion has module m=2 mm. For the transmission ratio 1:2, find:
      (a) The no of teeth on the gear
      (b) The centre distance
      (c) The pressure angle (take that the base diameter equals pitch diameter minus 2.2 m)
4. (a) Take function $x= r(1-\cos \alpha)$ describing the harmonic cam and construct a displacement diagram with rise from 0 to p/2, dwell from p/2 to p, and return from p to 2p. Assume lift L=1cm. Find the maximum acceleration and at the transitions from one part to another: p/2, p and 2p.

5. A four coupled- wheel locomotive with two inside cylinders has reciprocating and revolving parts per cylinder as 300kg(f) and 250 kg(f) respectively. The distance between planes of driving wheels is 150cms. The pitch of cylinder is 60cms. The diameter of tread and driving wheels is 190cms. The revolving parts for each coupling rod crank are 125 kg(f). The angle between engine cranks is 900 and the length of coupling rod crank is 22cm. The angle made by coupling rod crank with adjustment crank is 180. The distance of centre of gravity of balance weighs in planes of driving wheels from a scale centre is 75cms. Crank radious is 32cms.
   Determine:
   (a) The magnitude and position of balance weights required in leading and trailing wheels to balance 2/3 of reciprocating and whole of revolving parts if half of the required reciprocating parts are to be balanced in each pair of coupled wheels.

(b) The maximum variation of tractive force and hammer blow when locomotive speed is 100kmph.

6. Determine the equations of motion and the natural frequencies of the two degree – of – freedom spring-mass system as shown in fig.



7. (a) Distinguish reverse and direct crank methods of balancing of radial engines.
   (b) Distinguish balancing of inline engines and radial engines with appropriate examples.
8. A machine mounted on springs and fitted with a dashpot has a mass of 60 kg. There are three springs, each of stiffness 12 N/mm. The amplitude of vibrations reduces from 45 to 8 mm in two complete oscillations. Assuming that the damping force varies as the velocity. Determine
   (a) The damping coefficient
   (b) The ratio of frequencies of damping and undamped vibrations
   (c) The periodic time of damped vibrations

(03-3216)

III/IV B.E. DEGREE EXAMINATION
SECOND SEMESTER – APRIL 2014
MECHANICAL ENGINEERING
Elective II – AUTOMOBILE ENGINEERING

Time : Three hours Maximum : 70 marks

Answer Part A and any FOUR questions from Part B & All questions carry equal marks.

Part A must be answered at one place and assume any missing data.

1. a) What are the advantages and disadvantages of single plate clutch?
   b) What are the materials used for chasis frames and body?
   c) What is an overdrive?
   d) What is the function of a Hook's joint?
   e) What is the principle of automotive brakers?
   f) What is the pressure modulation with reference to antilock brake system?
   g) Name different lights used on a modern car.

2. a) State the purpose of supercharging. What is the effect on fuel consumption of an engine?
   b) Draw an engine valve and name its different parts.

3. a) Explain the necessity of a transmission in a vehicle.
   b) Describe in detail various types of gear selector mechanisms used in automobiles.

4. a) What is the function of a clutch? Discuss various factors affecting the torque transmission in a clutch.
   b) Explain the working of a single plate clutch with neat sketch

5. a) Draw cross – section of an automobile tyre and show on it various constructional features.
   b) What is the function of a propeller shaft ? Explain the construction of a propeller shaft.

6. a) Differentiate between Davis and Akermann steering gear mechanisms.
   b) Explain in detail the necessity and principle of working of an antilock brake system. Describe its main components.

7. a) Explain the operation of a battery ignition system.
   b) Draw a simplified wiring circuit for the lighting system of car and discuss the same.

8. a) Discuss the requirements of a lubricant.
   b) Explain briefly Fuel and Air filters.

(03-3207)

III/IV B.E. DEGREE EXAMINATION
SECOND SEMESTER – APRIL 2014
MECHANICAL ENGINEERING
Elective II – AUTOMOBILE ENGINEERING

Time : Three hours Maximum : 70 marks

Answer Part A and any FOUR questions from Part B & All questions carry equal marks.

Part A must be answered at one place and assume any missing data.

1. a) What is a super charger?
   b) What is the use of a flywheel?
   c) What is the function of a dynamo?
   d) How does a centrifugal clutch work?
   e) What causes the engine to knock?
   f) What is wheel alignment?
   g) What is the function of condenser in ignition system?

2. Explain the combustion phenomenon in S.I engines

3. Explain the working of a Fuel injection system.

4. a) Explain a simple hydraulic brake system using a neat sketch.

   b) Describe how the directional stability is produced with steering axis.

5. Draw the sketch of a typical automotive reactive muffler and explain its working.

6. Explain the working of an epicyclic gear train.

7. Explain the elements of a suspension system with the help of neat diagrams.

8. What is preventive maintenance? Explain.