SUBJECT CODE NO:- K-03
FACULTY OF ENGINEERING AND TECHNOLOGY
T.E. (MECH/PROD) Examination Oct/Nov 2016
Design of Machine Elements - II
(Revised)

[Time: Three Hours]   [Max.Marks:80]

Please check whether you have got the right question paper.

N.B
i) Attempt any three questions from each section.
ii) Assume suitable data, if necessary.
iii) Use of non-programmable calculator and design data book is allowed

Section A

Q.1   It is required to design a pair of spur gears with 20^0 full depth involute teeth consisting of a 20 teeth pinion   14
meshing with a 50 teeth gear. The pinion shaft is connected to a 20KW, 1440RPM electric motor. The
starting torque of the motor can be taken as 150% of the rated torque. The material for the pinion is plain
carbon steel Fe 410 (6wt 410N/mm^2) while the gear is made of gray cast iron FG 200 (6wt 200 N/mm^2) The
factor of safety is 1.5. Design the gear based on Lewis equation and using velocity factor the account for the
dynamic load.

Q.2   The pair of bevel gear is to be used to transmit 10kw. Number of teeth on pinion and gear are 20 and 60   13
respectively. The steel pinion meshes with C.I. gear. The safe bending stresses for steel and C.I are
85 N/mm^2 and 60 N/mm^2 respectively. Speed of pinion is 1200rpm and gear is 400rpm. The tooth profile is
$14 \frac{1^0}{2}$ composite. Design the pair, use L=3b, wear factor of 600 N/m. And dynamic factor of 80kN/m. Check

out the design for wear and dynamic load E$_p$=2.1×10^{5}mpa & E$_g$= 1×10^{5}mpa. $kv = \frac{6}{6+v}$.

Q.3   a) Explain compound and reverted gear trains.   03
b) In an epicyclic gear train, an arm carries two gear A & B having 35 and 50 teeth respectively. If the   10
arm rotates at 160rpm in the anti-clockwise direction about the centre of the gear. 'A' which is
fixed, determine the speed of gear 'B'. If the gear 'A' instead of being fixed makes 300rpm in the
clockwise direction, what will be the speed of gear B?

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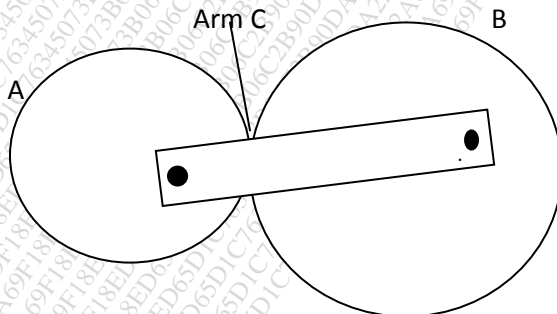
Q.4 A multi plate disc clutch having steel and bronze plate is used to transmit 5 kw at 100rpm. The clutch   13
operated in with oil with coefficient of friction 0.1 and the average allowable pressure of 350kN/m^2. If the
inner radius and outer radius of contact area are 50mm and 80mm respectively. Find out.
   i)   Total no. of discs of steel & bronze require
   ii)   Axial force require to engage and disengage the clutch.
   iii)   Average pressure
   iv)   Actual maximum pressure

Q.5 Write short notes on (any three)   13
   i)   Thermal consideration in worm gear.
   ii)   Centrifugal clutch
   iii)   Formative no. of teeth on helical gear and bevel gear
   iv)   Causes of gear failure

Section B

Q.6   a) Explain hydrodynamic bearing.   04
       b) A 100mm diameter shaft operating at 2000rpm is supported in a 140mm long full journal bearing   10
           subjected to a radial load of 45KN. Operating temperature of oil is limited to 80^{0}c and surrounding
           air temperature is 40^{0}c. Assume ZN/p=30$\times$10^{-6}. Using McKee and Lasche equation, determine
           coefficient of friction, bearing pressure Hg and Hd and viscosity Z of the lubricant.

Q.7 A single row deep groove ball bearing is subjected to a radial force of 6KN and thrust force of 2KN.The shaft   13
rotates at 1200rpm. The expected life of bearing is 22,000 hrs. The minimum acceptable diameter of the
shaft is 75mm. Select suitable ball bearing for this applications.

Q.8 A flat leather belt is used to transmit 10kw from a pulley rotating at 750rpm to another pulley rotating at   13
250RPm. The centre distance of the pulley is twice the diameter of larger pulley. The belt should operate at
a constant speed of 20m/s approximately. The stress in the belt should not exceed 2.5 N/mm^2. The density
of leather belt is 0.95gram/cc and coefficient friction between belt and pulley is 0.3. Belt thickness is 5mm.
Calculate
   i)   Diameter of pulley
   ii)   Length and width of belt
   iii)   Belt tension

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Q.9   Fig shows a configuration of a differential band brake. Assume μ=0.3.   13
       a) Determine the tension in the band ,if the braking torque of 200NM is applied to the drum, for the
           given direction of rotation.
       b) Further design the band if the thickness of band is 3mm with σ_{safe}=70mpa.
       c) Also calculate the heat generated during braking. If drum rotates at 150rpm.
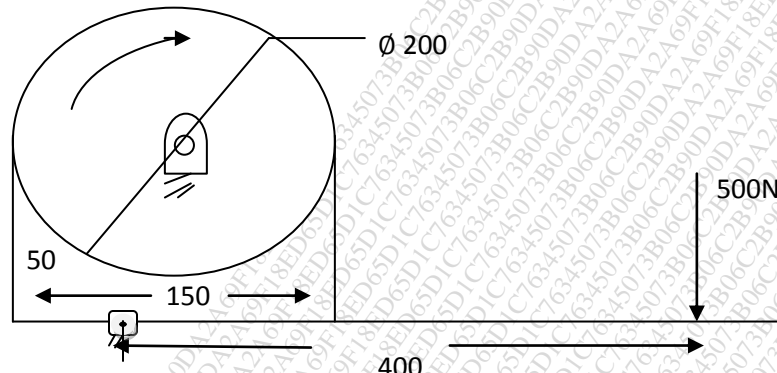
Q.10   Write short notes (any three)   13
       i)   Compare between V-belt drive and flat belt drive.
       ii)   Brake lining material
       iii) Centrifugal clutch
       iv)   Optimum design

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SUBJECT CODE NO:- K-24
FACULTY OF ENGINEERING AND TECHNOLOGY
T.E.(MECH) Examination Oct/Nov 2016
Heat Transfer
(Revised)

[Time:Three Hours] **[Max.Marks:80]**

Please check whether you have got the right question paper.

N.B
    i) Attempt any three questions from each Section.
    ii) Use of data book. steam tables, Mollier charts, non-programmable calculator is allowed..
    iii) Neat diagrams must be drawn wherever necessary.
    iv) Figures to the right indicate full marks.
    v) Assume suitable data. if necessary.

Section A

Q.1
    a) Derive general heat conduction equation in Cartesian coordinate system.   08
    b) One meter long Nichrome wire of resistivity 1 μΩ m is to dissipate power of 10 kW in the surrounding fluid which is at 80^0C. Find the diameter of the wire, if the maximum operating temperature of the wire is 1000^0C. Take 'h'= 1000 W/ $m^{2\,0}$C and 'k' (wire) = $60 W/m^0$C.   05

Q.2
    a) Show that $Q_{fin}= \sqrt{P \times h \times k \times A_{cs}} \times (t_0 - t_a) \times \tanh(m \times l)$ for fin insulated at the tip.   08
    b) What are Biot and Fourier numbers? Explain its significance.   05

Q.3
    a) Explain errors in the measurement of temperature in a thermo well.   05
    b) Water at 28°C enters a pipe of 20 mm ID with a mean velocity of 0.05 m/s the pipe surface temperature is 40°C. Determine the outlet temperature for length of 1m., 5m and 10m. Assume hydrodynamic boundary layer fully developed. (for water take: ρ=997kg/m^3; v=0.8315x10^{-6} m^2/s; Pr=5.68; c=4178 J/kg-K; k=0.6129 W/mK).   08

Q.4
    a) Discuss the difference between thermal and hydrodynamic boundary layer.   05
    b) Air at 20°C and 1 atmosphere is forced through a 25 mm diameter tube 400 mm long, at an average velocity of 0.33 m/s. Calculate the rate of heat transfer if the tube wall is maintained at 180°C.   08

Q.5   Write short notes on any TWO   7x2
    a) Heat conduction through composite cylinder
    b) Lumped heat capacity method
    c) Buckingham π-theorem

Section-B

Q.6
    a) Water at atmospheric pressure is to be boiled in polished copper pan. The diameter of the pan is 350 mm and is kept at 115°C. Calculate: (i) Power of the burner. (ii) Rate of evaporation in kg/h. (iii) Critical heat flux for these conditions.   08
    b) Explain turbulent film condensation with neat sketch.   05

Q.7
    a) Explain the concept of black body.   05
    b) Assuming the sun (diameter= 1.4 x 109 m) as a black body having a surface temperature of 5750 K and at a mean distance of 15 x 10^{10} m from the earth (diameter= 12.8 x10^{6}m), estimate, (i) The   08

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total energy emitted by sun, (ii) The emission received per m^2 just outside the atmosphere of the earth, (iii) The total energy received by the earth if no radiation is blocked by atmosphere of earth,(iv) The energy received by a 1.6 m x1.6m solar collector whose normal is inclined at 50^0 to the sun. The energy loss through the atmosphere is 42 % and diffuse radiation is 22% of direct radiation.

Q.8	a)	Explain intensity of radiation and solid angle.	08
	b)	Two parallel black plates 0.5 by 1 m are spaced 0.5 m apart. One plate is maintained at 1000°C and the other at 500°C. What is the net radiant heat exchange between the two plates?	05
Q.9	a)	Explain and derive overall heat transfer coefficient of two fluids separated by plane wall and flowing through inside and outside tube.	08
	b)	An oil cooler for a lubrication system has to cool 1000 kg/h of oil (cp=2.09kJ/kg°C) from 70°C to 30°C by using a cooling water flow of 1000kg/h at 25°C. Give you choice for a parallel or counter flow heat exchanger, with reasons. Calculate the surface area of the heat exchanger. if the overall heat transfer coefficient is 20 W/m^2°C	05
Q.10		Write explanatory notes on any Two:	7x2
	a)	Critical heat flux	
	b)	LMTD	
	c)	Fouling of heat exchanger	

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SUBJECT CODE NO:- K-53
FACULTY OF ENGINEERING AND TECHNOLOGY
T.E.(Mech) Examination Oct/Nov 2016
A:-Tool Engineering
(OLD)

[Time: Four Hours]   [Max. Marks:80]

Please check whether you have got the right question paper.

N.B
  i) Q.No.1 and Q.No.5 are compulsory.
  ii)solve three question from each section .
  iii) Assume suitable data & dimensions it required
  iv) All dimensions one in mm

Section- A

Q.1   Attempt any four question of the following   16
  a)   Differentiate between orthogonal and oblique cutting
  b)   How does rake angle affect the life of cutting tool
  c)   Draw neat and well labeled diagram of merchant circle for forces analysis
  d)   Why Jig and fixture are called production tool
  e)   Explain design principles for Drill Bushing
  f)   Write notes on diamond pin
  g)   Draw well labeled sketch of pull type broach

Q.2   Draw neat sketches and specify nomenclature   12
  1)   Reamer
  2)   Twist drill

Q.3   The tool life equation far cutting tool is given by   12
  $VT^{0.10} f^{0.60} d^{0.20} = C$
  A 50 minutes tool life was obtained while cutting at V=50m/min, f=0.3 mm/rev and d=1.5 mm .determine the change in tool life if cutting speed, feed and depth of cut are increased by 25% individually any also taken together

Q.4   Design draw and dimension a drill Jig drill one holes of dia.20mm in the component shown in fig 01   12
OR
Design draw and dimension a milling fixture to mill a slot of size 8× 4mm in the component shown in fig01

Section –B

Q.5   Attempt any four question of the following   16
  a)   Define following press operations
       1) Blanking 2) slitting   3) squeezing 4) piercing
  b)   Differentiate between compound die and combination die
  c)   What is stripper? What are the various types of strippers
  d)   Why more than one draw is needed to draw a cup
  e)   What is deep draw ability?
  f)   Sketch v-bending die and U-bending dies

Q.6 a) Define spring back and explain now allowances may be made to compensate for its harmful effects in   06
        bending
     b) Explain bending terminology with the help of suitable sketch   06

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Q.7 Design and draw compound press tool for manufacturing a washer of 36mm outer diameter with 18mm 12
dia of hole

Material = Aluminium
Thickness =1.8mm
Shear strength =80mpa

Q.8 a) What is Centre of pressure ? How it determined? 06

b) Write note on strip layout 06
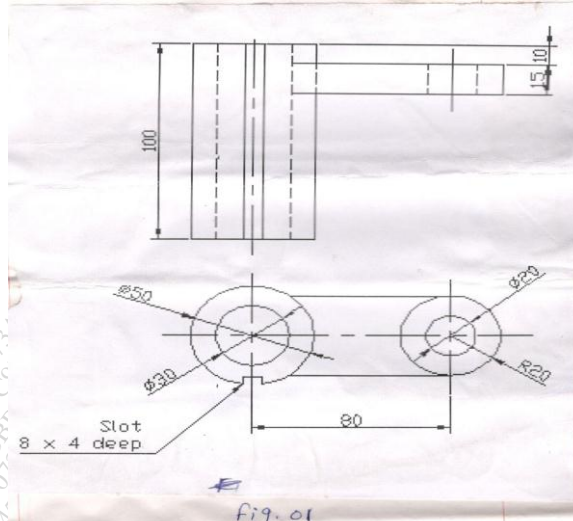
fig.01

SUBJECT CODE NO:- K-53
FACULTY OF ENGINEERING AND TECHNOLOGY
T.E.(Mech) Examination Oct/Nov 2016
B:-Tool Engineering (Revised from 2015-2016 Batches)
(Revised-II)

[Time: Four Hours]   **[Max. Marks:80]**

Please check whether you have got the right question paper.

N.B
i) Q.4 and Q.8 are compulsory Attempt any two question from the remaining question of each sections.
ii) Use drawing sheet for Q.4
iii) Assume suitable data and dimensions it required
iv) All dimensions are in mm

Section A

Q.1	a)	The following equation for tool life is given for a turning operation	06

$$VT^{0.14} f^{0.78} d^{0.36} = C$$

A 80 minute tool life was obtained while cutting at v=32m/min , f=0.3 mm/rev and d=2.4 mm . Determine the change in tool life it cutting speed ,feed and depth of cut are increased by 25% taken together

	b)	Describe the factors on which tool wear and tool life depends	06
Q.2	a)	How is the size of a single point cutting tool designated? explain with any one example	04
	b)	Why should tools with negative rake angles be operated at higher cutting speeds?	04
	c)	Explain "Merchant force circle"	04
Q.3	a)	What are the essential requirements of clamps and clamping devices? Draw the sketch of cam-clamp assembly	06
	b)	What is meant by "fool proofing "as applied to design of Jigs and fixtures? How it can be achieved? Explain with suitable example	06
Q.4		Design and draw a drill jig to drill 1omm diameter holes in the work piece as shown in figure -1	16

OR

	Design a milling fixture to mill the slot 20 mm width and 10mm deep in the work piece as shown in figure- 2 consider that four holes 16mm diameter are accurately finished	16

Section –B

Q.5		Draw neat sketches of the following with their nomenclature of their elements (any two)	12
		a) Spiral point hand tap	
		b) Hand reamer with pilot and guide	
		c) Peripheral milling cutter	
Q.6	a)	Explain with neat sketches the following basic sheet metal operations	06
		1. 'V' bending	
		2. Blanking and lancing	
	b)	Find the center of pressure (shank center) of the blanked shape shown in figure-3	06
Q.7	a)	Write a short note on "forging dies"	06
	b)	Explain the methods used to reduce cutting forces in blanking and piercing operations	06

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Q.8 Design and draw progressive die to manufacturing sheet metal component shown in figure-4. Assume 16 thickness of sheet 3.2mm and shear strength of material 120N/mm^2 .Do not consider the elastic recovery of the material . find clearance, punch and dia. opening sizes, total cutting force. Draw strip layout separately

OR

a) A cup 50mm in diameter and 75mm deep is to be drawn from 1.5mm thick drawing steel with a 12 tensile strength of 315N/mm^2 .The corner radius is negligible, determine
   1. Blank diameter
   2. Number of drawing operations
   3. Force for the first draw with 40% reduction
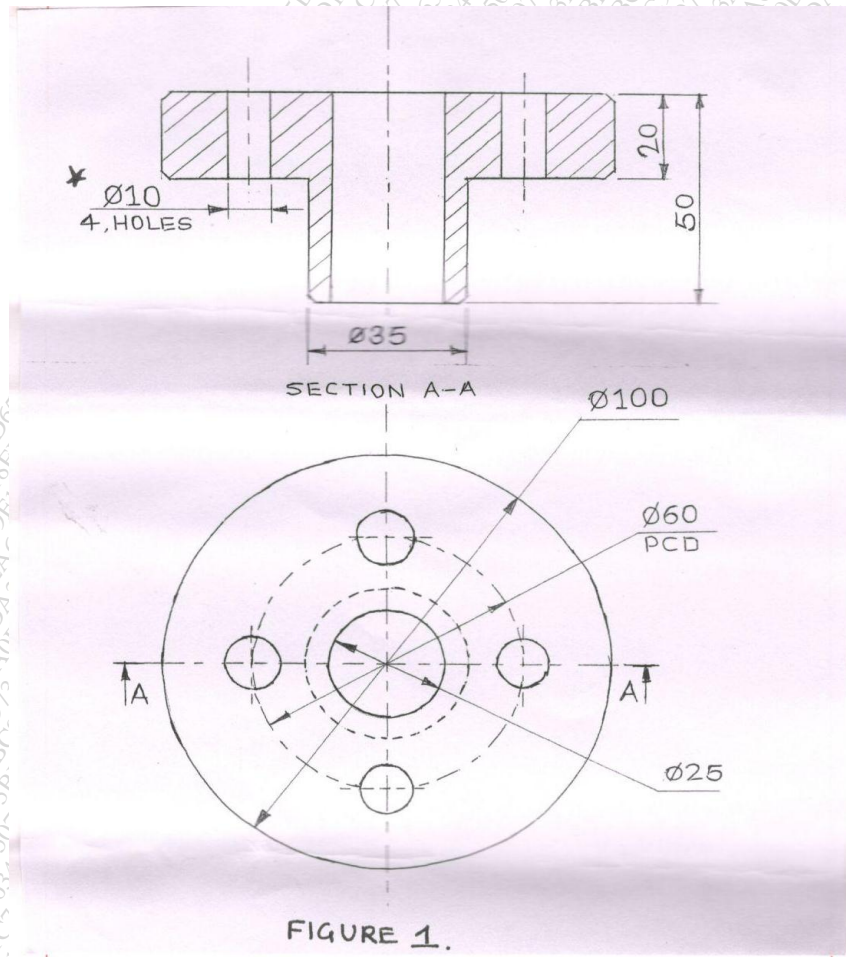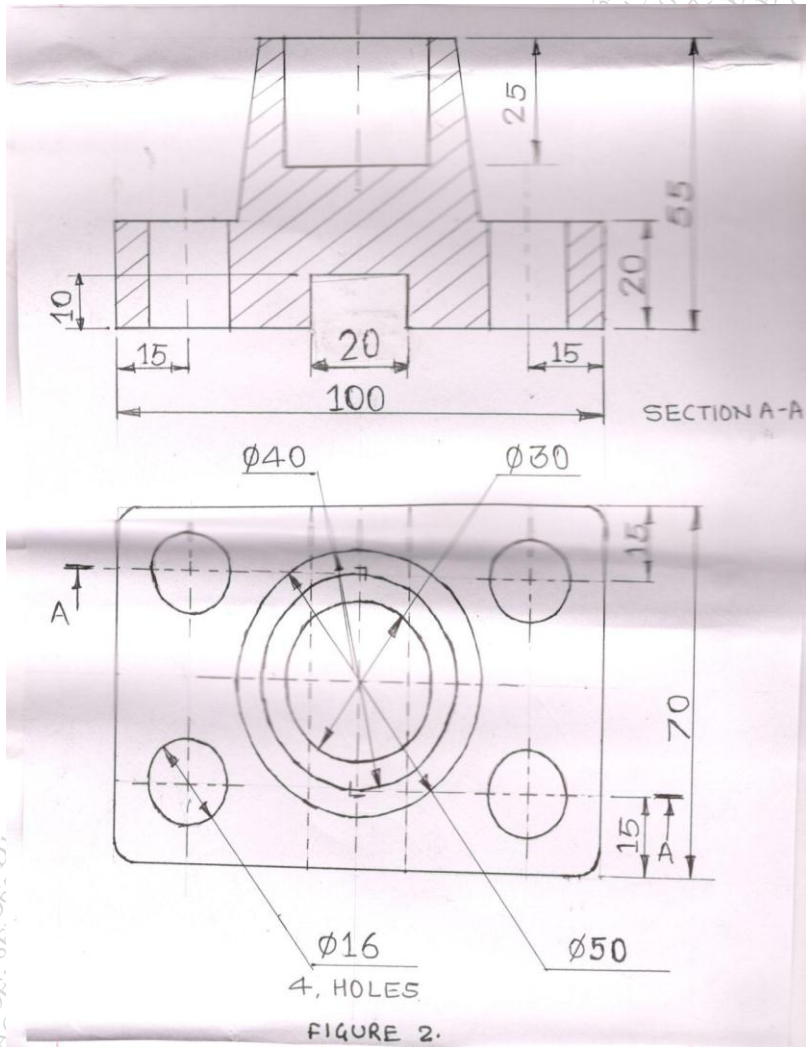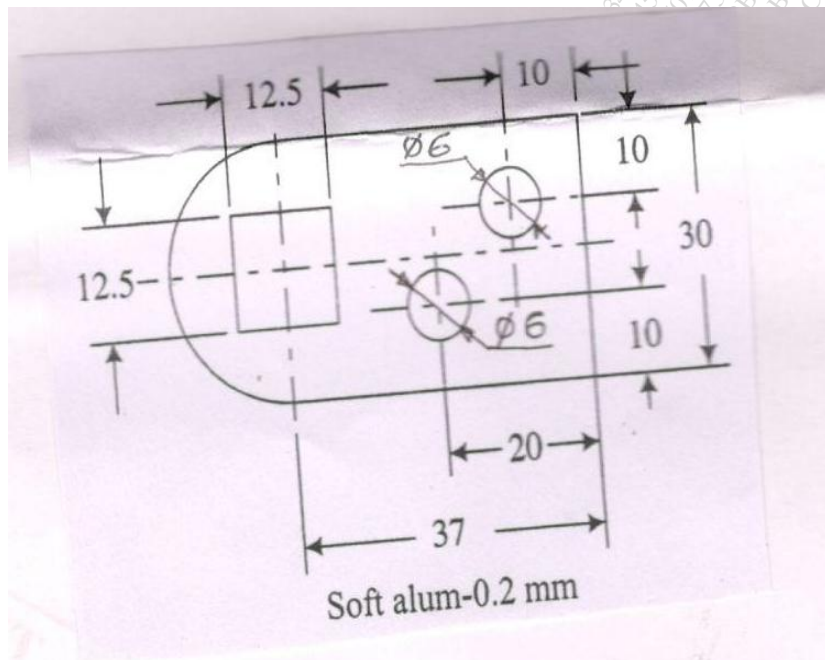b) Write short on " press terminology and press selection" 04

SECTION A-A

FIGURE 1.

SECTION A-A

Ø40   Ø30

Ø16
4. HOLES

Ø50

FIGURE 2.

FIGURE·3.

Soft alum-0.2 mm

FIGURE 4

Half-hard alum 3.2 mm

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SUBJECT CODE NO:- K-84
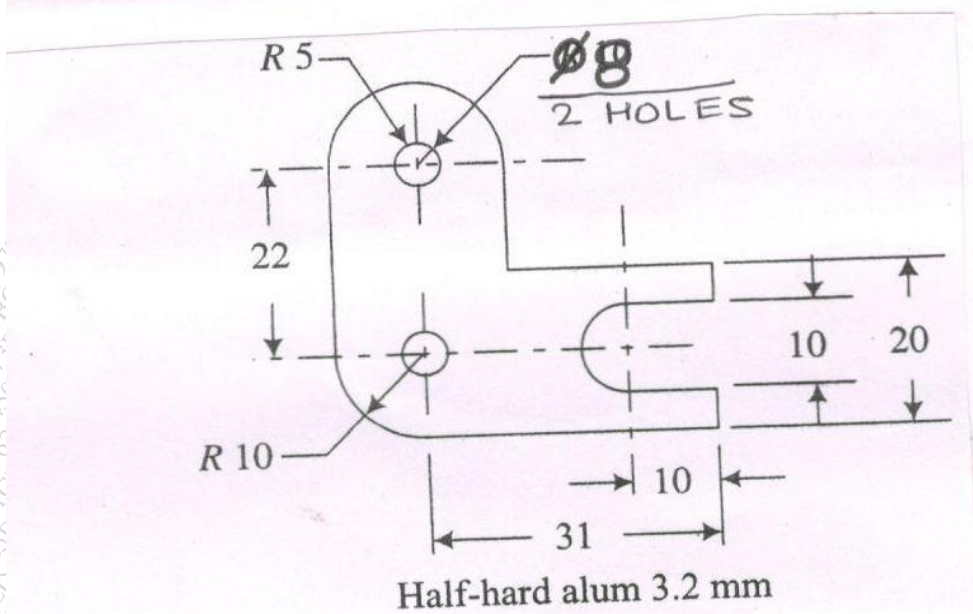**FACULTY OF ENGINEERING AND TECHNOLOGY**
T.E.(Mech) Examination Oct/Nov 2016
CAD/CAM/CAE
(Revised)

[Time:Three Hours]   **[Max. Marks:80]**

Please check whether you have got the right question paper.

N.B
1) Attempt any three questions from each section.
2) Please check whether you have got the right question paper.
3) Figures to the right indicate full marks.
4) Assume suitable data wherever necessary.

Section A

Q.1	a)	Define the term CAD and list down its advantages and disadvantages	07
	b)	Explain the differences in scope between automation and CAD/CAM.	06
Q.2	a)	Enlist and explain the functions to be performed by a graphic package.	06
	b)	Explain with suitable examples various image generation techniques used in graphic display devices.	07

Q.3   A square of side 30 units has its co-ordinates A (15,15), B (45,15) C(45,45), D(15,45) perform the following   13
transformations in succession and show it on graph paper.
1) Scale it by factor 1.25
2) Rotate about origin by 25^0 anticlockwise.

Q.4	a)	Differentiate between wireframe and solid modelling techniques	06
	b)	Explain the role played by CSG in solid modelling and the various operations to be carried over to construct the 3-D geometry	07

Q.5   Write short notes on (any three)   14
a) Data input devices used in CAD
b) Bezier curves
c) Need and use of different standards in CAD
d) Concurrent engineering.

Section B

Q.6	a)	Explain the various types of motion control systems /used in NC machines	07
	b)	Define and explain the co-ordinate axis system for	06

1) A lathe
2) Drilling machine
3) Milling machine

Q.7   Write down the manuscript of the manual part programme for the drilling operation to be performed on a   13
square plate of 100mn side. Six equidistance holes of 10mm diameter are to be drilled on the PCD of 70mm
The center of the pitch circle is coinciding with the center to the plate. Use the following information.
1) Thickness of the part is 20 mm
2) Use TAB sequential format.
3) Specify the dimensions/ travels/ increments in microns.
4) Assume suitable starting point.

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Q.8   a)   Explain the elements of numerical control machine   07

         b)   What is DNC? Explain   06

Q.9   a)   Enlist and explain the rules of APT programming   05

         b)   A profile milling operation is to be performed to sensate the outline of the part as shown in the fig. 1   08
the part thickness is 20mm, cutter diameter is 16mm, cutter speed is 500 rpm. Write down the
complete APT programme consisting of

        1)   Geometry statements to define the geometry

        2)   Motion statements to perform the profile milling

        3)   Auxiliary statements
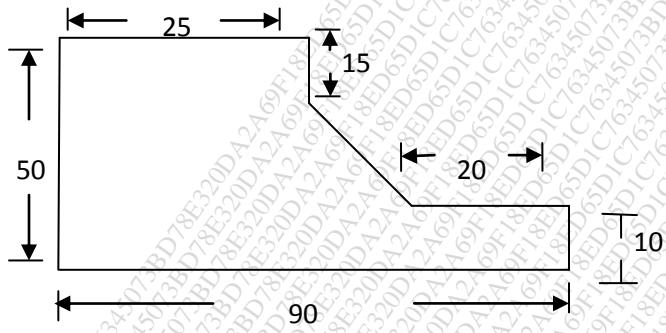
        4)   Post processor statements

Fig.1

Q.10   Write short notes on (any three)   14

        1)   GT

        2)   CAPP

        3)   FMS

        4)   CIM

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SUBJECT CODE NO:- K-151
FACULTY OF ENGINEERING AND TECHNOLOGY
T.E.(Mech) Examination Oct/Nov 2016
Industrial Hydraulics and Pneumatics
(Revised)

[Time:Three Hours]   [Max. Marks:80]

Please check whether you have got the right question paper.

N.B
    i) Solve any three questions from each section.
    ii) Assume suitable data wherever found necessary.

Section A

Q.1	a)	State the Pascal's law. Explain its significance in the hydraulic and pneumatic system.	06
	b)	What are the essential properties of hydraulic fluids? Explain each of them in brief. What are oil additives?	07
Q.2	a)	What are the different standards used in hydraulic & pneumatic symbols? What are the general rules for drawing the symbols?	05
	b)	Draw standard symbols for the following?	08
		i) Roll lever operated, spring return 2 position for way directional control valve.	
		ii) Hydraulic unloading valve.	
		iii) Flow control valve with bypass & check in one direction.	
		iv) Hydraulic reversible motor with variable speed.	
Q.3	a)	With neat sketch explain the construction of a vane pump and it's working.	08
	b)	What is an air compressor? What are the different types of air compressors? State advantages disadvantages of each of them.	05
Q.4	a)	Give the classification of different valves used in hydraulic & pneumatic systems. With neat symbols explain different uses of pressure control valve.	06
	b)	With neat sketch the principle of working of an axial piston pump.	07
Q.5		Write short notes on <u>any three</u>	14
		i) F.R.L. unit	
		ii) Bernoulli's equation and its application	
		iii) Reciprocating actuators	
		iv) Basic pneumatic circuit	
		v) Oils used in hydraulic	
		vi) Pumps & motors	

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Section B

Q.6   a) What is a flow control valve? Why it is used? Explain the different arrangements of using the flow control valve.   07

      b) What is a pressure booster? With a simple circuit explain the use of a pressure booster in a circuit.   06

Q.7   a) Explain with neat circuit a compressed air supply system using an air filter, drier, condition to a reservoir with a safety pressure valve.   06

      b) Draw a circuit for a pneumatic system used for operating a double acting cylinder. Explain the working 07 of the circuit.

Q.8   Draw a hydraulic circuit for a system where speed control is applied in forward stroke. Explain the working in 13 details. Consider the reciprocating actuator being used in the system.

Q.9   What are the different types of switches and sensors used in electro hydraulic & electro pneumatic systems? 13 Explain each in brief.

Q.10   Write short notes on <u>any three</u>   14
1) Ladder diagram for an electro pneumatic system.
2) PLC
3) Electro hydraulic & electro pneumatic systems
4) Valve actuators used in electro system
5) Piping in hydraulics & pneumatics
6) Seals used in hydraulic & pneumatics

2016

SUBJECT CODE NO:- K-198
FACULTY OF ENGINEERING AND TECHNOLOGY
T.E.(MECH/PROD) Examination Oct/Nov 2016
Metallurgy & Materials
(Revised)

[Time:Three Hours]   [Max. Marks:80]

Please check whether you have got the right question paper.
N.B   i)Solve any three questions from each section.
Section A

Q.1	a)	What are crystals structures into which the metal crystallize? Explain them with the help of neat sketches.	08
	b)	Define the following terms.	06
		i) Unit cell	
		ii) Automic packing factor.	
		iii) Co – ordination number.	
Q.2	a)	Describe an isomorphous system.	07
	b)	What are Hume – Rothery rules?	06
Q.3	a)	Draw and Lable only steel portion of iron – iron carbide diagram and explain invariant reactions found init.	10
	b)	Define Hardenability.	03
Q.4	a)	What are the different methods of surface hardening? What is pack carburizing? Explain its advantages and limitations.	07
	b)	Distinguish between annealing and normalizing.	06
Q.5	a)	What are the imperfections found in crystals? Explain any one with the help of a neat sketch.	05
	b)	Explain the term "Mar-tempering"	04
	c)	Write note on "sub – zero treatment"	04

Section B

Q.6	a)	What type of stainless steel would you proper for the following? Why?	08
		i) Wrist watch	
		ii) Razor blades	
		iii) Utensils	
		iv) Steam turbine blades.	
	b)	Why alloying elements are added to steel?	06
Q.7	a)	Explain the factors influencing microstructure of cast irons.	08
	b)	Write note on chilled cast irons.	05
Q.8	a)	What are cartridge brass and Muntz metal? What are their characteristic properties and uses?	08
	b)	Write note on "properties and applications of magnesium and its alloys.	05
Q.9	a)	Enlist major properties and applications of crystalline and non – crystalline ceramics.	07
	b)	What are fibers reinforced composites? Describe its properties and applications.	06
Q.10	a)	Classify tool steel and explain its applications.	05
	b)	Write note on "Emergence of Nano – technology"	04
	c)	Write note on "Gunmetal and its types".	04

2016

SUBJECT CODE NO:- K-298
FACULTY OF ENGINEERING AND TECHNOLOGY
T.E.(MECH/PROD) Examination Oct/Nov 2016
Design of Machine Elements-I
(Revised)

[Time: Three Hours]   [Max. Marks:80]

Please check whether you have got the right question paper.

N.B
    i) <u>Solve any three questions from each section</u>.
    ii) Use separate answer-book for each section.
    iii) Figures to the right indicate full marks.
    iv) Assume suitable data, if necessary and state them clearly.

Section A

Q.1   Design a cotter joint used to connect two coaxial rods subjected to a load of 35kN. The components are made   12
       of 30C8 (Syt = 400MPa). Design the joint and specify the main dimensions.

Q.2   a) Explain the significance of aesthetic consideration in design.   04
       b) A right angled bell crank lever is to be designed to raise a load of 5kN at the short arm end. The lengths 08
           of the short and long arms are 100mm and 450mm respectively. The pins are made of steel 30C8
           (Syt = 380 MPa) and factor of safety is 5. The permissible pressure on the pin is 10 MPa. The lever has
           rectangular cross section and ratio of width to thickness is 3:1. The length to diameter ratio of the
           fulcrum pin is 1.25:1. Calculate the diameter and length of fulcrum pin; dimensions of boss of the lever
           at the fulcrum; shear stress in pin; dimensions of cross section of lever. Assume that the arm of the
           bending moment on the lever extends up to axis of the fulcrum.

Q.3   a) Derive an expression of eccentric load perpendicular to axis of the bolts.   06
       b) A cast iron bracket is shown in fig.1 support a load of 10kN. It is fixed to a horizontal channel by means 06
           of four identical bolts, two at A and two at B. The bolts are made of 30C8 with Syt = 400MPa and factor
           of safety is 5. Determine major diameter of bolts (d_c=0.8d).

Fig.1
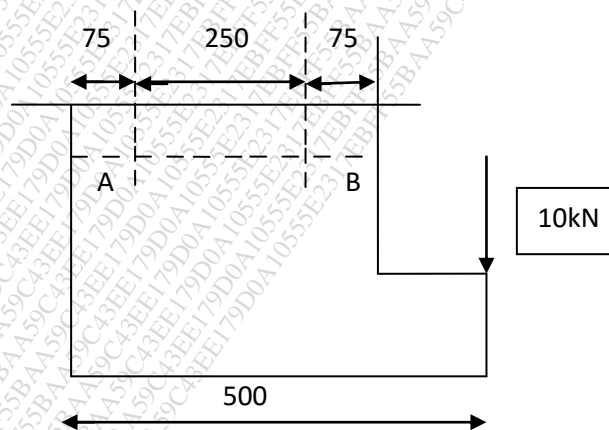
Q.4   Explain in detail a coupling and design procedure of rigid flange coupling.   12

Q.5   Write short notes on. (<u>any four</u>)   16
       a) Basic procedure of machine design
       b) Torque requirement for lifting load by power screw.
       c) Bolts of uniform strength.
       d) Ergonomic consideration in design
       e) Selection and use of theories of failure

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Section B

Q.6 A circular bar of 400mm length is supported freely at its two ends. It is acted upon by central concentrated cyclic load having minimum value 20kN and maximum value of 50kN. Determine the diameter of the bar by taking factor of safety of 1.5, size factor 0.85 and surface finish factor 0.9. The material properties are ultimate stress 650MPa; yield stress 500MPa and endurance stress 350MPa. 12

Q.7 A welded connection of steel plates is shown in the figure 2. It is subjected to an eccentric load of 50kN. Determine the size of weld if permissible shear stress in the weld is not to exceed 80N/mm^2. 12
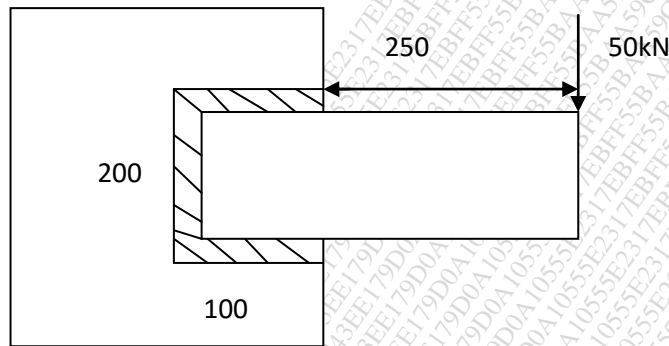

Fig.2

Q.8 A railway wagon is moving at a velocity of 2.5m/s is brought to rest by a bumper consisting of two identical helical compression springs arranged in parallel. The springs are compressed by 160mm before bringing the wagon to rest. The mass of the wagon is 1200kg. The spring index can be taken as 6. The springs are made up of oil hardened tempered steel wire of ultimate tensile strength of 1500MPa and modulus of rigidity is 81370 MPa. The permissible shear stress for the spring wire can be taken as 50% of the ultimate tensile strength. Design the spring and calculate maximum force on each spring, wire diameter, mean coil diameter and number of active coils. 12

Q.9 A semi elliptical leaf spring consists of two extra full length leaves and ten graduate leaves including master leaf. Each leaf is 7.5mm thick and 50mm wide. The centre to centre distance between the two eyes is 1m. The leaves are prestressed in such a way that when the load is maximum stresses induced in all the leaves is equal to 360MPa. Determine the maximum force the spring can withstand and the deflection in the spring. 12

Q.10 Write short notes on the following. (<u>any four</u>) 16
    a) Soderberg's Equation
    b) Shot Peening
    c) Eccentrically loaded riveted joint
    d) Advantages of welded joints over riveted joints
    e) Caulking and Fullering

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SUBJECT CODE NO:- K-173
FACULTY OF ENGINEERING AND TECHNOLOGY
T.E.(MECH/PROD) Examination Oct/Nov 2016
Theory of Machines-II
(Revised)

[Time: Three Hours]   [Max. Marks:80]

Please check whether you have got the right question paper.

N.B   i) Solve any three questions from each section.
              ii) Assume suitable data wherever necessary.

Section A

Q.1   a)   State & prove the law of gearing.   05
      b)   Two mating gears have 20 & 40 involute teeth of module 10 mm & 20^0 pressure angle.   08
           The addendum on each wheel is to be made of such a length that the line of contact on each side
           of the pitch point has half the maximum possible length.
           Determine the addendum height for each gear wheel length of the path of contact & contact ratio.

Q.2   a)   Derive an expression for the centre distance of a pair of spiral gears.   04
      b)   Two shafts inclined at an angle of 65^0 & with a least distance between them of 175mm are to be   09
           connected by spiral gears of normal pitch 15 mm to give reduction ratio 3:1 find suitable diameter
           & number of teeth. Determine also the efficiency, if the spiral angle are determined by the
           condition of maximum efficiency. The friction angle is 7^0.

Q.3   a)   Define & explain.   06
           1) Stability   2) Sensitiveness   3) Hunting   4) Isochronism
      b)   A porter governor has all four arms 250 mm long. The upper arms are attached on the axis of   07
           rotation & the lower arms are attained to the sleeve at a distance of30mm from the axis. The mass
           of each ball is 5 kg & the sleev has a mass 50kg. The extreme radii of rotation are 150mm & 200
           mm. Determine the range of speed of the governor.

Q.4   a)   Explain the turning moment diagram of a four stroke I.c. engine.   04
      b)   The Turning moment diagram for a four stroke gas engine may assumed for simplicity to be   09
           represented by four triangles the area of which from the line zero pressure are follows.
           Suction stroke = $0.45 \times 10^{-3} m^2$
           Compression stroke = $1.7 \times 10^{-3} m^2$
           Expansion stroke = $6.8 \times 10^{-3} m^2$
           Exhaust stroke = $0.65 \times 10^{-3} m^2$
           Of area represents 3 MN-M of energy Assuming the resisting torqueto be uniform, find the mass of
           the rim of fly wheel required to keep the speed between 202 & 198 rpm. The mean radius of the
           rim is 12m.

Q.5   a)   Discuss the effect of gyroscopic couple on four wheeler.   06
      b)   The turbine rotor of a ship has a mass of 2.2 tonnes & rotations at 1800 rpm clockwise when   08
           viewed from the aft. The radius of gyration of the rotor is 320 mm. Determine the gyroscopic
           couple & its effects.
      i)   The ship turns right at a radius if 250m with a speed of 25 km/h.

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ii)   The ship pitches with the bow rising at an angular velocity of 0.8 rad/s.

iii)   The ship rolls at an angular velocity of 0.1 rad/s.

Section – B

Q.6   a) Explain the laws of friction.   06

       b) Explain with neat sketch single plate clutch also explain uniform pressure & uniform wear theory.   07

Q.7   a) Explain the phenomena of slip & creep in belt drive.   06

       b) A leather belt is required to transmit 7.5 kw from a pulley 1.2 m in diameter running at 250 rpm. The angle embraced is 165^0 & the coefficient of friction between the belt & 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 & thickness of belt 10 mm. determine the width of the belt taking centrifugal tension into account.   07

Q.8   a) Explain the different causes of vibration & its effects.   05

       b) A pendulum consists of stiff weightless rod of length 'l' carrying a mass 'm' on its end as shown in fig. 0.1 two springs each stiffness 'k' are attached to the rod at a distance 'a' from the upper end determine the frequency for small oscillators.   08

Fig.01
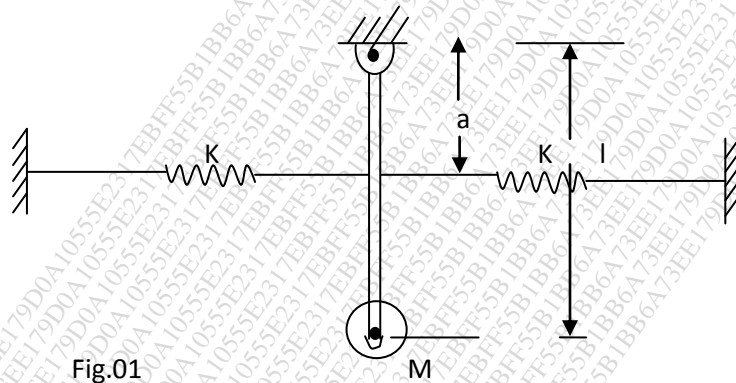
Q.9   a) Explain the form.   04

         1) Logarithmic Decrement.

         2) Damping factor

       b) Vibrating system consists of a mass of 50kg as during of stiffness 30 KN/M & a dampers. The damping provided is only 20% of the critical value determine.   09

         a) Damping factor.

         b) Critical damping coefficient.

         c) The natural frequency of damped vibration.

         d) The logarithmic decrement.

         e) Ratio of two consecutive amplitude.

Q.10   a) Explain the Transmissibility.   06

       b) Explain with neat sketch any two. Vibration measuring instrument.   08

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SUBJECT CODE NO:- K-230
FACULTY OF ENGINEERING AND TECHNOLOGY
T.E.(Mech) Examination Oct/Nov 2016
Fluid Mechanics [only for Part-I]
(Revised-II)

[Time:Three Hours]   **[Max. Marks:80]**

Please check whether you have got the right question paper.

N.B
- I. Solve any three questions from each section.
- II. Use of non- programmable calculator is permitted.
- III. Assume suitable missing data.

Section A

Q.1 a) State and prove the Pascal's law.   05
   b) If the velocity profile of a fluid over a plate is parabolic with the vertex 20 cm from the plate, where   08
      the velocity is 120 cm/sec. calculate the velocity gradients and shear stresses at a distance of 0, 10
      and 20 cm from the plate, if the viscosity of the fluid is 8.5 poise.

Q.2 a) Explain the phenomenon of capillarity. Obtain an expression for capillarity rise of a liquid.   06
   b) A block of wood of specific gravity 0.7 floats in water. Determine the meta centric height of the block if   07
      its size is $2m \times 1m \times 0.8m.$

Q.3 a) Explain the terms: 08
   - I. Path line.
   - II. Streak line.
   - III. Stream line
   - IV. Stream tube.
   b) A jet of water from a 25mm diameter nozzle is directed vertically upwards. Assuming that the jet
      remains circular and neglecting any loss of energy. What will be the diameter at a point 4.5m above   05
      the nozzle, if the velocity with which the jet leaves the nozzle is 12m/s.

Q.4 a) A pipe of 300mm diameter conveying 0.30m^3/s of water has a right angled bend in a horizontal   08
      plane. Find the resultant force exerted on the bend, if the pressure at inlet and outlet of the bend
      24.525 N/cm^2 and 23.544 N/cm^2.

   b) Distinguish between :   04
   - I. Steady flow and un-steady flow.
   - II. Uniform and non-uniform flow.

Q.5 a) The water is flowing through a taper pipe of length 100m having diameter 600mm at the upper end   08
      300mm at the lower end, at the rate of 50 liters/s. The pipe has a slope of 1 in 30. Find the pressure at
      lower end, if the pressure at the higher level is 19.62 N/cm^2.

   b) Define the terms :   06
   - I. Surface tension.
   - II. Compressibility and bulk modulus.

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Section B

Q.6 a) Define displacement thickness. Derive an expression for the displacement thickness. 06

b) Find the displacement thickness, the momentum thickness and energy thickness for the velocity 07

distribution in the boundary layer given by $\frac{u}{U} = 2\left(\frac{y}{\delta}\right) - \left(\frac{y}{\delta}\right)^2$

Q.7 a) A thin plate is moving in still atmospheric air at a velocity of 5 m/s. the length of the plate is 0.6 m 06
and width 0.5m. calculate
   I.   The thickness of the boundary layer at the end of the plate.
   II. Drag force on one side of the plate, take density of air as 1.24 Kg/m^3 and kinematic viscosity
        0.15 stokes.

b) Obtain von Karman momentum integral equation. 07

Q.8 a) Define and explain the terms: 05
   I.   Hydraulic gradient line and.
   II. Total energy line.

b) A main pipe divides into two parallel pipes, which again form one pipe the length and diameter for 08
the first parallel pipe are 2000m and 1.0m respectively, while the length and diameter of 2nd parallel
pipe are 2000 m and 0.8m. Find the rate of flow in each parallel pipe, if the total flow in the main is
3.0m^3/s. The co-efficient of friction for each parallel pipe is same and equal to 0.005.

Q.9 a) Derive Darcy's formula to calculate the frictional head loss in a pipe. 06

b) The thrust (T) of a propeller is assumed to depend on the axial velocity of the fluid V the density ρ 07
and viscosity μ of fluid, the speed N in RPM and diameter D, Find the relationship of T by
dimensional analysis.

Q.10 Solve any two. 14
   a) State and explain Buckingham's π- theorem.
   b) Explain the non-dimensional number.
   c) Find an expression for the drag force on smooth sphere of diameter D, moving with a uniform
      velocity V in a fluid of density ρ and dynamic viscosity μ . Using Rayleigh's method.

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SUBJECT CODE NO:- K-231
FACULTY OF ENGINEERING AND TECHNOLOGY
T.E.(Mech) Examination Oct/Nov 2016
Fluid Mechanics & Machinery
(Revised-I)

[Time: Three Hours]   [Max. Marks:80]

Please check whether you have got the right question paper.

N.B
i) Attempt any Three questions from each section (Section A and B)
ii) Figures to the right indicate full marks.
iii) Draw diagrams or graphs wherever required.
iv) Assume suitable data, if necessary.

Section- A

Q.1 a) Explain the compressibility and bulk modulus. What is effect of bulk modulus in injection pressure?   06

   b) An oil viscosity 0.5 Ns/m^2 is used for lubrication between a shaft and sleeve. The diameter of the shaft is   07
      0.5m and it rotates at 200rpm. Calculate the power lost in oil for a sleeve length of 100mm. The thickness of
      oil film is 1 mm.

Q.2 a) Derive Euler's equation of motion.   06

   b) The water is flowing through a pipe having diameters of 20 cm and 10 cm at sections 1 and 2 respectively.   07
      The rate of flow through pipe is 35 lit/s. The section 1 is 6 m above datum and section 2 is 4 m above datum.
      If the pressure at section 1 is 39.24 N/cm^2, find the intensity of pressure of pressure at section2.

Q.3 a) The rising force R of a supersonic plane during flight can be considered as dependent upon the length of   06
      the aircraft 'l', 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.

   b) A 7.2m height and 15 m long spillway discharges 94 m^3/s under a head of 2m. If a 1:9 scale model of this   07
      spillway is to be constructed, determine model dimensions, head over spillway model and the model
      discharge. If model experiences a force of 7500 N, determine force on the prototype.

Q.4 a) What are the governing equations of computational fluid dynamic (CFD)? Derive any one.   07

   b) Explain the physical meaning of divergence of the velocity in CFD.   06

Q.5   Write the notes on (any two)   14
      a) Buoyant force and center of buoyancy
      b) Continuity equation in cylindrical coordinates
      c) Distorted and non-distorted models.

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Section – B

Q.6 a) A 7.5 cm diameter jet having a velocity of 30 m/s strikes a flat plate, the normal of which is inclined at 45^0 to 06
the axis of the jet. Find the normal pressure on the plate:
   i)   When the plate is stationary , and
   ii)   When the plate is moving with a velocity of 15 m/s and away from the jet. Also determine the
            power and efficiency of the jet when the plate is moving.

   b) A jet of water of diameter 7.5 cm strikes a curved plate at its Centre with a velocity of 20 m/s. The curved 07
plate is moving with a velocity of 8 m/s in the direction of the jet. The jet is deflected through an angle of
165^0. Assuming the plate smooth find:
   i)   Force exerted on the plate in the direction of jet,
   ii)   Power of the jet
   iii)   Efficiency of the jet.

Q.7 a) Explain the working Principle of Pelton wheel turbine and derive its hydraulic efficiency.   07

   b) A Kaplan turbine runner is to be discharged to develop 9100 kW. The net available head is 5.6 m. If the   06
speed ratio= 2.09, flow ratio = 0.68, overall efficiency =86% and the diameter of the boss is 1/3 the diameter
of the runner. Find the diameter of the runner, its speed and the specific speed of the turbine.

Q.8 a)   A centrifugal pump is to discharge 0.118 m^3/s at a speed of 1450 rpm against a head of 25m. The impeller 07
diameter is 250 mm, its width at outlet is 50 mm and manometric efficiency is 75%. Determine the vane
angle at the outer periphery if the impeller.

   b) Explain priming and cavitation of centrifugal pump.   06

Q.9 a) A hydraulic press has a ram of 150 mm diameter, plunger of 20 mm diameter. The stroke of the plunger is 07
200 mm and weight lifted is 800 N. If the distance moved by the weight is 1 m in 20 minutes, determine:
   i)   The force applied on the plunger
   ii)   Power required to drive the plunger
   iii)   Number of strokes performed by the plunger

   b)   Explain the working principle of the hydraulic accumulator with neat sketch.   06

Q.10   Write short notes on (any two)   14
   a)   Radial flow reaction turbine
   b)   Multistage centrifugal pump
   c)   Hydraulic crane

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SUBJECT CODE NO:- K-263
FACULTY OF ENGINEERING AND TECHNOLOGY
T.E.(Mech) Examination Oct/Nov 2016
Industrial Management & Engineering Eco.
(Revised)

[Time: Three Hours]   [Max. Marks:80]

Please check whether you have got the right question paper.
N.B   1)   Solve any three questions from each section.

Section A

Q.1	a)	Define management. What are the principles of management?	07
	b)	What is management of change?	06
Q.2	a)	What is knowledge cycle? Explain in detail.	07
	b)	What are the functions of entrepreneur?	06
Q.3	a)	Explain the fourteen points of total Quality management (TQM).	07
	b)	What is the Joint Stock Company?	06
Q.4	a)	Explain the concept of line organization.	07
	b)	What are the functions of Human Resource Management?	06

Q.5   Write short notes on (any three).   14
    a)   Matrix organization.
    b)   Manpower planning.
    c)   Functions of Trade Union.
    d)   Schemes for Entrepreneurship development.

Section B

Q.6	a)	What is overhead cost? Explain with a suitable example.	06
	b)	What are the benefits of holding inventory?	07
Q.7	a)	What is Economic order Quality (EOQ)?	06
	b)	What are the economic principles for management decisions?	07
Q.8	a)	Explain Law of supply with a suitable example.	06
	b)	What is perfect competition? Explain in details.	07
Q.9	a)	Explain payback period method.	06
	b)	What is Internal Rate of Return (IIR) method?	07

Q.10   Write short notes on (any three).   14
    a)   Profitability Index method.
    b)   EBQ.
    c)   Scope of Financial management.
    d)   Models of Inventory.

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