

GUJARAT TECHNOLOGICAL UNIVERSITY**BE SEM-VIII Examination May 2012****Subject code: 181901****Subject Name: Refrigeration and Air conditioning****Date: 10/05/2012****Time: 10.30 am – 01.00 pm****Total Marks: 70****Instructions:**

1. Attempt all questions.
2. Make suitable assumptions wherever necessary.
3. Figures to the right indicate full marks.
4. Use of calculator, Psychrometric chart and p-h chart is permissible.

Q.1 (a) Explain the working of Vapour compression refrigeration system with the help of a neat sketch. Mention the advantages of vapour compression refrigeration system over air refrigeration system. **07**

(b) Explain the following terms briefly : **07**

- 1) Refrigerating effect
- 2) Dew point temperature
- 3) Comfort Air conditioning
- 4) Cooling and Dehumidification
- 5) Wet bulb temperature
- 6) Psychrometry
- 7) Relative humidity

Q.2 (a) An air refrigerator working on Bell coleman cycle takes in air at 1 bar and at a temperature of 10°C . The air is compressed to 5 bar abs. The same is cooled to 25°C in the cooler before expanding in the expansion cylinder to cold chamber pressure of 1 bar. The compression and expansion laws followed are $p v^{1.35} = C$ and $p v^{1.3} = C$ respectively. Determine C.O.P of the plant and net refrigeration effect per kg of air. **07**

Take $C_p = 1.009 \text{ kJ/kg K}$ and $R = 0.287 \text{ kJ/kg K}$ for air.

(b) State the principle of Steam jet refrigeration system. Explain the working of Steam jet refrigeration system. **07**

OR

(b) State main applications of Refrigeration. Explain Ice making plant with a suitable diagram. **07**

Q.3 (a) In a 15 TR ammonia refrigeration plant, the condensing temperature is 25°C and evaporating temperature -10°C . The refrigerant ammonia is sub-cooled by 5°C before passing through the throttle valve. The vapour leaving the evaporator is 0.97 dry. Find (1) Coefficient of performance and (2) power required. Use the following properties of ammonia :- **07**

Saturation temperature $^{\circ}\text{C}$	Enthalpy, kJ/kg		Entropy, kJ/kg K		Specific heat, kJ/kg K	
	Liquid	Vapour	Liquid	Vapour	Liquid	Vapour
25	298.9	1465.84	1.1242	5.0391	4.6	2.8
-10	135.37	1433.05	0.5443	5.4770	---	---

(b) Briefly explain construction and working of Practical vapour absorption refrigeration system. Also mention the advantages of this system. **07**

OR

Q.3 (a) Mention the limitations of Simple vapour compression refrigeration cycle. Briefly explain the working of Two stage compression with water **07**

intercooler and liquid sub-cooler employed for vapour compression system.

- (b) The atmospheric air at 30°C dry bulb temperature and 75 % relative humidity enters a cooling coil at the rate of 200 m³/min. The coil dew point temperature is 14°C and the by-pass factor of the coil is 0.1. Determine: 1. The temperature of air leaving the cooling coil; 2. The capacity of the cooling coil in tonnes of refrigeration 3. The sensible heat factor for the process. **07**

Q.4 (a) Classify air conditioning systems. Explain Central air conditioning system with a neat sketch. **07**

- (b) A small office hall of 25 persons capacity is provided with summer air conditioning system with the following data: Outside conditions = 34° C DBT and 28° C WBT Inside conditions = 24° C DBT and 50 % RH Volume of air supplied = 0.4 m³/min/person Sensible heat load in room = 125600 kJ/h Latent heat load in the room = 42000 kJ/h Find the sensible heat factor of the plant. **07**

OR

Q.4 (a) Write note on : **08**

- (a) Shell and tube condenser
(b) Screw compressor

- (b) Describe with neat sketch Li-Br and water system. What are its limitations? **06**

Q.5 (a) Write short note on : **08**

- (a) Split air conditioner
(b) Sources of Heat load

- (b) Explain in brief the following : **06**

- (1) Filters
(2) Humidifiers used in air conditioning systems.

OR

Q.5 (a) Attempt the following: **08**

- (1) What is Refrigerant? Name some important refrigerants. State the properties of sound refrigerant.
(2) State various evaporators in use. Compare Flooded and DX (dry expansion) type evaporators.

- (b) A circular duct of 40 cm is selected to carry air in an air conditioned space at a velocity of 440 m/min to keep the noise level at desired level. If this duct is replaced by a rectangular duct of aspect ratio of 1.5, find out the size of rectangular duct for equal friction method when (a) the velocity of air in two ducts is same, (b) the discharge rate of air in two ducts is same. **06**

GUJARAT TECHNOLOGICAL UNIVERSITY
B.E. - SEMESTER – VIII EXAMINATION – OCTOBER 2012

Subject code: 181901**Date: 27/10/2012****Subject Name: Refrigeration and Air-conditioning****Time: 02.30pm - 05.00pm****Total Marks: 70****Instructions:**

1. Attempt any five questions.
2. Make suitable assumptions wherever necessary.
3. Figures to the right indicate full marks.

Q.1 (a) Explain standard vapour compression refrigeration cycle with T-S and P-H diagram. **07**

What is the effect of sub-cooling on the performance of vapour compression refrigeration system?

(b) A R-12 vapour compression system has saturated suction temperature of -5°C and saturated discharge temperature of 40°C . The refrigerant vapour is dry-saturated at the suction of compressor and becomes superheated after compression. For one ton of refrigeration capacity, Calculate (i) Refrigerating effect (ii) mass flow rate (iii) Power and (iv) COP of the system. **07**

Q.2 (a) Explain Boot-strap air refrigeration system with neat diagram. **07**

(b) Explain Steam jet refrigeration system with neat system diagram and T-S or P-H diagram. **07**

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OR

(b) Explain working of Li-Br vapour absorption refrigeration system with neat sketch. **07**

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Q.3 (a) Explain compound compression with flash chamber but without intercooler with system diagram and P-H diagram. **07**

(b) Explain multiple evaporator at different temperature with individual expansion valve with neat sketch and P-H diagram. **07**

OR

Q.3 (a) Explain construction, working, advantages and disadvantages of Thermostatic Expansion valve with neat sketch. **07**

(b) (i) Explain Flooded type evaporator with neat sketch. **05**
(ii) State different types of compressors used in refrigerators. **02**

Q.4 (a) Explain Adiabatic saturation process with neat sketch. **07**

(b) Following data is available for an air conditioning system comprising of filter, cooling coil, fan and distribution system using only fresh air for the purpose of maintaining comfort conditions in summer. RSH = 11.63 KW, RLH = 2.33 KW. Outside design condition: 28°C DBT, 20°C WBT. Inside design condition: 21°C DBT, 50% RH. Temperature of air entering the room = 11°C . Calculate (i) RSHF (ii) Coil bypass factor (iii) rate of flow of air kg/hr. (iv) Load on cooling coil (v) Coil ADP **07**

OR

Q.4 (a) Explain flywheel effect as applied to cooling load calculation with neat **07**

- labeled diagram.
- Q.4 (b)** Explain the procedure for calculating cooling load due to infiltration air. **07**
- Q.5 (a)** Explain Velocity reduction method of duct design. State its advantages and disadvantages. **07**
- (b)** Define Effective Temperature. Explain various factors governing effective temperature. **07**
- OR**
- Q.5 (a)** Explain with neat sketch various terms used in air distribution. **07**
- (b)** Attempt any TWO **07**
- (i) State desirable properties of ideal refrigerant.
- (ii) Explain All water air conditioning system with neat diagram.
- (iii) Explain Fan laws. State its significance.



GUJARAT TECHNOLOGICAL UNIVERSITY**BE SEM-VIII Examination May 2012****Subject code: 181903****Subject Name: Production Technology****Date: 14/05/2012****Time: 10.30 am – 01.00 pm****Total Marks: 70****Instructions:**

1. Attempt all questions.
2. Make suitable assumptions wherever necessary.
3. Figures to the right indicate full marks.

Q.1 (a) The following observations were made during orthogonal turning of a mild steel tubing of 60 mm diameter on a lathe. **07**

- (1) Cutting speed24 m/min
- (2) Tool rake angle32°
- (3) Feed rate0.12 mm/rev
- (4) Tangential cutting force.....3000N
- (5) Feed force.....1200N
- (6) Length of continuous chip in one revolution...96 mm

Determine:

- (i) Co-efficient of friction
- (ii) Shear plane angle
- (iii) Velocity of chip tool face
- (iv) Chip thickness

(b) Compare hobbing and shaping as production methods of spur gear in large quantities with neat sketch giving expected degree of accuracy and surface finish. **07**

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Q.2 (a) Describe Ultrasonic Machining (USM) process with neat sketch. Discuss how the following factors effects the material removal rate of USM. **07**

- | | |
|-----------------|-----------------------------|
| (i) Grain Size | (iv) Feed force |
| (ii) Frequency | (v) Hardness ratio |
| (iii) Amplitude | (vi) Abrasive concentration |

(b) List the various types of locating devices used for both Jigs and Fixture and Explain any three of them with neat sketch. **07**

OR

(b) Draw neat schematic diagram of a sectioned view of a blanking die and punch assembly and label on it. Explain the function of (i) Die Block (ii) Punch (iii) Knock out. **07**

Q.3 (a) Draw neat sketch of chip formation in metal cutting and derive following relation for the shear angle (ϕ) **07**

$$\phi = \tan^{-1} \left(\frac{r \cos \alpha}{1 - r \sin \alpha} \right)$$

Where r = chip thickness ratio, α = tool rake angle

(b) Discuss following thread manufacturing methods with neat sketch (i) Chasing (ii) Rolling (iii) Tapping **07**

OR

- Q.3 (a)** Draw neat sketch of single point cutting tool with label of six major angles and other terminology of it. Discuss essential characteristic and function of cutting fluids. **07**
- (b)** Enlist different types of gears and draw gear tooth terminology. **07**
With appropriate example discuss plain indexing and compound indexing methods of manufacturing a gear on milling machine.

- Q.4 (a)** Calculate the different speeds available on spindle of a lathe and show them on 1 x 2 x 3 (cross) and 1 x 2 x 3 (open) ray diagram using following data: **07**
- (1) Max spindle speed RPM = 166
 - (2) Min spindle speed RPM = 30
 - (3) No of spindle speed = 6

- (b)** Describe principle of Electrical Discharge Machining (EDM) with figure and state its advantages, limitation and application. **07**

OR

- Q.4 (a)** Explain single spindle automates and transfer machines with suitable example. **07**
- (b)** How are unconventional machining methods classified? Compare LBM and EBM process with different factors which consider for classification of unconventional machining. **07**

- Q.5 (a)** Distinguish between a Jig and Fixture. Sketch different drill bushes useful in drill jigs. **07**
- (b)** Determine the material utilization factor for producing 60 mm equilateral triangle blank from a 4 mm thick. Assume bridge allowance is 1.5T and the blanks are arranged in straight line as showing in figure 1. $a = b$ **07**

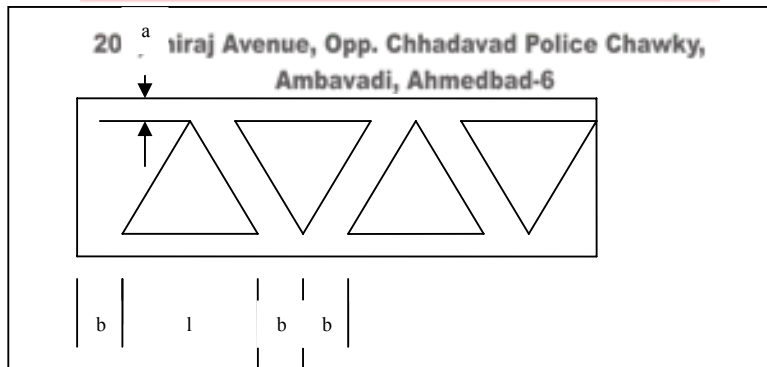


Figure 1.

OR

- Q.5 (a)** Draw and discuss following clamping devices **07**
- (i) Hinged Clamp
 - (ii) Quick Action Nut
 - (iii) Hydraulic Clamp
- (b)** Differentiate Between **07**
- (i) Capstan and Turret lathes
 - (ii) Piercing and Blanking operation

GUJARAT TECHNOLOGICAL UNIVERSITY
BE - SEMESTER-VIII • EXAMINATION – SUMMER 2013

Subject Code: 181903**Date: 15/05/2013****Subject Name: Production Technology****Time: 10:30 am TO 01:00 pm****Total Marks: 70****Instructions:**

1. Attempt all questions.
2. Make suitable assumptions wherever necessary.
3. Figures to the right indicate full marks.

- Q.1** (a) Define Non-conventional machining? Why do we need these processes? **07**
 Give classification of the Non conventional processes?
- (b) Distinguish between jig and fixture. State advantages of jigs and fixtures. **07**

- Q.2** (a) Write in detail the methods of reducing the cutting forces in press **07**
 working.
- (b) Discuss the various types of pilots used in progressive die. **07**

OR

- (b) Sketch and design a progressive die to make a steel washer 30 mm outside **07**
 diameter with 15 mm hole. From 1.6 mm thick steel sheet. The ultimate
 shear strength of the material is 320 N/mm². Calculate,
- a. Maximum punch force necessary to blank and punch the washer if
 both punches operate at the same time.
 - b. Punch and die size for piercing and blanking operation

- Q.3** (a) Write short note on Lathe tool Dynamometer. **07**
- (b) In orthogonal cutting, if the feed is 1.25 mm/rev and chip thickness after **07**
 cutting is 2mm, determine the following.

1. Chip thickness ratio
2. Shear angle

The tool bit has a rake angle of 10°.

If shear strength = 600 N/mm²

Width of cut = 10 mm

Cutting speed = 30 m/min

Co-efficient of friction = 0.9

Determine,

- a. Shear force
- b. Friction angle
- c. Cutting force
- d. Horse power at the cutting tool

OR

- Q.3** (a) Draw Merchant's force diagram. Derive the equations for frictional force, **07**
 normal reaction, shear force and normal force.
- (b) The following equation for tool life has been obtained for H. S. S. tool. **07**

$$VT^{0.13} f^{0.6} d^{0.3} = C$$

A 60 minute tool life was obtained while cutting at V = 40 m/min, f = 0.25
 mm/rev and d = 2 mm.

Calculate the effect on tool life if speed, feed and depth of cut are together
 increased by 25% and also if they are increased individually by 25%. Also
 give your comments.

- Q.4** (a) What is LASER? Explain LBM. **07**
(b) Describe the degrees of freedom for workpiece located in space. Draw a simple sketch to show the 3-2-1 locating principle and explain. **07**

OR

- Q.4** (a) List various clamping devices used in jigs and fixtures. Sketch any two clamping devices and explain its working. **07**
(b) Write important functions of dielectric fluid and electrolyte. Also write various types of commonly used dielectric fluid and electrolyte. **07**

- Q.5** (a) Explain with the help of sketch, principle, types, and applications of gear hobbing. **07**
(b) Describe the essential parts of turret lathe. What is the field of application of turret lathe? **07**

OR

- Q.5** (a) Write short note on Gear finishing process. **07**
(b) Discuss the various types of multi spindle automats. **07**



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Enrolment No. _____

GUJARAT TECHNOLOGICAL UNIVERSITY

BE SEM-VIII Examination May 2012

Subject code: 181902

Subject Name: Machine Design - II

Date: 12/05/2012

Time: 10.30 am – 01.00 pm

Total Marks: 70

Instructions:

1. Attempt all questions.
2. Make suitable assumptions wherever necessary.
3. Figures to the right indicate full marks.
4. Illustrate your answer with neat sketches wherever required.
5. Use of any data book is restricted.

- Q.1 (a)** Explain different modes of gear teeth failures, stating their reasons and remedies. **04**
- (b)** Design a spur gear pair to transmit 15 kW power from an electric motor shaft **10**
running at 1500 rpm to a machine shaft from the following specifications.

Tooth system = 20° pressure angle full depth involute

Number of teeth on pinion = 25

Speed reduction ratio = 3:1

Service factor = 1.25

Material of pinion and gear = FG 200

Design bending stress of material = 60 MPa

Surface hardness of pinion and gear = 200 BHN

Endurance strength of the material = 84 MPa

Dynamic load factor = 1.78 N/mm

Modulus of elasticity = 1.1×10^5 MPa

Assume pitch line velocity as 7.5 m/sec for module calculation.

$$\text{Velocity factor, } C_v = \frac{3}{3 + v}$$

$$\text{Lewis form factor, } y = \left(0.154 - \frac{0.912}{Z} \right) \text{ for } 20^{\circ} \text{ pressure angle full depth involute tooth system}$$

$$\text{Dynamic load equation, } F_d = F_t + \frac{21.v(f.C + F_t)}{21.v + \sqrt{f.C + F_t}}$$

$$\text{Wear load, } F_w = d_p \cdot f \cdot KW \cdot Q$$

- Q.2 (a)** Design a single rope drum to transmit a torque of 8 kN.m with a 32 mm rope. **07**
Assume the height of the load to be raised as 2.7 meter and the ratio of the pulley system as 2. The mean diameter of the drum is 576 mm. Assume the drum to be made of Grey cast iron, grade 20 having allowable shear strength of 33 MPa. Make a neat sketch of the arrangement.

[P.T.O.]

- (b) A single point hook is made from a 50 mm M.S. bar with 84 mm bed diameter. Calculate the safe load that can be taken by this hook, if the design permissible stress is limited to 160 MPa. If the hook section is changed to trapezoidal section from triangular section for the same bar what will be the change in load carrying capacity? 07

For trapezoidal section,

$$R_n = \frac{\left(\frac{b_i + b_o}{2}\right) \cdot H}{\left(\frac{b_i \cdot R_o - b_o \cdot R_i}{H}\right) \log_e \left(\frac{R_o}{R_i}\right) - (b_i - b_o)}$$

$$R = R_i + \frac{H(b_i + 2b_o)}{3(b_i + b_o)}$$

For triangular section,

put $b_o = 0$ in above relations.

OR

- (b) Explain the procedure of designing multi speed gear box. 07
- Q.3** (a) What are the advantages of helical gears over spur gears? 04
- (b) Design a pair of helical gears to transmit 50 kW at a speed of 1440 rpm to a shaft required to run at 480 rpm. The helix angle is approximately 25° and 20° full depth teeth are used. Both the gear and pinion are made of steel with permissible stress 80 N/mm² and 100 N/mm² respectively. Take minimum number of teeth on pinion 16. Check your design for dynamic load and determine minimum hardness of teeth required. 10
- OR**
- Q.3** (a) Explain the importance of thermal considerations in worm and worm gear design. 04
- (b) Two shafts at right to each other are connected by a bevel pair having full depth involute teeth. The pinion having 20 teeth transmits 40 kW at 750 rpm to gear shaft running at 375 rpm. Take allowable static stress for pinion and gear materials 100 and 70 N/mm² respectively. Determine module, pitch diameters and face width from strength considerations. 10
- Q.4** (a) Explain the piston materials. 04
- (b) Design a cast iron piston for a single acting four stroke diesel engine for following data: 10
- Cylinder bore = 100 mm, stroke = 125 mm, $p_{\max} = 5.8 \text{ N/mm}^2$, $p_{\text{mean}} = 0.8 \text{ N/mm}^2$,
 $\eta_m = 85 \%$, speed = 1500 rpm, Fuel consumption = 0.16 kg/BP/hr,
 H.C.V. = $40 \times 10^3 \text{ kJ/kg}$, Constant C = 0.05, K = $46.6 \text{ W/m}^0\text{K}$,
 $\sigma_t \text{ (C.I.)} = 30 \text{ N/mm}^2$
 For piston : $\mu = 0.1$, $p_b = 0.45 \text{ N/mm}^2$
 For piston rings: $p_w = 0.030 \text{ N/mm}^2$, $\sigma_t = 80 \text{ N/mm}^2$
 For piston pin: $p_b = 20 \text{ N/mm}^2$, $\sigma_b = 120 \text{ N/mm}^2$, $\tau = 60 \text{ N/mm}^2$.
- OR**
- Q.4** (a) Why 'I' section is chosen for the connecting rod in the design of I.C.Engine? 04

- (b) Design a connecting rod for a 4 – stroke petrol engine from the following data: **10**
- | | |
|--|------------|
| Cylinder bore | = 100 mm |
| Stroke length | = 140 mm |
| Engine speed | = 1500 rpm |
| Possible over speed of engine | = 2500 rpm |
| Maximum explosion pressure | = 2.5 MPa |
| Weight of reciprocating parts | = 18.5 N |
| Length of connecting rod | = 315 mm |
| Yield strength of connecting rod material | = 320 MPa |
| Factor of safety | = 5 |
| Permissible bearing pressure for big end | = 12.5 MPa |
| Permissible bearing pressure for small end | = 15 MPa |

Q.5 (a) Explain Wire ropes with its designation. What are the advantages of wire ropes. **07**
Explain selection of wire ropes.

(b) Why trapezoidal section is used for hook? Draw a neat sketch of single hook and show the critical section on it. **07**

OR

Q.5 (a) Explain design procedure designing belt conveyors. **07**

(b) Classify the conveyors. Explain construction and working of any one conveyor. **07**



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GUJARAT TECHNOLOGICAL UNIVERSITY
B.E. - SEMESTER – VIII EXAMINATION – OCTOBER 2012

Subject code: 181902**Date: 29/10/2012****Subject Name: Machine Design - II****Time: 02.30pm - 05.00pm****Total Marks: 70****Instructions:**

1. Attempt any five questions.
2. Make suitable assumptions wherever necessary.
3. Figures to the right indicate full marks.
4. Use of PSG Design Data Book is permitted in exam.

Q.1 (a) A three stage gear box with twelve speeds is to be designed based on R10 series with minimum spindle speed of 125 rpm. The second stage consists of three speed steps. The electric motor is connected to the gear box through a belt drive and runs at 1440 rpm and transmits of 5 kW. Using standard spindle speeds, **10**

1. Draw the structure and speed diagram for the arrangement.
2. Determine the ratio of the belt pulley diameters.
3. Draw the gear box layout.
4. Determine the number of teeth on each gear of the gear box.

(b) What are the basic objectives of a material handling system? **04**

Q.2 (a) What are the basic principles in selecting the type of material handling equipment? **06**

(b) Design a connecting rod for a petrol engine from the following data: **08**
Diameter of piston = 110 mm; Mass of reciprocating parts = 2 kg; Length of connecting rod = 325 mm; Stroke = 150 mm; Speed = 1500 rpm with possible over speed of 1850 rpm; Compression ratio = 4:1; Factor of safety = 4; Maximum explosion pressure = 5.5 MPa
Select suitable material and permissible stresses for its.

OR

(b) The cylinder of a four stroke diesel engine has the following specifications: **08**
Brake power = 7.5 kW; Speed = 1400 rpm; Maximum gas pressure = 3.5 MPa; Indicated mean effective pressure = 0.35 MPa; Mechanical efficiency = 80 %;
The cylinder liner and head are made of grey cast iron ($S_{ut} = 260$ MPa and $\mu = 0.25$). The factor of safety for all parts is 6. Calculate:

1. Bore and length of the cylinder liner
2. Thickness of the cylinder liner (Take, $C = 3.2$ mm)
3. Thickness of the cylinder head

- Q.3** A pair of parallel helical gears consists of 24 teeth pinion rotating at 5000 rpm and supplying 12 kW power to a gear. The speed reduction is 4:1. The normal pressure angle and helix angle are 20° and 23° respectively. Both gears are made of hardened steel ($S_{ut} = 600 \text{ N/mm}^2$). The service factor and factor of safety are 1.5 and 3 respectively. Calculate 14
1. Module and face width of gears.
 2. Surface hardness for the gears assuming a factor of safety of 1.5 for wear consideration.

OR

- Q.3** A pair of mating carefully cut spur gears has 20° full depth of 4 mm module. The number of teeth on pinion and gears are 38 and 115, respectively. The face width is 40 mm. If the pinion and gear are made of steel with $f_b \text{ Static} = 233 \text{ MPa}$ and surface hardness of 300 BHN. Calculate the safe power that can be transmitted when the pinion is run at 1200 rpm. 14

- Q.4** It is required to design a pair of bevel gears, which are mounted on shafts intersecting at right angles. The pinion receives 20 kW power through its shaft and rotates at 720 rpm. The number of teeth on pinion and gear are 30 & 45 respectively. The pressure angle is 20° full depth teeth form. The gears are made of plain carbon steel with permissible bending stress as 200 MPa. The gears are case hardened and the surface hardness is 300 BHN. Take service factor = 1.25. 14

OR

- Q.4** A speed reducer unit is to be designed for an input of 5 kW with a transmission ratio of 25. The speed of the hardened steel worm is 1750 rpm. The worm wheel is to be made of chilled bronze. The tooth form is to be 20° full depths involute. Assume double start worm. Design a worm and worm wheel. 14

- Q.5** Design a plain carbon steel centre crankshaft for a single acting four stroke, single cylinder engine for the following data: 14
- Piston diameter = 250 mm; Stroke = 400 mm; Maximum combustion pressure = 2.5 MPa; Weight of the flywheel = 5 kg; Total belt pull = 100 N; Length of connecting rod = 950 mm. The flywheel is used as a pulley.
- When the crank has turned through 30° from top dead centre, the pressure on the piston is 1 MPa and the torque on the crank is maximum.
- Any other data required for the design may be assumed.

OR

- Q.5** Design the various components of a valve gear mechanism for a horizontal gas engine with the following data: 14
- Diameter of port is 70 mm, its weight is 5 N, and its lift is 25 mm. The maximum combustion pressure is 4.5 MPa. The valve opens 33° before O.D.C. and closes 1° after I.D.C. and it is to open with constant acceleration and deceleration for each half of the lift. The gas pressure in cylinder when the exhaust valve start to opens is 0.34 N/mm^2 , the pressure on the top side of the valve may be taken as 0.1 N/mm^2 absolute and the greatest suction pressure is 0.035 N/mm^2 below atmospheric. The engine runs at 350 rpm. The effective length of each arm of the rocker lever is 175 mm and the included angle is 140° .

GUJARAT TECHNOLOGICAL UNIVERSITY
BE - SEMESTER-VIII • EXAMINATION – SUMMER 2013

Subject Code: 181902**Date: 13/05/2013****Subject Name: Machine Design-II****Time: 10:30 am TO 01:00 pm****Total Marks: 70****Instructions:**

1. Attempt all questions.
2. Make suitable assumptions wherever necessary.
3. Figures to the right indicate full marks.

Q.1 (a) Design a spur gear pair from the following given data. **07**

Power to be transmitted = 22.5 kW, Pinion speed = 1450 rpm, Speed reduction = 2.5, No. of teeth on pinion = 20, Service factor = 1.5, $b = 10m$, Pitch line velocity = 5 m/sec (For initial calculation of module), Maximum permissible error in gear tooth profile = 0.025 mm, $k = A$ factor depending upon the form of teeth = 0.111, Velocity factor = $3 / (3 + V)$, where V is the pitch line velocity in m/s.

Take endurance surface hardness = 600 MPa

Lewis form factor = $0.154 - 0.912 / \text{No. of teeth}$ for 20° pressure angle involute tooth system. The materials and stresses are as under:

Material	[σ_b]	Elasticity Modulus	Hardness
Pinion (Fe 410)	135 N/mm ²	2.1×10^5 N/mm ²	260 BHN
Gear (FG 200)	65 N/mm ²	1.1×10^5 N/mm ²	250 BHN

(b) Draw speed ray diagram and layout for a six speed gear box .The out put speed are 160 r.p.m. minimum and 1000 r.p.m. maximum. The motor speed is 1440 r.p.m. **07**

Q.2 (a) A pair of helical gears having a transmission ratio 8:3 , with a steady load condition , used for turbine. The maximum speed is 2400 r.p.m. The pinion is to have 27 teeth and a face width of 100 mm. The circular module is 6 mm. The material used for gears is heat treated steel with 250 BHN and have static stress of 210 MPa. The gears are carefully cut. Calculate value of dynamic load and wear load. **07**

(b) Determine the power capacity of a pair of helical turning gears having a transmission ratio of 10:1. The teeth are 20° full depth involute $- 6$ mm module . The pinion has 25 teeth and rotates at 5000 r.p.m. The active face width is 76 mm and material is C-40 steel untreated. **07**

OR

(b) Two shafts at right to each other are connected by a bevel pair having full depth involute teeth. The pinion having 20 teeth transmits 40 kW at 750 rpm to gear shaft running at 375 rpm. Take allowable static stress for pinion and gear materials 100 N/mm^2 and 70 N/mm^2 respectively. Determine module, pitch diameters and face width . **07**

Q.3 (a) Explain the different causes of gear tooth failures and suggest possible remedies to avoid such failures. **05**

- (b) A speed reducer unit is to be designed for an input of 1.1 kW with transmission ratio 27. The speed of hardened steel worm is 1440 rpm. The worm wheel is to be made from phosphor bronze. The tooth form is to be 200 involute. Take center distance between worm and worm wheel = $x = 100$ mm. Pitch circle diameter of worm = $\frac{1.416}{6}$, worm is double start.

$$C_v = \frac{6}{6 + v}$$

$$\text{Form factor } y = 0.154 - \frac{0.912}{T}$$

Allowable stress for phosphor bronze = 84 MPa, flexural endurance limit for phosphor bronze = 168 MPa, load stress factor = $k = 0.55$, check for (1) Tangential load- power transmitted due to tangential load, (2) Dynamic load, (3) Static load or endurance strength, (4) Wear load, (5) Heat dissipation.

OR

- Q.3 Design & draw a 2 stage spur gear reduction gear box pairs for operating a set of two belt conveyor for following data: 14

- Maximum conveyor speed = 1.5 m/s
- Effective diameter of driving pulley of conveyor = 250 mm
- Amount of torque transmitted by each driving pulley of conveyor = 200 Nm.
- Speed of input shaft = 1920 rpm.

Use data design book.

- Q.4 (a) Determine the principle dimensions of cylinder for a vertical 4 stroke compression ignition engine from the following data: Brake power = 4.5 kW, Speed = 1200 rpm, Indicated mean effective pressure = 0.35 MPa, Mechanical efficiency = 80%. 09

- (b) Describe the criteria for deciding the size of suction and exhaust valve of an I.C. engine. 05

OR

- Q.4 (a) Design a connecting rod for a high speed diesel engine from the following data: 09

Cylinder bore = 100 mm, Stroke = 120 mm, Maximum speed = 1800 rpm, Compression ratio = 18, Max. Explosion pressure = 5 MPa, Mass of reciprocating parts = 3.5 Kg, Length of connecting rod = 240 mm, If the connecting rod is made of drop forged steel, determine the size of I-section, size of small end bearing, big end bearing and bolts. Assume suitable stresses.

- (b) 1) Why an I-section is usually preferred to round section in case of connecting rods? 05
2) What are the merits and demerits of wet and dry cylinder liners?

- Q.5 (a) The following data refers to a flat belt conveyor for transporting crushed rock 07

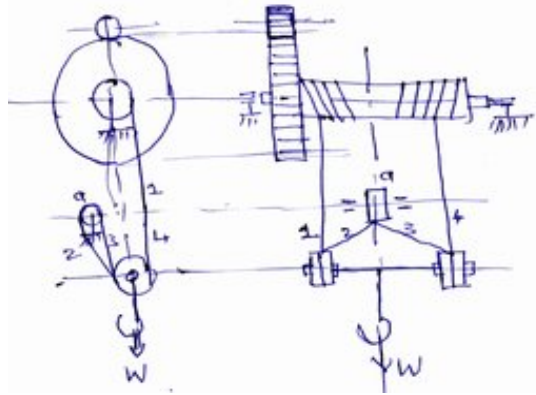
Mass density = 2 tons/m³, belt speed = 1.5 m/s, belt width (B) = 0.8m, surcharge angle = 25°, effective width of the material carried by the belt safely = $b = (0.9B - 0.05)$.

- (b) With neat sketches, explain the different types of idler used in conveyors. 07

OR

Q.5 (a) Select the ropes, pulleys and drum for an over head travelling crane with a **10** lifting magnet.

Lifting capacity = 4500 kg (mass), Weight of lifting magnet = 210 kg (mass),
Weight of lifting tackle = 110 kg (mass),
Lifting height = 8.5 m, No. of rope parts = 4.



(b) Differentiate between screw conveyor and vibratory conveyor.

04

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GUJARAT TECHNOLOGICAL UNIVERSITY**BE SEM-VIII Examination May 2012****Subject code: 181904****Subject Name: Thermal Engineering****Date: 16/05/2012****Time: 10.30 am – 01.00 pm****Total Marks: 70****Instructions:**

1. Attempt all questions.
2. Make suitable assumptions wherever necessary.
3. Figures to the right indicate full marks.
4. Use of steam table and Mollier chart is allowed.

- Q.1** (a) What is critical pressure? Derive the expression for critical pressure ratio in flow through nozzles. Calculate its value for superheated steam. **07**
- (b) What do you mean by compounding of steam turbine? Explain with neat diagram velocity compounded impulse turbine. **07**

- Q.2** (a) Describe with neat sketch closed cycle gas turbine. Write its merits and demerits over open cycle gas turbine. **07**
- (b) Steam is expanded in a set of nozzles from 10 bar and 200 °C to 5 bar. Is the nozzle convergent or convergent-divergent? Assuming the isentropic expansion of steam, calculate the minimum area of nozzles to flow steam at the rate of 3 kg per second. Neglect the initial velocity and take coefficient of discharge $C_d = 0.97$. **07**

OR

- (b) Explain combined steam and gas turbine power plant with neat schematic diagram. Also discuss its importance. **07**

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- Q.3** (a) What do you mean by governing of steam turbine? State various methods of governing and explain with neat sketch the Nozzle Control Governing. **07**
- (b) A mean blade ring diameter of a single stage impulse turbine is 1.3 meter. It runs at 3200 R.P.M. The nozzle angle is 15° and blade speed ratio is 0.45. The blade friction factor is 0.9 and the discharge is axial. Calculate blade inlet and outlet angles and Power output per kg of steam. **07**

OR

- Q.3** (a) Define the term “Degree of Reaction”. Explain Parson’s reaction turbine. **07**
- (b) The following data refer to a stage (One ring of fixed blades and one ring of moving blades) of Parson’s reaction turbine: **07**
 The mean diameter of blade ring is 680 mm. Running speed is 3100 R.P.M. The steam velocity at exit from fixed blades is 160 m/s.
 Blade outlet angle is 21°.
 Steam flow rate through blades is 7.4 kg per second.
 Draw the velocity diagram and find :
 (i) Blade inlet angle
 (ii) Power developed in the stage.
 (iii) The maximum blade efficiency.

- Q.4** (a) Derive the expression of optimum pressure ratio for maximum work **07**

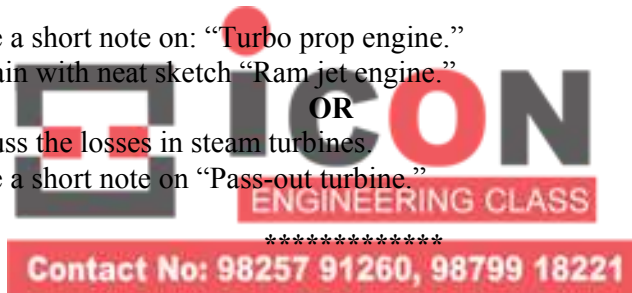
out put in actual Brayton Cycle.

- (b) The compressor of an open cycle constant pressure gas turbine draws air at pressure 1 bar and temperature 300 K. The pressure of air after compression is 4 bar. The isentropic efficiencies of compressor and turbine are 77 % and 85 % respectively. The A:F ratio is 78:1. Calculate the power developed and thermal efficiency of the cycle for the mass flow rate of air = 2.7 kg per second. Take $C_p = 1 \text{ kJ/kg K}$ and $\gamma = 1.4$ for air and gases both. The calorific value of fuel used is 42 MJ per kg. 07

OR

- Q.4 (a)** Explain in brief with neat diagrams the various methods used to improve the efficiency and specific out put of a simple open cycle gas turbine plant. 07
- (b)** A gas turbine plant draws air at 1 bar and 295 K. Air is compressed to 4 bar and then heated to a temperature of 850 K. The efficiencies of compressor and turbine are 81 % and 87 % respectively. Neglect the pressure drop. 07
Determine the overall efficiency of the plant :
(1) Without regenerator and
(2) With the regenerator of 71 % effectiveness.
Take $C_p = 1 \text{ kJ/kg K}$ and $\gamma = 1.4$ for air and gases both.

- Q.5 (a)** Write a short note on: "Turbo prop engine." 07
- (b)** Explain with neat sketch "Ram jet engine." 07
- OR**
- Q.5 (a)** Discuss the losses in steam turbines. 07
- (b)** Write a short note on "Pass-out turbine." 07



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GUJARAT TECHNOLOGICAL UNIVERSITY
BE - SEMESTER-VIII • EXAMINATION – SUMMER 2013

Subject Code: 181904**Date: 10/05/2013****Subject Name: Thermal Engineering****Time: 10:30 am TO 01:00 pm****Total Marks: 70****Instructions:**

1. Attempt all questions.
2. Make suitable assumptions wherever necessary.
3. Figures to the right indicate full marks.

Q.1 (a) Show that the maximum discharge of fluid through a nozzle takes place when the **07**

ratio of the fluid pressure at the throat to the inlet pressure is $\left(\frac{2}{n+1}\right)^{\frac{n}{n-1}}$ where n

is the index of adiabatic expansion.

(b) Explain the metastable flow of steam through a nozzle and the significance of **07**
 Wilson's line.

Q.2 (a) What is the principle of operation of steam turbines? And what is the difference **07**
 between impulse and reaction turbines.

(b) What is compounding? Describe various ways of compounding impulse and **07**
 reaction turbines with merits and demerits.

OR

(b) Dry saturated steam with an initial pressure of 11 bar is expanded to 1.5 bar **07**
 through a convergent divergent nozzle. The flow rate of steam is estimated as 2
 kg/sec. area of cross-section of nozzle as its throat is 1 cm². If the efficiency of
 nozzle is 88%. Find the numbers of nozzles and exact throat and exit area. Take
 the index of expansion as 1.2.

Q.3 (a) Sketch the velocity diagram of a single stage impulse turbine and determine the **07**
 expression for the force, workdone, diagram efficiency, gross stage efficiency and
 axial thrust.

(b) The data pertaining to an impulse turbine is as: Blade speed: 300 m/s; isentropic **07**
 enthalpy drop in nozzles: 450 kJ/kg; nozzle efficiency: 0.9; nozzle angle: 20°;
 blade velocity coefficient: 0.85; blade exit angle: 25°. Calculate for a mass of 1
 kg/sec

- (a) The inlet angle of moving blades,
- (b) The axial thrust,
- (c) The driving force on the wheel,
- (d) The diagram power,
- (e) The energy lost in blades due to friction,
- (f) The diagram efficiency.

OR

Q.3 (a) Prove that the diagram or blade efficiency of a single stage reaction turbine is **07**
 given by

$$\eta_{bl} = 2 - \frac{2}{1 + 2\rho \cos \alpha - \rho^2} \text{ where } R_d = 50\% \text{ and } C_{f1} = C_{f0}$$

Further prove that maximum blade efficiency is given by $(\eta_{bl})_{\max} = \frac{2 \cos^2 \alpha}{1 + \cos^2 \alpha}$

- (b) Describe the process and purpose of reheating as applicable to steam flowing through a turbine. 07

Q.4 (a) Derive an expression for the thermal efficiency of a gas turbine plant, and show that it is independent of the mass of air circulated in it. 07

- (b) In a constant pressure open cycle gas turbine air enters at 1 bar and 20°C and leaves the compressor at 5 bar. Using the following data: 07

Temperature of gases entering the turbine = 680 °C, pressure losses in the combustion chamber = 0.1 bar, $\eta_{\text{compressor}} = 85\%$, $\eta_{\text{turbine}} = 80\%$, $\eta_{\text{combustion}} = 85\%$, $\gamma = 1.4$, and $c_p = 1.024 \text{ kJ/kg K}$ for air and gas. Find

- (i) The quality of air circulation if the plant develops 1065 kW.
(ii) Heat supplied per kg of air circulation.
(iii) The thermal efficiency of the cycle.

Mass of the fuel may be neglected.

OR

Q.4 (a) Prove that optimum pressure ratio for maximum specific output for a gas turbine plant is given by r_p (optimum) = $\left\{ \eta_{\text{turbine}} \times \eta_{\text{compressor}} \cdot \frac{T_3}{T_1} \right\}^{\gamma/2(\gamma-1)}$ 07

- (b) What are the main requirements of a gas turbine combustion chamber? Are these requirements mutually compatible? Explain it. 07

Q.5 (a) Draw a schematic diagram of a Pulse Jet Engine and describe its operation. What are the advantages and disadvantages of Pulse Jet Engine? 07

- (b) Write a short note with schematic diagram on Turbo Jet Engine. 07

OR

Q.5 (a) Explain brief note on Back Pressure Turbine with neat sketch and Enthalpy-Entropy diagram. 07

- (b) Write a short note on methods of attachment of blades to turbine rotors. 07

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GUJARAT TECHNOLOGICAL UNIVERSITY**BE SEM-VIII Examination May 2012****Subject code: 181905****Subject Name: Industrial Safety & Maintenance Engineering (D. E.-II)****Date: 08/05/2012****Time: 10.30 am – 01.00 pm****Total Marks: 70****Instructions:**

1. Attempt all questions.
2. Make suitable assumptions wherever necessary.
3. Figures to the right indicate full marks.

- Q.1** (a) What are important provisions of Indian Factories Act with regard to safety? Explain briefly. **07**
- (b) Describe roll of management and roll of government in Industrial safety. **07**
- Q.2** (a) Write important functions of safety committees in big industries, namely, refineries, petro-chemicals and fertilizers where safety is of prime importance, Also write organization structure of safety committee. **07**
- (b) Describe importance of following in preventing accidents in industries: Plant Layout, Illumination, Ventilation, House-keeping **07**
- OR**
- (b) Write short notes on (i) Boiler Act (ii) ESI Act (iii) Explosive act **07**
- Q.3** (a) What are seven basic parameters which form basis of Condition Monitoring Techniques in maintenance of industrial equipments? Write briefly on each Technique. **07**
- (b) Write methods and instruments used for condition monitoring of a Gear Box used for speed-reduction of a prime mover. **07**
- OR**
- Q.3** (a) What is FMEA? How does FMEA help maintenance personnel? **07**
- (b) What is Fault Tree Analysis? Explain briefly. **07**
- Q.4** (a) What is Total Productive Maintenance (TPM)? How does it differ from Total Quality Management (TQM)? **07**
- (b) Write two basic systems adopted in TPM and explain briefly the systems. **07**
- OR**
- Q.4** (a) Compare in brief:
Break-down maintenance, Opportunistic maintenance,
Routine maintenance **07**
- (b) How Equipment Life Cycle is useful for deciding maintenance activities? Draw Bath Tub Curve and show which part is important from maintenance point of view. **07**
- Q.5** (a) Define various performance measuring parameters/indices used for analysis of effectiveness of maintenance function. **07**
- (b) Draw chart of System approach of Maintenance Functions **07**
- OR**
- Q.5** (a) Enumerate three basic approaches for preparation of maintenance **07**

- budget.
- (b) Differentiate between Fixed Costs and Variable Costs associated with Maintenance Function. Give suitable example in each case. **07**



GUJARAT TECHNOLOGICAL UNIVERSITY
B.E. - SEMESTER – VIII EXAMINATION – OCTOBER 2012

Subject Code: 181905**Date: 25/10/2012****Subject Name: Industrial Safety & Maintenance Engineering****Time: 02.30pm - 05.00pm****Total Marks: 70****Instructions:**

1. Attempt any five questions.
2. Make suitable assumptions wherever necessary.
3. Figures to the right indicate full marks.

- Q.1** (a) What is industrial safety? How it is associated with risk? **07**
 (b) Explain roll of management and roll of government in industrial safety. **07**
- Q.2** (a) What do you know about internal and external accident also explain what is major and minor accident in an industry? **07**
 (b) What are the aims and objectives of industrial legislation? **07**
- OR**
- (b) What is boiler act? Can this act is applicable to boiler belonging to or under the control of Army Navy and Air Force? **07**
- Q.3** (a) What is meant by industrial maintenance? What are different activities which come under maintenance? **07**
 (b) Differentiate between Emergency maintenance and Breakdown maintenance. **07**
- OR**
- Q.3** (a) What are basic principles of maintenance planning? **07**
 (b) What is Reliability, Maintainability and Availability? Ideally every company would like to achieve 100 percent reliability but this is seldom possible .Justify this statement. **07**
- Q.4** (a) What are the causes of equipment breakdown? **07**
 (b) What is Total Productive Maintenance (TPM) and discuss it's similarities with TQM? **07**
- OR**
- Q.4** (a) Explain MTBS, MTBF, MTTF, MTTR and failure rate. **07**
Q.4 (b) What is an economics aspect of maintenance? Explain with neat figure. Showing all the costs. **07**
- Q.5** (a) What is fault tree analysis? Apply it for a car accident and suggest detail analysis. **07**
 (b) What are the functions of lubrication? And give the tips on lubrication. **07**
- OR**
- Q.5** (a) What is wear debris analysis? Write the names of any three wear debris analysis techniques commonly used. **07**
 (b) What is thermal monitoring? How temperature sensitive tapes work? **07**

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BE - SEMESTER-VIII • EXAMINATION – SUMMER 2013

Subject Code: 181905**Date: 09/05/2013****Subject Name: Industrial safety and Maintenance engineering****Time: 10:30 am TO 01:00 pm****Total Marks: 70****Instructions:**

1. Attempt all questions.
2. Make suitable assumptions wherever necessary.
3. Figures to the right indicate full marks.

- Q.1 (a)** Discuss various outcome in terms of improved productivity achieved through better safety conditions in industrial plant **07**
- (b)** Discuss various activities involved during safety analysis of a product **07**
- Q.2 (a)** Discuss causes of accidents in industrial plant **07**
- (b)** Discuss classification of hazardous conditions in industrial plant **07**
- OR
- (b)** List the personal protective equipments for following human body parts with IS standards **07**
 (i) Head, (ii) Ear, (iii) Face, (iv) Eye, (v) Overall body, (vi) Foot and leg, (vii) fingers and hands
- Q.3 (a)** Discuss major welfare factors in Factory Act, 1948 **07**
- (b)** Discuss major benefits covered in ESI Act, 1948 **07**
- OR
- Q.3 (a)** Discuss various steps involved in Industrial Hygiene. **07**
- (b)** What do you mean by occupational diseases? Discuss occupational diseases caused due to physical condition and respiration in dusty environment. **07**
- Q.4 (a)** Discuss objectives and advantages of ergonomics **07**
- (b)** Discuss objectives and advantages of planned maintenance. **07**
- OR
- Q.4 (a)** Discuss reliability and machine availability **07**
- (b)** Discuss major causes of equipment breakdown **07**
- Q.5 (a)** Discuss types of costs associated in maintenance **07**
- (b)** What is mean by unplanned maintenance? Discuss in details. **07**
- OR
- Q.5 (a)** Discuss fault tree analysis **07**
- (b)** Discuss in brief condition checking and trend monitoring with respect to condition monitoring. **07**

GUJARAT TECHNOLOGICAL UNIVERSITY**BE SEM-VIII Examination May 2012****Subject code: 181908****Subject Name: Machine Tool Design (Dept Elect-II)****Date: 08/05/2012****Time: 10.30 am – 01.00 pm****Total Marks: 70****Instructions:**

1. Attempt all questions.
2. Make suitable assumptions wherever necessary.
3. Figures to the right indicate full marks.

- Q.1** (a) Enlist various requirements of a machine tool. One of the requirements is machine tool should provide good surface finish, which depends on Machine tool vibrations. Explain how these vibrations can be controlled. **07**
- (b) What are the advantages of hydraulic drives over other types of drives? Explain in brief important elements of a hydraulic drive **07**

- Q.2** (a) List various methods of obtaining stepless / infinitely variable drives and explain with the help of neat sketch stepless friction drive **07**
- (b) Analyze in detail the use and need of parallel and diagonal ribs in the lathe bed **07**

- (b) Define stiffness and rigidity of a machine tool and explain how static and dynamic stiffness can be analyzed. **07**

- Q.3** (a) What are the advantages of using geometric progression for deciding the spindle speeds? Draw the open and cross type speed structure diagram and the possible ray diagrams for these speed structure diagrams for 2 X 2 drive having speeds N_1, N_2, N_3 and N_4 . **07**
- (b) Explain the mechanism for control of feed drive of a copying device which copies and produces a similar contour on the job. **07**

OR

- Q.3** (a) Discuss in brief with a neat sketch hydrodynamically lubricated slideway stating its load carrying capacity, advantages and disadvantages **07**
- (b) A steel work piece of diameter 100mm is to be for rough turned using a depth of cut 1.5mm/rev. Calculate the cutting force and feed force Considering specific cutting resistance of steel = 500N/mm^2 , allowance for rake angle = 0.1, allowance for wear = 0.15, $F_v / F_h = 0.25$, $F_r / F_h = 0.30$, coefficient of friction = 0.2, weight of traversing parts = 500 N and correction factor for overturning moment = 1.2 **07**
- Find the power rating of the cutting and feed drives if the maximum cutting speed = 315m/min, maximum feed rate = 0.5mm/rev, maximum depth of cut = 2.5mm and mechanical efficiency of kinematic chain for cutting and feed motions = 0.8

- Q.4** (a) List various automatic machines and explain the working of automatic cutting off machine. **07**
- (b) Explain in detail with the help of neat sketch the control of feed by limit switch **07**

OR

- Q.4** (a) Compare various shapes of slideways in respect of their advantages and **07**

- disadvantages
- (b) Explain the method of eliminating backlash in the feed drive mechanism 07
- Q.5** (a) Give detailed classification of automatic blank feeding system and explain with neat sketch any one of them 07
- (b) How minimum shaft size calculated so as to minimize size of the gearbox. 07
- OR**
- Q.5** (a) What points should be considered for designing of spindle of a machine tool? 07
- (b) List various types of bearing and explain parameters on which their selection for supporting the spindle of machine tool depends on. 07



GUJARAT TECHNOLOGICAL UNIVERSITY**B.E. - SEMESTER – VIII EXAMINATION – OCTOBER 2012****Subject Code: 181908****Date: 25/10/2012****Subject Name: Machine Tool Design****Time: 02.30pm - 05.00pm****Total Marks: 70****Instructions:**

1. Attempt any five questions.
2. Make suitable assumptions wherever necessary.
3. Figures to the right indicate full marks.

- Q.1** (a) Explain design procedure of speed gear box. **07**
 (b) What is ray diagram? for 2x2 gear box transmitting 10 HP power, which has the minimum Σd ? Where d is diameter of shaft. Which has better layout? **07**
- Q.2** (a) Why machine tool structures are designed considering rigidity criteria, not with the strength criteria? **07**
 (b) Explain design procedure of feed gear box. **07**
- OR**
- (b) Choice of hydraulic circuit depends on which factors? Explain selection of electrical motor for a machine. **07**
- Q.3** (a) Why geometric progression series is preferred over arithmetic progression series? Discuss their merits and demerits. **07**
 (b) A 2x2 drive is required to be designed for transmitting 12 HP with speed ranging from 400 rpm with $\phi = 1.4$. Select suitable structural form and optimum ray diagram. **07**
- OR**
- Q.3** (a) Explain general requirement of machine tool. **07**
 (b) Explain machine tool design consideration for two criteria (a) Manufacturing (b) Economy. **04**
- (C) Explain Step less regulation of speed and feed rates in machine tool. **03**
- Q.4** (a) Explain function of machine tool structure and also discuss about their requirement during design. **07**
 (b) A steel work piece of diameter 80 mm is to be for rough turned using a depth of cut 1.2 mm/rev. Calculate the cutting force and feed force considering specific cutting resistance of steel = 400 N/mm², allowance for rack angle = 0.1, allowance for wear = 0.15, $F_v/F_h = 0.25$, $F_r/F_h = 0.3$, coefficient of friction = 0.2, weight of transmitting parts = 400N and coefficient of factor for overturning moment = 1.1 **07**
 Find the power rating of the cutting feed drives if the maximum cutting speed = 300 m/min, maximum feed rate = 0.4 mm/rev, maximum depth of cut = 2.5 mm and mechanical efficiency of kinematic chain for cutting and feed motion = 0.8
- OR**
- Q.4** (a) Compare various section of bed and discuss how their rigidity of bed section is increased. **07**
- Q.4** (b) Explain hydraulic circuit for shaping and grinding machine. **07**
- Q.5** (a) List various automatic machines and explain the automatic cutting of machine. **07**
 (b) Explain about design of hydrodynamic slideway. **07**
- OR**
- Q.5** (a) Explain about recirculating ball screws for machine tool. **07**
 (b) Explain design procedure for a spindle of lathe machine. **07**

GUJARAT TECHNOLOGICAL UNIVERSITY**BE SEM-VIII Examination May 2012****Subject code: 181907****Subject Name: Automobile body engineering (Department elective-II)****Date: 08/05/2012****Time: 10.30 am – 01.00 pm****Total Marks: 70****Instructions:**

1. Attempt all questions.
2. Make suitable assumptions wherever necessary.
3. Figures to the right indicate full marks.

- Q.1** (a) Explain briefly GRP and FRP used in automobile body. **07**
 (b) Give the difference between toughened glass, sheet glass and laminated glass. **07**

- Q.2** (a) Explain different materials used for automobile body. **07**
 (b) What is dash board? Explain different instruments included in dash board. **07**

OR

- (b) Explain crash test to be performed for auto vehicles. **07**

- Q.3** (a) Give detailed classification of vehicle bodies. **07**
 (b) What is vehicle safety? Explain requirements and provisions for vehicle safety. **07**

OR

- Q.3** (a) Explain various seating dimension parameters with sketch. **07**
 (b) Write a brief note on 'heating and ventilation systems' of the vehicle. **07**

- Q.4** (a) What is vehicle drag? Explain the types of drags in a vehicle. **07**
 (b) Explain wind tunnel testing of scale model. **07**

OR

- Q.4** (a) Explain body optimization techniques and aerodynamics aids for optimization of drag. **07**
 (b) Explain different aerodynamic forces and moments with their effects on the vehicle. **07**

- Q.5** (a) Explain roll over test to be performed for auto vehicles. **07**
 (b) Explain methods for paint and painting process for automobile body. **07**

OR

- Q.5** (a) Draw the bus body layout and give the function of each component of bus body. **07**
 (b) What is driver's visibility? Explain methods for improving visibility of drivers in a vehicle. **07**

GUJARAT TECHNOLOGICAL UNIVERSITY
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Subject Code: 181907**Date: 09/05/2013****Subject Name: Automobile Body Engineering (Department Elective II)****Time: 10:30 am TO 01:00 pm****Total Marks: 70****Instructions:**

1. Attempt all questions.
2. Make suitable assumptions wherever necessary.
3. Figures to the right indicate full marks.

- Q.1** (a) What is “Streamline Design” for vehicle body? Give the importance of smooth curves and slopping surfaces. **07**
 (b) Explain with neat sketch or layout of articulated bus. **07**
- Q.2** (a) What is aerodynamics forces and moment? Explain the different types of forces and moment produce on vehicle. **07**
 (b) What is wind tunnel? Write different types of wind tunnels. Also gives advantages of it. **07**
- OR**
- (b) Describe the drag, side force and lift forces in details. **07**
- Q.3** (a) Discuss about the conventional and integral type of bus body construction. **07**
 (b) What are the requirements of body for various types of vehicles? **07**
- OR**
- Q.3** (a) Explain about the visibility consideration in the body design. **07**
 (b) What is the characteristic of flat platform body? **07**
- Q.4** (a) Explain in brief different types of bus body style. **07**
 (b) Why toughened glass is used in Automobile? Explain difference between toughened glass and laminated glass. **07**
- OR**
- Q.4** (a) What are the different entrance and exit locations in the bus? **07**
Q.4 (b) What are the different types of painting methods and explain the modern procedure of spray painting? **07**
- Q.5** (a) What are the functions of painting in Automobile body and What are the main constituents of paints? **07**
 (b) Discuss the materials used for car body construction, truck body and passenger bus body. **07**
- OR**
- Q.5** (a) Discuss about interior trim, exterior trim and upholstery of automobile body. **07**
 (b) Explain about any four vehicle body repair tools. **07**

GUJARAT TECHNOLOGICAL UNIVERSITY**BE SEM-VIII Examination May 2012****Subject code: 181906****Subject Name: Gas Dynamics****Date: 08/05/2012****Time: 10.30 am – 01.00 pm****Total Marks: 70****Instructions:**

1. Attempt all questions.
2. Make suitable assumptions wherever necessary.
3. Figures to the right indicate full marks.
4. Use the Gas tables given at end of paper.

- Q.1** (a) Describe the behavior of flow in a convergent divergent nozzle when it is operated at (i) Design pressure ratio (ii) Pressure ratio higher than design value (iii) Pressure ratio less than design value. **07**
- (b) Prove that the mass flow parameter is given by following expressions. **07**

$$\frac{m\sqrt{T_0}}{AP_0} = \sqrt{\frac{2\gamma}{R(\gamma-1)} \left\{ \left(\frac{p}{p_0} \right)^{\frac{2}{\gamma}} - \left(\frac{p}{p_0} \right)^{\frac{\gamma+1}{\gamma}} \right\}}$$

- Q.2** (a) Derive the following from one dimensional steady flow energy equation **07**

$$\frac{a^2}{\gamma-1} + \frac{1}{2}C^2 = \frac{1}{2}C_{\max}^2 = H_0 = \frac{1}{2}a^2 \left(\frac{\gamma+1}{\gamma-1} \right) = \frac{\gamma}{\gamma-1} \frac{p_0}{\rho_0}$$

- (b) Air ($c_p=1.045$ kJ/kg K, $\gamma=1.35$) at $p_1=3.5 \times 10^5$ N/m² and $T_1=505$ K flows with a velocity of 202 m/s in a 30 cm diameter duct. Calculate (a) Mass flow rate (b) Stagnation temperature (c) Mach number (d) Stagnation pressure values assuming the flow as compressible and incompressible. **07**

OR

- (b) An aircraft is flying at an altitude of 12000 metres ($T=216.65$ K, $p=0.193$ bar) at a Mach number of 0.82. The cross sectional area of the inlet diffuser before the L.P. compressor stage is 0.5 m². Determine (a) the mass of air entering the compressor per second (b) the speed of the aircraft (c) the stagnation pressure and temperature of air at the diffuser entry. **07**

- Q.3** (a) Explain the expansion and compression both adiabatically and isentropically with help of T-S and P-V diagrams. **07**
- (b) The pressure, velocity and temperature of air ($\gamma=1.4$, $C_p=1.0$ KJ/kg K) **07**

at the entry of a nozzle are 2 bar, 145 m/s and 330 K; the exit pressure is 1.5 bar. Determine for isentropic flow (a) the mach number at entry and exit (b) the flow rate and maximum possible flow rate.

OR

- Q.3** (a) Derive the expression for the pressure ratio, across normal shock in terms of density ratio (Rankine Hugoniot expression). **07**
- (b) Derive the equation of static pressure ratio across the normal shock, **07**

$$\frac{P_y}{P_x} = \frac{2\gamma}{\gamma-1} Mx^2 - \frac{\gamma-1}{\gamma+1}$$

- Q.4** (a) Obtain an expression for change in entropy as a function of stagnation pressure ratio for Fanno flow process. Hence show that stagnation pressure always **07**

decreases in the process.

- (b) The air with mach number 0.3, stagnation pressure 6 bar and stagnation temperature 350 K enters into a thermally insulated duct of constant diameter 10 cm. If the duct operates under choking condition, determine the length of duct, flow parameters at duct exit and mass flow rate. Take the mean friction coefficient for the duct as 0.004. 07

OR

- Q.4 (a) Explain the mechanism of energy conversion in Rayleigh flow. 07
 (a) When a subsonic flow is heated
 (b) When a supersonic flow is cooled.
- (b) Starting from the energy equation for flow through a normal shock, obtain the Prandtl Mayer relation 07

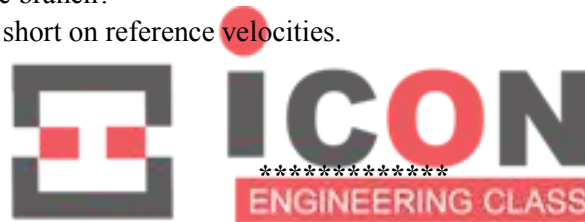
$$Mx * My* = 1$$

- Q.5 (a) What are the various types of wind tunnels used for low and high speed testing of models? Describe briefly the special problems of the supersonic tunnels. 07
- (b) Define the following terms:(a)Stagnation pressure (b)Stagnation temperature (c)Stagnation velocity of sound (4)Mach number (5)Critical and maximum velocity. 07

OR

- Q.5 (a) Prove that upper part of Fanno flow process is subsonic and lower part is supersonic. How would the state of a gas change from the supersonic to subsonic branch? 07
- (b) Write a short on reference velocities. 07

+



Isentropic Flow Table (Flow of perfect gas, $\gamma=1.4$):

M	T/T ₀	P/P ₀	A/A*	F/F*
0.4	0.969	0.895	1.59	1.375
0.75	0.898	0.688	1.062	1.031
0.8	0.886	0.656	1.038	1.018

Fanno Flow Table (Flow of perfect gas with friction, $\gamma=1.4$):

M	P/P*	c/c*= ρ^*/ρ	T/T*	Po/Po*	F/F*	$\frac{4fL_{max}}{D}$
0.3	3.619	0.3257	1.178	2.035	1.698	5.299
1.00	1.000	1.000	1.000	1.000	1.000	1.000
1.20	0.804	1.158	0.932	1.030	1.011	0.0336

GUJARAT TECHNOLOGICAL UNIVERSITY
BE - SEMESTER-VIII • EXAMINATION – SUMMER 2013

Subject Code: 181906

Date: 09/05/2013

Subject Name: Gas Dynamics (DE-II)

Time: 10:30 am TO 01:00 pm

Total Marks: 70

Instructions:

1. Attempt all questions.
2. Make suitable assumptions wherever necessary.
3. Figures to the right indicate full marks.

- Q.1** (a) Explain the propagation of disturbances in compressible fluid with a neat sketch. 07
- (b) Prove that the mass flow parameter for an air as a perfect gas is given by 07
- $$\frac{\dot{m}_{max}\sqrt{T_0}}{AP_0} = 0.0404$$
- following expressions: during a steady one dimensional isentropic flow in variable area passage.

- Q.2** (a) Derive the following from one dimensional steady flow energy equation 07
- $$\frac{a^2}{\gamma - 1} + \frac{1}{2}C^2 = \frac{1}{2}C_{max}^2 = h_0$$
- (b) The pressure, temperature and Mach number at the entry of a flow passage are 2.5 bar, 28°C and 1.5 respectively. If the exit Mach number is 3, determine for adiabatic flow of a perfect gas ($\gamma = 1.3$, $R = 0.469$ kJ/kg-K): (i) Stagnation temperature 07
(ii) temperature and velocity of gas at exit, and (iii) the flow rate per square meter of the inlet cross-section.

OR

- (b) Air ($\gamma = 1.4$, $R = 287$ J/kg-K) enters a straight axisymmetric duct at 320 K, 3.8 bar and 180 m/s and leaves it at 280 K, 2.2 bar and 335.8 m/s. The area of cross-section at entry is 400 cm². Assuming adiabatic flow determine: (i) stagnation temperature (ii) maximum velocity (iii) mass flow rate, (iv) area of cross-section at exit. 07
- Q.3** (a) Explain the variation in area, pressure and velocity with variation in Mach number for nozzle and diffuser. 07
- (b) A conical diffuser has entry and exit diameters 15 cm and 30 cm respectively. The pressure, temperature and velocity of air at entry are 0.69 bar, 340 K and 180 m/s respectively. Determine: 07
(a) the exit pressure (b) the exit velocity (c) the force exerted on the diffuser walls.

Assume isentropic flow, $\gamma = 1.4$, $C_p = 1.00$ kJ/kg-K.

Use the following properties for Isentropic flow:

M	M*	T/T ₀	P/P ₀	A/A*	F/F*	A _p /A*P ₀
0.10	0.1094	0.998	0.993	5.822	4.624	5.781
0.107	0.1098	0.991	0.992	5.370	4.300	5.724
0.50	0.534	0.952	0.843	1.340	1.203	1.129

OR

- Q.3** (a) Starting from the energy equation for flow through a normal shock, obtain the Prandtl Mayer relation 07

$$M_x^* M_y^* = 1$$

- (b) Derive the equation of static pressure ratio across the normal shock, 07

$$\frac{P_y}{P_x} = \frac{2\gamma}{\gamma-1} M_x^2 - \frac{\gamma-1}{\gamma+1}$$

- Q.4 (a) Derive an equation describing a Fanno curve, show three Fanno curves on the temperature entropy co-ordinates at three mass flow densities. 07

- (b) The air with mach number 0.3, stagnation pressure 6 bar and stagnation temperature 350 K enters into a thermally insulated duct of constant diameter 10 cm. If the duct operates under choking condition, determine the length of duct, flow parameters at duct exit and mass flow rate. Take the mean friction co-efficient for the duct as 0.004. 07

Use the following properties for Fanno Flow Process:

M	P/P*	$\frac{c/c^*}{=\rho^*/\rho}$	T/T*	Po/Po*	F/F*	$\frac{4\bar{f}L_{max}}{D}$
0.3	3.619	0.3257	1.178	2.035	1.698	5.299
0.4	2.696	0.4310	1.163	1.590	1.375	2.308
1.00	1.000	1.000	1.000	1.000	1.000	1.000
1.20	0.804	1.158	0.932	1.030	1.011	0.0336

OR

- Q.4 (a) Prove that the Mach number at the maximum enthalpy and maximum entropy points on the Rayleigh line are $\frac{1}{\sqrt{\gamma}}$ and 1.0 respectively. 07

- (b) Derive the equation of maximum non-dimensional heat transfer rate in Rayleigh flow process. Also obtain the value of supersonic mach number for the same maximum heat transfer rate. 07

- Q.5 (a) Discuss the practical applications of wind tunnels. 07

- (b) Discuss the following terms with help of sketch: 07
 (a) Mach cone (b) Mach angle (c) zone of action (d) zone of silence

OR

- Q.5 (a) Show that the upper and lower branches of a Fanno curve represent subsonic and supersonic flows respectively. How would the state of a gas change from the supersonic to subsonic branch. 07

- (b) Write a short on reference velocities. 07
