4E2049

Total No. of Questions: 5 OR 5 Total No. of Pages: 4

Roll No. _____

B.Tech. IV Semester (Old Back) Exam., July 2014
Mechanical Engg.
4ME1 Design of Machine Elements-I
4E2049

Time: 3Hours **Maximum Marks: 80**
Min Passing Marks: 24

Attempt any **five questions,** selecting **one question** from **each unit**. All Questions carry **equal** marks. (Schematic diagrams must be shown wherever necessary. Any data you feel missing suitably be assumed and stated clearly. Units of quantities used/ calculated must be stated clearly.

Use of following supporting material is permitted during examination. (Mentioned in form No.205)

1_____ 2. _____

UNIT -I

Q. 1 a) Explain the various symbols which represents designation of steel on the basis of chemical composition as per the BIS. 12

b) What do you mean by standardization & Interchangeability of parts ? 4

12+4=16

OR

Q.1 a) Calculate the fundamental deviation & tolerances and hence obtain the limits of the size for the hole & the shaft in the following fit; 50H7f7, a close running fit used for an electric motor, a pump set etc 10

b) Explain the following terms
1. Basic size 2. Actual Size 3. Basic hole 4. Basic shaft 5. Upper Deviation 6. Lower deviation 6

10+6=16

UNIT -II

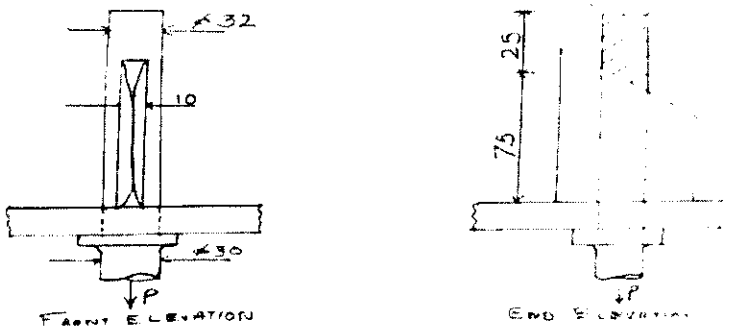
Q. 2 a) Define following terms:-
i) Stress concentration factor
ii) Factor of safety

iii) Notch sensitivity
iv) Fatigue failure
v) Endurance strength
vi) Design for finite life 6

b) For a cottered joint/connection as shown below, determine maximum load 'p' that should be applied.

Safe tensile stress = $35N/mm^2$
Safe shear stress = $17.5\ N/mm^2$
Safe crushing stress = $85N/mm^2$

Neglect stress concentration factor.



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OR

Q.2 a) Design a Knuckle joint to connect two mild steel rods which transmits a tensile force of 25KN. The safe working stress for tension, shear & crushing are 100 N/mm^2, $60N/mm^2$ respectively.
b) Explain the bending failure of cotter & Knuckle Pin.

12+4=16

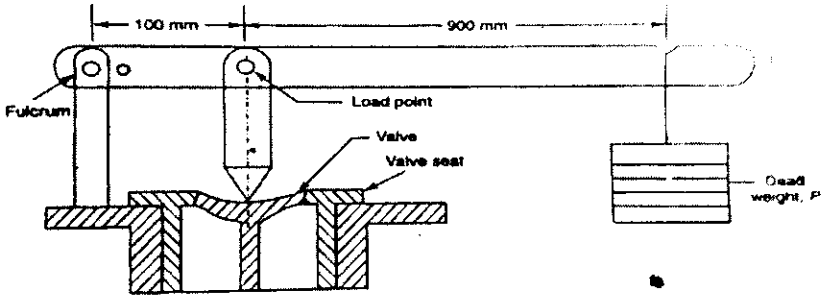
UNIT -III

Q. 3 a) Design a leaf spring for the rear axle of a tractor trolley. The load on the rear axle of the trolley is 10,000N. The span is 1200 mm and width of clamp is 100 mm. In all 12 leaves are used, out of which two are main leaves and remaining are graduated leaves.
b) Discuss the material which can be used in leaf springs. Also discuss nipping of laminated springs.

8+8=16

OR

Q.3 a) Design a simple lever of safety valve for a boiler having a gauge pressure of $1.5\ MN/m^2$. The valve diameter is 90 mm. The lever is 1mtr. long& the distance between the fulcrum & the valve point is 100 mm as shown in the figure above.



b) Explain different classes of levers with diagram.

UNIT -IV

Q.4 a) Explain the following terms.

i) Shaft & axle

ii) Various criteria of shaft designing

iii) Effect of keyway on the strength of shaft

1+4+3=8

b) A turbine shaft transmits 500 KW at 900 r.p.m. The permissible shear stress is 80N/ mm^2 , while twist is limited to 0.5° in a length of 2.5 m, calculate the diameter of shaft. Take G=0.8x10^5 N/mm^2. If the shaft chosen is hollow with di/do=0.6 calculate the percentage saving in material.

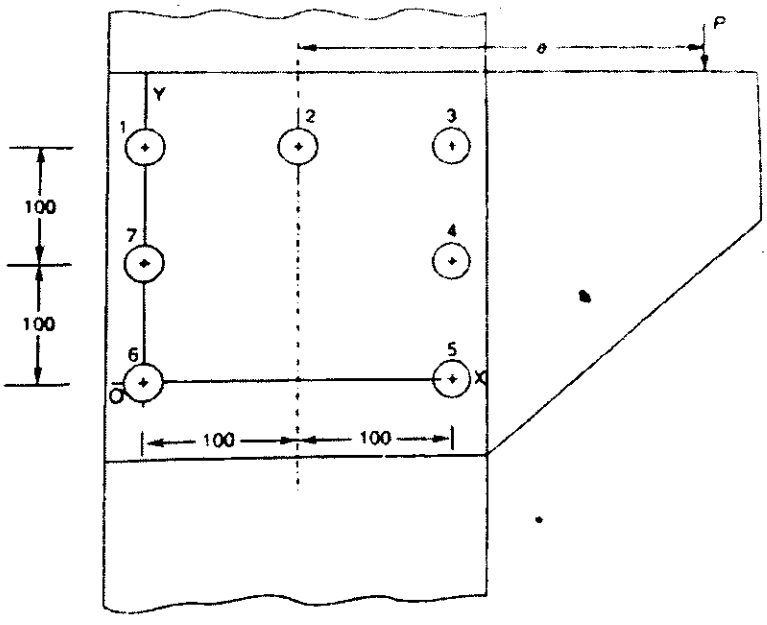
OR

Q.4 a) Classify shaft coupling, mentioning the uses of each type.

b) Design & Draw a cast iron, protected type flange coupling to connect two shafts of 36 mm diameter transmitting 15 KW at 720 r.p.m. The overload capacity is 1.25 times the torque. The bolts & keys are made of C20 steel and flanges are made of FG 200

UNIT -V

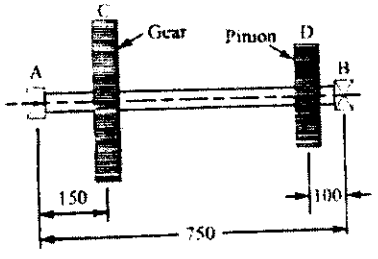
Q. 5 Design an eccentrically loaded lap screwed joint as shown in figure below. The bracket plate is 25 mm thick. All bolts are to be of the same size the load on bracket is 30 KN the bolt spacing is 100 mm & eccentricity is 400 mm. permissible shear strength of bolt is 60 N/mm^2.

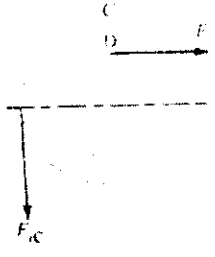


OR

Q.5 A steel solid shaft transmitting 15 KW at 200 r.p.m. is supported on two bearings 750 mm apart has two gears keyed to it as shown below.

The pinion having 30 teeth of 5 mm module delivers power horizontally to right. The gear having 100 teeth 0f 5 mm module is receiving power in vertical direction from below. Using an allow stress of 54 MPa. Determine the diameter of shaft.





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574

4E2099

Total No. of Questions: Total No. of Pages: 4

Roll No. _____

B.Tech. IV Sem. (Main/Back) Exam July 2014

Automobile Engg.

4AE1Design of M/C Elements-I

4E2099

Time: 3Hours **Maximum Marks: 80**

Min Passing Marks: 24

Attempt any **five questions,** selecting **one question** from **each unit**. All Questions carry **equal** marks. (Schematic diagrams must be shown wherever necessary. Any data you feel missing suitably be assumed and stated clearly. Units of quantities used/ calculated must be stated clearly.

Use of following supporting material is permitted during examination.
(Mentioned in form No.205)

1. DESIGN DATA HAND BOOK 2. _____

	UNIT-1	
Q.1	(a) Define 'mechanical property' of an engineering material. State any six mechanical properties, give their definitions and one example of the material possessing the properties.	6
	(b) Select suitable materials for the following parts stating the special property which makes it most suitable for use in manufacturing:	6
	(i) Turbine blade, (ii) Bush bearing, (iii) Carburetor body,	
	(iv) Keys (used for fastening), (v) Cams, (vi) Heavy duty machine tool beds,	
	(vii) Ball bearing, (viii) Automobile cylinder block, (ix)Helical springs.	
	(x) Diesel engine crankshaft (xi) Worm and worm gear (xii)Tramway axle :	
	(c) What are fits and tolerances? How are they designated?	4
	OR	
	(a) Calculate the tolerances, fundamental deviations and limits of sizes for the shaft designated as 40 H8 / f7.	8
	(b) What are the general considerations in design of machine components?	8
	UNIT-2	
Q.2	(a) Explain stress concentration in the machine components? How it is mitigated, describe with the suitable diagram.	8
	(b) explain following :	8
	(i) Fatigue (ii) Interchangeability (iii) Factor of safety (iv) endurance limit	
	OR	
	What is a cotter joint? What are the types of cotter joint. Design and draw a cotter joint to support a load varying from 50 kN in compression to 30 kN in tension. The material used is carbon steel for which the following allowable strasses may be used. The load is applied statically. Tensile stress = compressive stress = 50 MPa, shear stress = 35 MPa and crushing stress = 90 MPa.	16

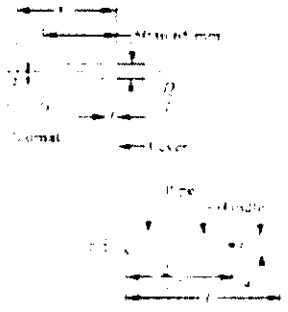
515

UNIT-3

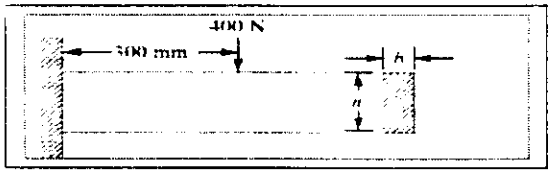
Q.3 (a) A cranked lever, as shown in figure has the following dimensions : 10

Length of the handle = 300 mm Length of the lever arm = 400 mm Overhang of the journal = 100 mm

If the lever is operated by a single person exerting a maximum force of 400 N at a distance of 1/3rd length of the handle from its free end, find : 1. Diameter of the handle, 2. Cross-section of the lever arm, and 3. Diameter of the journal. The permissible bending stress for the lever material may be taken as 50 MPa and shear stress for shaft material as 40 MPa.



(b) A beam of uniform rectangular cross-section is fixed at one end and carries an electric motor weighing 400 N at a distance of 300 mm from the fixed end. The maximum bending stress in the beam is 40 MPa. Find the width and depth of the beam if depth is twice that of width. 6



OR

(a) Explain the leaf spring with suitable diagram. Describe nipping in the leaf spring. 8

(b) 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 a permissible stress of 280 MPa. Determine the thickness and width of the steel spring leaves. The ratio of the total depth to the width of the spring is 3. Also determine the deflection of the spring. 8

UNIT-4

Q.4 (a) A shaft is transmitting 97.5 kW at 180 r.p.m. If the allowable shear stress in the material is 60 MPa, find the suitable diameter for the shaft. The shaft is not to twist more that 1° in a length of 3 metres. Take C = 80 GPa. 6

(b) Design and draw a protective type of cast iron flange coupling for a steel shaft transmitting 15 kW at 200 r.p.m. and having an allowable shear stress of 40 MPa. The working stress in the bolts should not exceed 30 MPa. Assume that the same material is used for shaft and key and that the crushing stress is twice the value of its shear stress. The maximum torque is 25% greater than the full load torque. The shear stress for cast iron is 14 MPa. 10

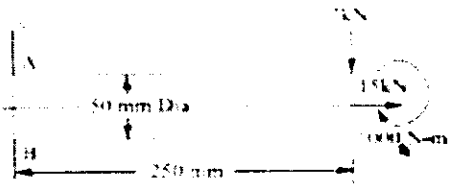
OR

(a) What are the flexible couplings, what are their types? Explain universal or Hooke's coupling with diagram. 6

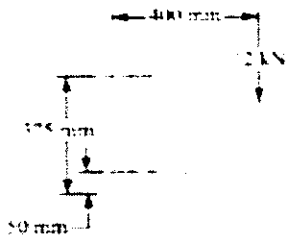
(b) A shaft is supported by two bearings placed 1 m apart. A 600 mm diameter pulley is mounted at a distance of 300 mm to the right of left hand bearing and this drives a pulley directly below it with the help of belt having maximum tension of 2.25 kN. Another pulley 400 mm diameter is placed 200 mm to the left of right hand bearing and is driven with the help of electric motor and belt, which is placed horizontally to the right. The angle of contact for both the pulleys is 180° and $\mu = 0.24$. Determine the suitable diameter for a solid shaft, allowing working stress of 63 MPa in tension and 42 MPa in shear for the material of shaft. Assume that the torque on one pulley is equal to that on the other pulley. 10

UNIT 5

Q.5 (a) A shaft, as shown in Figure, is subjected to a bending load of 3 kN, pure torque of 1000 N-m and an axial pulling force of 15 kN. Calculate the stresses at A and B. 8

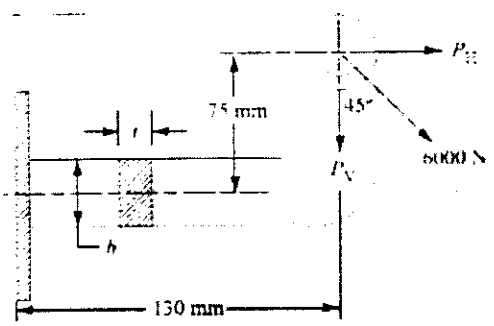


(b) For supporting the travelling crane in a workshop, the brackets are fixed on steel columns as shown in Figure. The maximum load that comes on the bracket is 12 kN acting vertically at a distance of 400 mm from the face of the column. The vertical face of the bracket is secured to a column by four bolts, in two rows (two in each row) at a distance of 50 mm from the lower edge of the bracket. Determine the size of the bolts if the permissible value of the tensile stress for the bolt material is 84 MPa. Also find the cross-section of the arm of the bracket which is rectangular. 8



OR

(a) A mild steel bracket as shown in Fig is subjected to a pull of 6000 N acting at 45° to its horizontal axis. The bracket has a rectangular section whose depth is twice the thickness. Find the cross-sectional dimensions of the bracket, if the permissible stress in the material of the bracket is limited to 60 MPa. 8



(b) Discuss on bolts of uniform strength giving examples of practical applications of such bolts. 3

(c) Explain the method of determining the size of the bolt when the bracket carries an eccentric load parallel to the axis of the bolt. 5

4E2050

Total No. of Questions: Total No. of Pages:

Roll No. _____

B.Tech. IV Semester (Old Back) Exam., July 2014
Mechanical Engg.
4ME2 Automobile Engineering
4E2050

Time: 3Hours **Maximum Marks: 80**
Min Passing Marks: 24

Attempt any **five questions,** selecting **one question** from **each unit**. All Questions carry **equal** marks. (Schematic diagrams must be shown wherever necessary. Any data you feel missing suitably be assumed and stated clearly. Units of quantities used/ calculated must be stated clearly.

Use of following supporting material is permitted during examination. (Mentioned in form No.205)

1_____ 2. _____

UNIT -I

Q. 1 a) What is Chasis ? What are the various component of chasis? Explain the classification of chasis with respect to engine fitting? 2+2+4=8
b) What is a frame ? What are the functions of frame? Explain different types of frames. 2+2+4=8

OR

Q.1 a) Describe briefly with a neat sketch, the construction and working of single plate clucth.
b) Explain with the help of neat sketch, the construction and performance of fluid coupling.
8+8=16

UNIT -II

Q. 2 a) What is a epicyclic gear box? Describe its principle with the help of a neat sketch
2+6=8
b) What is an overdrive? Explain its construction and working with neat sketch.
2+6=8

P.T.O.

OR

Q.2 a) What is propeller shaft? What are the function of a propeller shaft in the transmission system of vehicle? Explain with the help of neat sketch, the construction of propeller shaft. 2+2+4=8

b) Explain Hotchkiss Drive and Torque Tube Drive with neat sketches. 8

8+8=16

Unit- III

Q.3 a) Describe tyre construction in brief. 8

b) Explain the necessity of power steering in an automobile. Explain Integral Power Steering. 4+4= 8

8+8=16

OR

Q.3 a) What is a suspension system? What are the functions of a Suspension system? Explain briefly the elements of suspension system. 4x2=8

b) What are hydraulic brakes? Explain with neat sketch a 'hydraulic braking system'. 2+6=8

UNIT -IV

Q. 4 a) Explain brifly the specific gravity test and cadmium test conducted to ascertain the conditions of a battery. 8

b) Explain the construction & Working of starting motor for automobile.. 8

8+8=16

OR

Q.4 a) Describe a magneto-ignition system with neat sketch. Also state its advantages and disadvantages. 4+4= 8

b) Explain the requirements of automotive headlights. Also explain how they have been met with in modern design of headlights 8

UNIT-V

Q.5. a) Draw the layout of the air conditioning system for a car and explain its working. Describe briefly the function of each component.

5+5=10

b) Write short note on refrigerants used in automotive air conditioning system. 6

10+6=16

OR

Q.5. a) Write short notes on air bags & belts used in automotive air conditioning system.

b) Explain briefly Night Vision System(NVS) and Global Positioning System(GPS). 8+8=16

960

4E2051

Total No. of Questions: _____ Total No. of Pages: 1

Roll No. _____

B.Tech. IV Semester (Back) Exam., July 2014
Mechanical Engg.
4ME3 Fluid Mechanics
4E2051

Time: 3Hours **Maximum Marks: 80**
Min Passing Marks: 24

Attempt any **five questions,** selecting **one question** from **each unit.** All Questions carry **equal** marks. (Schematic diagrams must be shown wherever necessary. Any data you feel missing suitably be assumed and stated clearly. Units of quantities used/ calculated must be stated clearly.

Use of following supporting material is permitted during examination. (Mentioned in form No.205)

1_____ 2._____

UNIT -I

Q. 1 a) A fluid absolute viscosity 8 poise flows past a flat plate and has a velocity 100 cm/s at the vertex which is 20 cm. from the plate surface, make calculations for the velocity gradients and shear stress at points 5 cm, 10 cm and 15 cm. from the boundary. Assume
(i) a straight line velocity distribution and (ii) a parabolic velocity distribution. Comment upon the result. 12
b) Explain the concept of hydrostatic paradox. 8

OR

Q.1 a) A wooden block of volume 0.03 m^3 weighing 210 N is attached to noe end a 3.5 m long wooden rod whose other end is hinged to wall. The block and part of a rod are under water in the position shown in fig. . Find the inclination θ of the rod with the horizontal. The rod weighs 15N and has a uniform cross sectional area of 2000mm^2. 10

B) Explain the terms centre of buoyancy, metacentre and metacentric height. 6

UNIT -II

Q. 2 a) Two dimensional flow is described by the velocity components: $\mu = 5x^3 ; v = -15\, x^2\, y$. Evaluate the stream functions, velocity and acceleration at point P(x=1m and y=2m) 10

b) State the momentum equation and mention some of its engineering applications. 6

10+6=16

OR

Q.2 a) A closed tank 1m x 1.25m in plan x 4.5 high and weighing 1175N is filled with water to depth of 3m. A hole in one of the side wall has an effective area of 7.5 cm^2 and is located at 20 cm above the tank bottom. If the coeeficient of fri=ction between the ground and the wheels is 0.012, determine the air pressure in the tank that is required to set it into motion. 8

b) A closed tank of a fire engine is partly filled with water , the air space above under pressure,. A 5 cm hose connected to the tank discharge on the roof of a building 2 m above the level of water in the tank. The friction losses are 50cm of water. What air pressure must be maintained in the tank to deliver15 it/s on the roof?.

UNIT -III

Q.3 a) A right angled V-notch is employed to measures the discharge. Estimate the flow rate if the head $(H \pm dH)$ measured above the sill is given as $(0.2 \pm 0.01)m$. Take the value of discharge coefficient to be equal to 0.60.

8

b) Derive an expression for the time of emptying a tank through an orifice at its bottom.

OR

Q.3 a) A pipeline 60 cm diameter and 5 km long, connect two reservoirs A and B whose constant difference of level is 15m. A branch pipe taken from a point distant 2 km form reservoir A leads to a third reservoir C. A regulating valve on this branch pipe helps to control the quality of water entering the reservoir C. Determine the rate of flow to reservoir B when a) no water is discharged to reservoir c; b) the quality of water discharged to reservoir C is 125 liters per second. Consider only friction losses and take f= 0.004 in the 125 liters per second. Consider only friction losses and take f = 0.004 in the Darcy formula for friction loss, $h_{f=\frac{4flv^2}{2gd}}$ 10

b) Derive an expression for the head loss due to sudden enlargement in pipe flow. 8

UNIT -IV

Q. 4 a) Wave motion inside a harbor is to be studied by means of a geometrically similar model constructed to scale of 1:40, Neglecting viscous and surface tension effects, obtain the prototype to model scale rations for a) velocity b) time c) acceleration and d) force.
In the harbor a 1.5 high wave travels a certain distance in 30 seconds. What will be the corresponding wave height in the model and what time it takes to travel the corresponding distance. 10

b) Briefly explain geometric, kinematic and dynamic similarities. 6

10+6=16

OR

Q.4 a) Compare the cost of pumping the same fluid at the same volumetric rate through 15 cm and 20 cm diameter pipes which have the same value of absolute roughness $\varepsilon = 0.03$. Assume that the Reynolds number is sufficient high of viscous effects to be negligible. 7

b) A Pipe 10 cm in diameter and 100 m long is used to pump the oil of viscosity 3.5 poise and specific gravity 0.92 at the rate of 1200 liters/minute. The first 300m of the pipe is laid along the ground sloping upwards at 10^0 to the horizontal and the remaining pipe is laid on the ground sloping upward at 15^0 to the horizontal. State whether the flow is turbulent of laminar? Determine the pressure required to be developed by the pump and the power of driving motor if the pump efficiency is 60 percent. Assume suitable data for friction coefficient, if required. 9

UNIT -V

Q. 5 a) What do you understand by the boundary layer? Illustrate with reference to flow over a flat plate. 6

b) The velocity distribution in laminar boundary layer over a flat plate is assumed as u= a sin(by) +c, where a, b and C are constants. Apply the appropriate boundary conditions and determine the velocity distribution law. 10

OR

Q.5 a) A 8 mm ball made of material of relative density 1.25 is suspended from a string. Wind flows past the ball at a velocity of 10 m/s . Calculate the angle which the string makes with the vertical. For air $\rho = 1.2\, kg/m^3$ and $\mu = 1.8\, X\, 10^{-5}\ Ns/m^2$ 10

b) Discuss the basic components of total drag. 6

501

B.Tech. IV Semester (Back) Exam., July 2014

Production and Industrial Engg.

4PI4 MACHINING AND MACHINE TOOLS

Common for AE & ME & PI

4E2052

Time: 3Hours | Maximum Marks: 80
Min Passing Marks: 24

Attempt any five questions, selecting one question from each unit. All Questions carry equal marks. (Schematic diagrams must be shown wherever necessary. Any data you feel missing suitably be assumed and stated clearly. Units of quantities used/ calculated must be stated clearly.

UNIT I

Q.1 a) Give classification of metal removal processes and describe related machines in brief. 8

b) For given data determine shear angle and friction angle during orthogonal cutting:

Rake angle: 20^0, Uncut chip thickness t =0.125 mm; Cutting force =1100N; Thrust (normal) component= 400N; Cutting ratio= 0.42. 8

OR

Q.1 a) Explain Merchant's model for determining the shear plane angle in orthogonal cutting. 8

b) Describe the geometry for a right hand turning tool? How does it defer from left hand tool geometry? 8

UNIT II

Q.2 a) Discuss tool wear mechanism and list types of tool damage. 8

b) Explain direct and indirect tool failure criteria. 8

OR

Q.2 a) Explain the effects of process parameters such as materials, speed, depth of cut etc. on tool life. 8

b) A 25 mm dia steel bar was turned at 300 rpm using HSS tool. Tool failure occurred after 10 min. When the speed was decreased to 250

rpm, the tool failed in 52.5 min. Assuming that Taylor's equation applies, fin the expected tool life at a cutting speed of 275 rpm. 8

UNIT III

Q.3 a) Using proper illustrations enumerates differences between capstan and turret lathes? 8

b) Where exactly the use of mechanical copying machines is preferred? Explain types of tracer machines. 8

OR

Q.3 a) Explain the process of centerless grinding (both the internal as well as external) with neat sketches. 8

b) Describe the standard marking system for grinding wheel and discuss their structure. 8

UNIT IV

Q.4 a) Describe various thread manufacturing processes and state their applications. 8

b) Explain various gear generating processes including hobbing, shaping etc. 8

OR

Q.4 State the difference between gear manufacturing and generating. Explain gear manufacturing through hot rolling, stamping and extrusion and mention their applications. 16

UNIT V

Q.5 Write short notes on

a) Hydraulic forming

b) Explosive forming

c) Electro hydraulic forming

d) Magnetic pulse forming 16

OR

Q.5 Write a note on industrial safety which includes safety of operators, reduction in industrial noise, prevention of environment etc. 16

B.Tech. IV Semester (Old Back) Exam., July 2014
Mechanical Engg.
4ME5 Kinematics of Machines
4E2053

Time: 3Hours **Maximum Marks: 80**
Min Passing Marks: 24

Attempt any **five questions,** selecting **one question** from **each unit.** All Questions carry **equal** marks. (Schematic diagrams must be shown wherever necessary. Any data you feel missing suitably be assumed and stated clearly. Units of quantities used/ calculated must be stated clearly.

UNIT -I

Q. 1 a) Explain with suitable sketches " Inversions of single slider crank chain. 8
b) Derive an expression for the magnitude of coriolis component of acceleration. 8

OR

Q.1 a) What are straight line mechanisms? Describe one type of exact straight line motion mechanism with the help of a sketch. 6

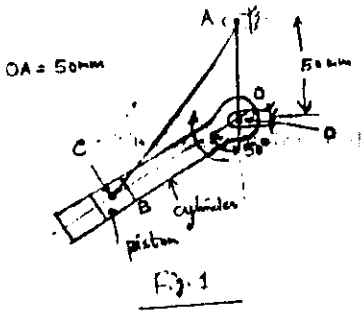


Fig. 1

b) The kinematic diagram of one of the cylinders of a rotary engine is shown in figure 1. The crank OA which is vertical and fixed, is 50mm long. The length of the connection rod AB is 125 mm, the time of the stroke 0B is inclined at 50^0 to the vertical, the cylinders are rotating at a uniform speed of 300 r.p.m. in a clockwise direction, about the fixed centre 0. Determine (a) acceleration of the piston inside the cylinder an (b) angular acceleration of the connecting rod.

10

UNIT -II

Q. 2 a) Derive an expression for the ratio of shaft velocities for Hooke's joint and draw the polar diagram depicting the salient features of driven shaft speed. 8
b) Derive an expression for correct steering for Davis steering gear mechanism. 8

OR

Q.2 a) Derive an expression for the ration of driving tensions in a V-belt drive assuming the angle of groove of the pulley to be as 2 β. 8
b) A leather belt is required to transmit 7.5 kw from a pulley 1.2 m in diameter, running at 250 r.p.m.. The angle embraced is 165^0 and the coefficient of fraction between the belt and the pulley is 0.3. If the safe working stress for the leather belt is 1.5 Mpa, density of leather 1 Mg/m^3 and thickness of belt is 10 mm . Determine the width of the belt taking centrifugal tension into account. 8

UNIT -III

Q. 3 a) Drive an expression for torque transmitted by a single plate clutch assuming uniform pressure. 8
b) The mean diameter of the screw jack having pitch of 10 mm is 50 mm. A Load of 20kn is lifted through a distance of 170 mm. find the work dine in lifting the load and

efficiency of the screw jack When (i) the load rotates with the screw and (ii) the load rests on the loose head which does not rotate with the screw. External and internal diameter of the bearing surface of the loose head are 60 mm and 10 mm respectively. The coefficient of friction for the screw and the bearing surface may be taken as 0.08. 8

OR

Q.3 a) A multi disc clutch has three discs on the driving shaft and two on the driven shaft. The outside diameter of the contact surface is 240 mm an inside diameter 120 mm. Assuming uniform wear and coefficient of friction as 0.3, find the maximum u=intensity of axial pressure between the discs for transmitting 25 KN at 1575 r.p.m. 8

b) From first principles, deduce an expression for the friction moment of a collar thrust bearing, stating clearly the assumptions made. 8

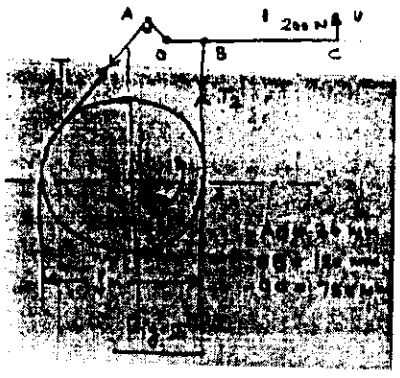
UNIT -IV

Q. 4 a) Describe with the help of a neat sketch the principles of operation of an internal expanding shoe brake. Derive the expression for the braking torque . 10

b) Describe the construction and working of prony brake absorption dynamometer. 6

OR

Q.4 a) A band and block brake, having 14 blocks each of which subtends an angle of 15^0 at the centre, is applied to a drum of 1 m effective diameter. The drum and flywheel mounted on the same shaft has a mass of 2000 kg and a combined radius of gyration of 500 mm. the two ends of the band are attached to pins on opposite sides of the brake lever at distances of 30 mm and 120 mm form fulcrum. If a force of 200 N is applied at a distance of 750 mm from the fulcrum as shown in fig. 2, find (i) Maximum braking torque (ii) angular retardation of the drum. 10



b) Explain the phenomenon of self energizing and self locking as applicable to case of differential band brake. 6

UNIT -V

Q. 5 a) Draw the displacement, velocity and acceleration diagram for a follower when it moves with uniform acceleration and retardation. Derive the expression for velocity and acceleration during out stroke and return stroke of the follower. 8

b) Explain with sketches the different types of cams and followers. 8

OR

Q.5 A can with a minimum radius of 50 mm , rotating clockwise at a uniform speed is required to give a knife edge follower the motion as described below:

1. To move outwards through 40 mm during 100^0 rotation of the cam.
2. To dwell for next 80^0
3. To return to its starting position during next 90^0 and
4. To dwell for the rest period of a revolution i.e. 90^0.

Draw the profile of the cam, when the line of stroke of follower passes through the centre of the cam shaft. Displacement of the follower is to take place with uniform acceleration and retardation . Determine the maximum velocity and acceleration of the follower when the cam shaft rotates at 900 r.p.m. 16

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Total No. of Questions: Total No. of Pages:

Roll No. _____

B.Tech. IV Semester (Old Back) Exam., July 2014
Mechanical Engg.
4ME6 Mechanical Measurement and Control
4E2054

Time: 3Hours **Maximum Marks: 80**
Min Passing Marks: 24

Attempt any **five questions,** selecting **one question** from **each unit**. All Questions carry **equal** marks. (Schematic diagrams must be shown wherever necessary. Any data you feel missing suitably be assumed and stated clearly. Units of quantities used/ calculated must be stated clearly.

Use of following supporting material is permitted during examination. (Mentioned in form No.205)

1._____ 2._____

UNIT -I

Q1. a) Give classification and performance characterization of an instrumentation system.

b) Discuss types of strain gages with neat sketch and deduce their formula for gage factor.

OR

Q1. a) How static and dynamic measurements of strain are performed?

b) Explain the temperature compensation and calibration of strain gages.

UNIT II

Q2. a) Elaborate is the principle of working of mechanical, electro-mechanical and photoelectrical sensors.

b) Discuss displacement measurement and related transducers.

OR

Q2. a) Explain how acceleration is measured and discuss one practical example of its application.

b) List various pressure gages and explain with suitable illustration, how bourdon's pressure gage works

UNIT III

Q3. a) Briefly explain the principle of AD and DA conversions.

b) What do you understand by multi-channel data acquisition system?

OR

Q3. a) Explain the differences between open and closed loop control systems and discuss their merits.

b) Write a short note on servo motors.

UNIT IV

Q4. Describe giving block diagrams the development of a speed control system for steam/gas turbines

OR

Q4. Calculate the time response specifications for a unity feedback system whose open loop transfer function is given by:

$$G(s) = \frac{25}{s(s+25)}$$

UNIT V

Q5 Determine the range of values of k for which the feedback control system, whose characteristic equation is given below, is stable:

$$is\ + 22\,s^3 + 10\,s^2 + s + k = 0$$

OR

Q5. Describe Routh's stability criterion for stability. State its limitations and special cases.