

Title : Question Paper

FF No. 868

Reg. No.

Bansilal Ramnath Agarwal Charitable Trust's
VISHWAKARMA INSTITUTE OF TECHNOLOGY, PUNE - 411037.
(An Autonomous Institute Affiliated to Savitribai Phule Pune University)

Examination : Final Semester Examination (FSE)

Year: 2017-18

SEM: - I

Class :-S.Y. B.Tech.

Div: (D) Comp.; (S) & (U), Mech.

Engg.

Subject : Engineering and Managerial Economics Subject Code : HS251TH

Max. Marks : 35

Total Pages of Question Paper : 3

Day & Date : Monday, 18/12/2017

Time : 11:00 am - 12:00 noon(1h)

Instructions to the Candidates:

1. Answer any 5 (FIVE) Questions
2. Each question carries maximum marks as 7 (SEVEN)
3. Answer questions in answer sheet with clear indication of question and sub question etc. numbers.
4. For multiple choice questions (MCQ), write clearly selected option eg. a, b, c, d against MCQ question number eg. 1, 2, 3; like eg. 1 (a), 2 (b), 3 (c) etc.
5. Do not split the answers in the answer book.
6. Write your Class, Division, Roll Number, Date, and Subject clearly on answer book.

Q1. Explain Demand with its law, definition, types, factors, function, schedule, properties and typical examples and sketches for demand curves.

Q2. Explain each of 4 basic structures/types/categories of competitions in the market, their features, conditions, typical examples.

Q3. Explain Consumer's Equilibrium with concepts of utility approaches, equations, typical example and sketch for single commodity model.

Q4. Explain production function, factors, methods, assumptions, diminishing returns or variable proportions with stages and typical equations and sketches of curves.

Q5. Explain the cost concept, its types/groups and list important cost factors in each category with formulae, typical tabular form and curve sketches.

Q6. Explain law of diminishing marginal utility with definition, assumptions, importance, exceptions/limitations and typical example with sketch.

Q7. How production costs affect supply? Explain with sketches and examples, what other factors affect product cost and hence its supply trend.

Q8: The demand and supply for monthly cell phone plan with unlimited texts is represented by:

$$Q_d = 50 - 0.5P$$

$$Q_s = -25 + P$$

Where P is the monthly price in dollars.

Answer the following questions:

(A) If the current price for the contract is \$ 40 per month, is the market in equilibrium?

(B) Would you expect the price to rise, fall, or be unchanged?

(C) If so, by how much? Explain.

Q9/ Answer any 7 number of multiple choice questions (MCQ), each carries 1 mark:

1. If the demand for a good is inelastic, an increase in its price will cause the total expenditure of the consumers of the good to:

- (a) increase
- (b) decrease
- (c) remain the same
- (d) become zero

2. In which of the following market structure is the degree of control over the price of its product by a firm very large?

- (a) imperfect competition
- (b) perfect competition
- (c) monopoly
- (d) in 'a' and 'b' both

3. Unlike other forms of competition an oligopolist

- (a) does not need to take account of its costs.
- (b) must consider the actions of its competitors in pricing decisions.
- (c) will produce at price equal to average cost in the long run.
- (d) all of the above.

4. An improvement in technology affecting the manufacture of a particular good will

- (a) shift the supply curve to the left.
- (b) shift the supply curve to the right.
- (c) shift both the demand curve and the supply curve to the right.
- (d) shift both the demand curve and the supply curve to the left.

5. If the number of buyers in a market increases, this is likely to result in

- (a) a small increase in price if the increase in the number of buyers is small relative to the number of buyers already in the market.
- (b) a large increase in price if the new buyers have a high willingness to pay relative to buyers already in the market.
- (c) a fall in the price because the willingness to pay of the new buyers is lower.
- (d) none of the above.

6. The law of diminishing returns applies in.....

- (a) short run;
- (b) long run;
- (c) very short run;
- (d) all the time period

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Issue 01 : Rev No. 0 : Dt. 16/03/16

7. Suppose there is an increase in the equilibrium quantity of goods traded, but the equilibrium price remains the same. Which of the below best fits this description?

- (a) an increase in demand and no change in supply.
- (b) an increase in supply and a decrease in demand.
- (c) an increase in demand and an increase in supply.
- (d) an increase in supply and a decrease in demand.

8. In the short run, when the output of a firm increases, its average fixed cost:

- (a) remains constant
- (b) decreases
- (c) increases
- (d) first decreases and then rises

9. The cost of one thing in terms of the alternative given up is called:

- (a) real cost
- (b) production cost
- (c) physical cost
- (d) opportunity cost

10. If the price of a good changes but everything else influencing suppliers' planned sales remains constant, there is a

- (a) rotation of the initial supply curve around the initial price.
- (b) new supply curve that is to the right of the initial supply curve.
- (c) new supply curve that is to the left of the initial supply curve.
- (d) movement along the supply curve

Bansilal Ramnath Agarwal Charitable Trust's
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Examination : ESE

Year: SY BTech.

Branch : Mechanical

Subject : Material Science

Subject Code : ME203THL

Max. Marks : 100

Total Pages of Question Paper : 01 + 01

Day & Date : 15/12/2017

Time : 10:00 am – 01:00 pm

Instructions to Candidate

1. All questions are compulsory.
2. Neat diagrams must be drawn wherever necessary.
3. Figures to the right indicate full marks.
4. Use of nonprogrammable electronic pocket calculator, mollier charts, steam tables and statistical table are allowed.

Q. 1**[16] [A] Solve the following : (Any One)****08**

- a) What is wet corrosion ? What is Galvanic corrosion ? Explain how it is possible to form a simple electrochemical cell using Lemon, a penny and a galvanized nail.
- b) What is 'Creep' ? How is the creep curve plotted ? What is the influence of temperature and applied stress on creep characteristics ? What materials would you suggest for high temperature service conditions ?

[B]**Solve the following :****04**

- a) A cold drawn steel wire is formed into a nail by additional deformation, producing the point at one end and the head at the other. Where will the most severe corrosion of the nail occur ?
- .b) Examination of a failed crankshaft in a diesel engine reveals no plastic deformation. The fracture surface is smooth. In addition several other cracks appear at other locations in the crankshaft. What could be the reason of failure ?

Q. 2**[16] [A] Write in brief about the following : (Any Four)****4x4**

- a) Mechanism of Oxidation Corrosion
- b) Oxidation Corrosion of Gold
- c) Rusting of iron
- d) Cathodic protection method against corrosion
- e) Fatigue life and Fatigue strength

Q. 3**[16] [A] Material is to be selected for the items mentioned below. What properties do you expect the material to posses. Suggest suitable material and justify your suggestion. (Any Four)****4x4**

- a) Steam Pipe Lines
- b) Railway lines
- c) Springs
- d) Hammer Head
- e) Material to work with Liquid Nitrogen

4x4

Q. 4

[16] [A] Write in brief about the following : (Any Four)

- a) Meaning of Steel specified as X T 80 W18 Cr 4 V1 Mo 2
- b) Stainless Steels and their applications
- c) Cast iron types and their applications
- d) Copper and its Alloys
- e) Properties of Aluminum

Q.5

[18]

[A] Answer in Brief : (Any Two)

12

- a) Write the properties and areas of Application for :
 - i) PVC
 - ii) TEFLON
- b) What are composite materials ? What are their advantageous characteristics ? List a few Natural composite materials.
- c) What are ceramic materials. Write in brief the applications of following ceramic materials: Alumina, Silica and Silicon Carbide.

[B] What type of Polymer would you select for following applications:

06

- i) Surgeon's Glove
- ii) Beverage container
- iii) Pulley

Q.6

[18]

[A] Write short Notes on : (Any Three)

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- a) FRC Material and its applications
- b) Insulator Material properties
- c) Piezoelectric Materials and their applications
- d) Classification of Magnetic Materials
- e) Photonic Materials

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Examination: ESE

Year: S.Y.B.Tech.
 Subject: Manufacturing Processes
 Max. Marks: 100
 Day & Date: Saturday 16/12/2017

Branch: Mechanical
 Subject Code: ME205TH
 Total Pages of Question Paper: 02
 Time: 10:00 AM to 01:00 PM

Instructions to Candidate

1. All questions are compulsory.
2. Neat diagrams must be drawn wherever necessary.
3. Figures to the right indicate full marks.
4. Use of nonprogrammable electronic pocket calculator, Mollier charts, steam tables and statistical table are allowed.

Q.1**Attempt Following**

- a What are the basic parts of a lathe machine? Discuss Carriage assembly in detail 8
 (OR)

- a Draw block diagram of Lathe machine showing different parts of lathe. 8
 b Enlist different speed changing mechanisms used in lathe. Explain how variation 4
 in speed is achieved by back gear arrangement?
 c Enlist different work-holding devices. How three-jaw chuck is different from four 4
 jaw chuck?

Q.2**Attempt Following**

- a Explain in detail Construction of Radial Drilling Machine. 8
 (OR)

- a Explain principal parts of Milling machine. 8
 b Draw sketches of Following work holding devices:

1. Vice
2. Angle plate
3. V Block
4. T bolt and clamp

- c How the size of drilling machine is specified? Discuss. 4

Q.3**Attempt Following**

- a Explain Submerged arc welding process in detail. 8
 (OR)

- a Explain welding process in which non-consumable electrode along with inert gas 8
 is used for welding.

- b Suggest type of flame used for welding following materials with gas welding with 4
 justification

1. Oxygen free copper alloy
2. Non Ferrous Alloys

- c Explain effects of polarity in arc welding. 4

Q.4 Attempt Following

- a Discuss friction welding in detail. 8
- b Explain the functions of coatings used in coated electrodes. 4
- c How Nuts, bolts can be attached to other metal parts by projection welding? 4
- c Differentiate laser beam welding and electron beam welding. 4
- d Discuss different shielding gases used in MIG and TIG. 4

(OR)

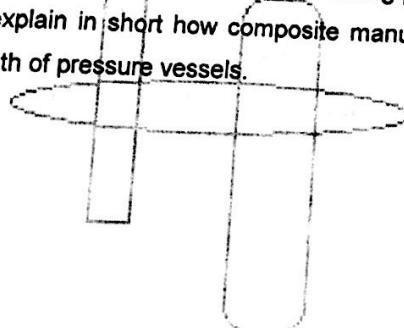
Q.5 Attempt Following

- a Explain in detail construction and working of plastic extruder. 8
- a Explain the process of manufacturing plastic components by injection molding. 8
- b Discuss manufacturing process used for ceramics component manufacturing 8

(OR)

Q.6 Attempt Following

- a Discuss steps in Hand lay-up manufacturing process for composites with neat sketch. 8
- a Explain Pultrusion process for manufacturing composite rods. 8
- b Draw sketches of different stages of thermoforming process. 4
- c Suggest and explain in short how composite manufacturing process is used to increase strength of pressure vessels. 4



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Examination: ESE

Year: S.Y. B. Tech.
 Subject: Applied Thermodynamics
 Max. Marks: 100
 Day & Date: 13/12/2017

Branch: Mechanical
 Subject Code: ME202THL
 Total Pages of Question Paper: 02
 Time: 10:00-13:00

Instructions to Candidates

1. All Questions are compulsory.
2. Neat diagrams must be drawn wherever necessary.
3. Figures to the right indicate full marks.
4. Use of non-programmable electronic pocket calculator, mollier charts, steam tables and statistical table are allowed.
5. Precise and to the point answers are expected.
6. Wherever required make suitable assumptions and clearly mention them.

Q I A. Define the following terms; 8

- i) Compressed liquid, ii) Saturated liquid, iii) Wet vapor iv) Dry saturated vapour,
 v) Superheated vapour, vi) Saturated line, vii) Fusion curve, viii) Vaporization curve,

OR

A. Show the following states and terms; 8
 i) Compressed liquid, ii) Saturated liquid, iii) Wet vapor iv) Dry saturated vapour,
 v) Superheated vapour, vi) Saturated line, vii) Fusion curve, viii) Vaporization curve, on p-T, p-v, T-s and h-s diagrams.

B. A rigid vessel of volume 0.86 m^3 contains 1 kg of steam at 2 bar pressure. Evaluate the specific volume, temperature, dryness fraction, internal energy, enthalpy, and entropy of steam. $h = 2600 \text{ kJ/kg}$ 6

C. What is triple point and critical point? What is the significance of these states in Thermodynamics? 6

Q II A. Why a throttling calorimeter fails to measure the quality if the steam is very wet? How is the quality measured then? Use appropriate state space diagrams in support of your answer. 8

OR

A. A mass of wet steam at temperature 165°C is expanded at constant quality 0.8 to pressure 3 bar. It is then heated at constant pressure to a degree of superheat of 66.5°C . Find the enthalpy and entropy changes during expansion and during heating. Draw the T-s and h-s diagrams. 8

B. Which one of the following statements is correct when saturation pressure of a vapour increases? Justify your answer.
 (a) Saturation temperature decreases, (b) Enthalpy of evaporation decreases
 (c) Enthalpy of evaporation increases, (d) All of the above 4

C. Which one of the following represents the condensation of a mixture of saturated liquid and saturated vapour on the enthalpy-entropy diagram? Justify your answer.
 (a) A horizontal line, (b) An inclined line of constant slope
 (c) A vertical line, (d) A curved line 4

- Q III** A. A steam plant operates with an initial pressure at 20 bar and temperature 400°C, and exhausts to a heating system at 2 bar. The condensate from the heating system is returned to the boiler plant at 65°C, and the heating system utilizes for its intended purpose 90% of the energy transferred from the steam it receives. The turbine efficiency is 70%. (a) What fraction of the energy supplied to the steam plant serves a useful purpose? 8

OR

- A. In the above case (Q III, A), If two separate steam plants had been set up to produce the same useful energy, one to generate heating steam at 2 bar, and the other to generate power through a cycle working between 20 bar, 400°C and 0.07 bar, what fraction of the energy supplied would have served a useful purpose? 8
- B. List the boiler mountings and accessories. Give the significance of any one from each category also mention the location of the same in actual power plant. 4
- C. Why the boilers operating at high pressure are economical? 4

201TLP

- Q IV** A. In a steam power plant operating on the Rankine cycle, steam enters the turbine at 40 bar, 350°C and exits at a pressure of 0.15bar. Then it enters the condenser and exits as saturated water. Then a pump feeds back this water to the boiler. The adiabatic efficiency of the turbine is measured as 90%. Determine; The net work output from cycle and heat supplied to the cycle. Show the cycle on T-s plane. 8

OR

- A. In the above case (Q IV, A), If the steam generation rate is 6000kg/hr and consumption of coal ($CV = 15MJ/kg$) is 1500kg/hr then estimate the Equivalent evaporation, Factor of evaporation, Boiler efficiency and Thermal efficiency of the plant. Show the power generation cycle on p-v and h-s planes. 8
- B. Why Carnot cycle is not a practicable vapor power cycle? 4
- C. In a Rankine cycle, with the maximum steam temperature being fixed from metallurgical considerations, as the boiler pressure increases, The;
 (a) Condenser load will increase, (b) Quality of turbine exhaust will decrease
 (c) Quality of turbine exhaust will increase; (d) Quality of turbine exhaust will remain unchanged. Justify your answer. 4

- Q V** A. Derive an expression for indicated work of a reciprocating air compressor by neglecting clearance volume and assuming polytropic compression process. 8

OR

- A. A single cylinder reciprocating compressor has a bore of 120mm and a stroke of 150mm and is driven at a speed of 1200 rpm. It is compressing air from a pressure of 120KPa and a temperature of 20°C to a temperature of 215°C. Assuming polytrophic compression ($n = 1.3$), no clearance and volumetric efficiency to be 100%. Calculate; i) Pressure ratio, ii) Indicated power, iii) Mass flow rate, and iv) Shaft power with a mechanical efficiency of 80%. 8
- B. Why Isothermal compression is desired? How attempts are made to have actual compression process in a compressor close to that of Isothermal? 4
- C. Why clearance volume is provided in reciprocating air compressors? What are its consequences on the compressor performance? 4

- Q VI** A. Prove that the use of intermediate pressure for minimum work, results in equal pressure ratios in the two-stages of compression, equal discharge temperatures, and equal work for two stages 8

OR

- A. A single acting two stage reciprocating air compressors with complete inter-cooling delivers 10.5 kg/min of air at 1bar and 27°C. The compression and expansion follows the law $p v^{1.3} = \text{constant}$. Calculate;
 i) Power required to drive the compressor, ii) Isothermal efficiency, and iii) FAD 8
- B. List the factors influencing the Volumetric efficiency of the reciprocating air compressor and give the expression amongst them. 4
- C. Why multistage compression is preferred over single stage compression? 4

Title : Question Paper

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Examination

Year: S.Y.

Subject : Kinematics and Mechanism

Maximum Marks: 100

Day & Date: 12/12/2017

: ESE

Branch : Mechanical

Code: ME201TLP / ME20103 / ME201TLP

Total Pages of Question Paper : 3

Time: 10 – 1 pm (3hrs)

Instructions to Candidate

1. All questions are compulsory. 2. Neat diagrams must be drawn wherever necessary. 3. Figures to the right indicate full marks. 4. Assume suitable data if necessary 5. Use of nonprogrammable electronic pocket calculator, mollier charts, steam tables and statistical table are allowed.

Q1 Attempt the following

- a) Derive the expressions for (i) Tangential Acceleration ii) Centripetal Acceleration, when motion of particle is along the circular path. (8)

OR

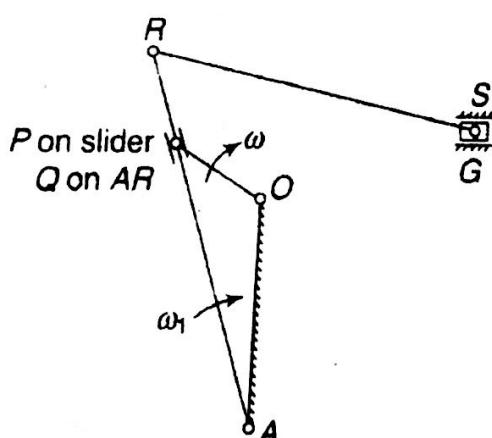
- a) What is velocity and acceleration image? How is it helpful in determining the velocity and acceleration of offset points on a link? (8)

- b) What is the Coriolis acceleration component? In which cases does it occur? (4)

- c) How magnitude and direction of Coriolis acceleration component is determined? (4)

Q2 Attempt the following

In a crank and slotted-lever quick-return mechanism the distance between the fixed centres O and A is 250 mm. Other lengths are: OP = 100 mm, AR = 400 mm, RS = 150 mm and angle AOP = 120°. Uniform speed of the crank is 60 rpm clockwise. Line of stroke of the ram is perpendicular to OA and is 450 mm above A.



- a) Calculate the velocity and the acceleration of the ram S. (8)

OR

- a) Velocity and Acceleration of link RS (8)

- b) Acceleration of link AR (6)

- c) Cutting angle and stroke length (4)

Q3 Attempt the following

- a) In an I.C. engine mechanism, the crank makes 45° with the line of centers and rotates at 240 rpm in clockwise direction. The length of the crank is 200 mm and length of the connecting rod is 800 mm. Use Klein's construction methods and determine the linear acceleration of piston, linear acceleration of the midpoint of the connecting rod and angular acceleration of the connecting rod. (8)

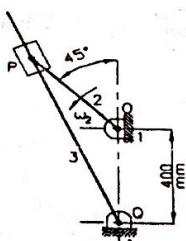
OR

- a) In an I.C. engine mechanism, the crank radius is 100 mm and the length of the connecting rod is 450 mm. The crank is rotating counter-clockwise at an angular velocity of 10 rad / sec. using vector algebra method; determine the velocity of the piston and the angular velocity of the connecting rod when the crank is at 45° from the inner dead centre. (8)
- b) Derive the equation for finding velocity and acceleration of slider in case of a slider crank mechanism. (4)
- c) Derive the equation for finding velocity and acceleration of connecting rod in case of a slider crank mechanism. (4)

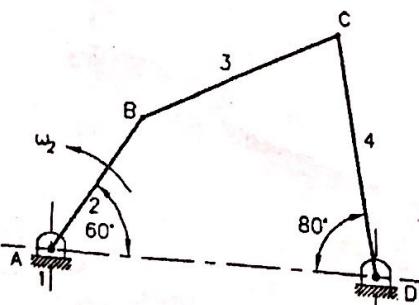
Q4 Attempt the following

- a) In an I.C. engine mechanism, the crank is 200 mm long and connecting rod is 800 mm long. Find by using Analytical method, the velocity and acceleration of piston and angular velocity and angular acceleration of connecting rod when the crank is turned through 60° from the inner dead centre. The angular velocity of the crank is 20 rad / sec and is increasing at the rate of 10 rad / sec every second. (8)

- a) What is the significance of the "loop-closure" equation in kinematics? Explain the complex number method of acceleration analysis of slider P in the following mechanism (8)



- b) The four-bar mechanism ABCD is shown in the Figure which is driven by link 2 at $\omega_2 = 10.5 \text{ rad/s}$, counter-clockwise. AB = 50 mm, CD = 56 mm, AD = 100 mm. Find the angular position of links 3 and 4. (Use Complex Algebra method) (4)



- c) Find the angular velocities of links 3 and 4 in above four bar mechanism (Use Complex algebra method) (4)

rotates
th of

Q5 Attempt the following

- a) The connecting rod has mass of 3kg for 50 oscillations, it needs 40 seconds when suspended from small end and 35 seconds when suspended from big end. The distance between the points of suspension is 200 mm. Find the moment of inertia of the connecting rod and the position of its C.G from the small end. (8)

OR

- a) The connecting rod of a gasoline engine is 300 mm long between its centres. It has a mass of 15 kg and mass moment of inertia of 7000 kg-mm². Its centre of gravity is at 200 mm from its small end centre. Determine the dynamical equivalent two-mass system of the connecting rod if one of the masses is located at the small end centre. (8)
- b) The crank and connecting rod of a vertical petrol engine, running at 1800 rpm are 60 mm and 270 mm respectively. The diameter of the piston is 100 mm and the mass of the reciprocating parts is 1.2 Kg. During the expansion stroke when the crank has turned 20° from the top dead centre, the gas pressure is 650 kN / m². The speed at which the gudgeon pin load is reversed in direction. Determine net force on the piston. (4)
- c) Determine net force net load on the gudgeon pin and thrust on the cylinder walls above problem (4)

Q6 Attempt the following

- a) Explain the graphical method of inertia force analysis of a horizontal reciprocating engine by drawing neat sketches. Discuss various steps clearly. (8)

OR

- a) Derive the expression for natural frequency in case tri-filler suspension experiments. (8)
- b) A single cylinder horizontal steam engine has a stroke of 0.75 m and a connecting rod 1.8 m long. The mass of reciprocating parts is 520 kg and that of the connecting rod is 230 kg. Centre of gravity of the connecting rod is 0.8 m from the crank pin and the moment of inertia about an axis through the center of gravity perpendicular to the plane of the motion is 100 kgm². For an engine speed of 90 rpm and a crank position of 45° from inner dead centre, determine the Force on the crankshaft due to the inertia of these parts. (6)
- c) Determine the torque on the crankshaft in above problem (4)

$$\omega = \frac{2\pi}{T}$$

(3)

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 (An Autonomous Institute Affiliated to Savitribai Phule Pune University)
 Examination : MSE

Year: S.Y.B.Tech.

Subject : Kinematics and Mechanisms

Max. Marks : 100

Day & Date : 3/10/2017

Branch : Mechanical

Subject Code : ME 201PPL TLP

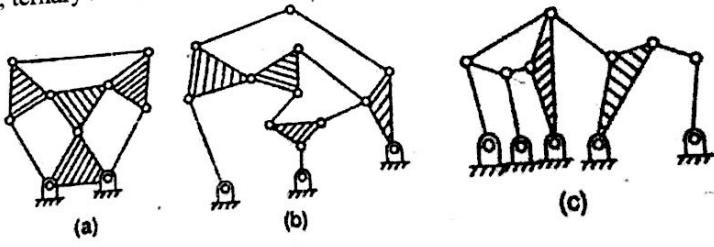
Total Pages of Question Paper : 03

Time : 3 hrs 10.00 a.m.

No. of pages - 3

Instructions to Candidate

1. All questions are compulsory.
2. Neat diagrams must be drawn wherever necessary.
3. Figures to the right indicate full marks.
4. Use of nonprogrammable electronic pocket calculator are allowed.
5. Assume suitable data wherever necessary.

| | | |
|-----|---|---|
| Q.1 | Solve the following questions | |
| | a) What do you mean by kinematic pair ? How do you classify them ? | 8 |
| | OR | |
| | a) What is Kutzback's criterion for degree of freedom of planer mechanisms? | 8 |
| | b) Draw and explain first inversion of double slider crank chain | 4 |
| | c) Define and explain the terms: binary joints, ternary joints, quaternary joints. | 6 |
| Q.2 | Solve the following questions | |
| | a) What do you mean by constrained motion? What are the different types of constrained motions? Explain each type with examples and neat sketches | 8 |
| | OR | |
| | a) For the kinematic linkages shown in Fig 1, find the number of binary links (Nb), ternary links and degree of freedom (F). | 8 |
| |  | |
| | Figure 1 | |
| | b) What is link ? Which are the different types. | 4 |
| | c) Draw and explain first inversion of single slider crank chain | 6 |
| Q.3 | Solve the following questions | |
| | a) Draw any one of exact straight line mechanism with minimum five locus points. | 8 |
| | OR | |
| | a) Explain Ackerman steering gear mechanism | 8 |
| | b) What do you mean by rubbing velocity in turning pairs | 4 |
| | c) What is transmission angle | 4 |
| Q.4 | Solve the following questions | |
| | | |

- a) Two shafts A and B are connected by a Hooke's coupling and have their axes inclined at 15 degrees. If the shaft A rotates at a uniform speed of 1200 rpm, find the maximum acceleration of shaft B and the angular positions of the shaft A at these instants ? 8

OR

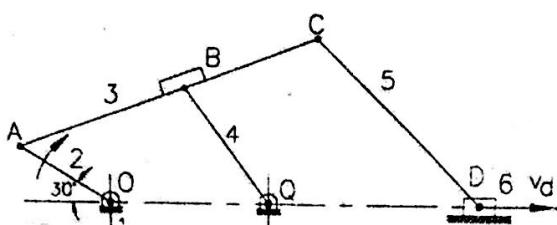
- a) Derive equation for angular velocity ratio between input and output shaft in Hooke's joint. 8

b) What is mechanical advantage 4

c) What do you mean by friction circle. 4

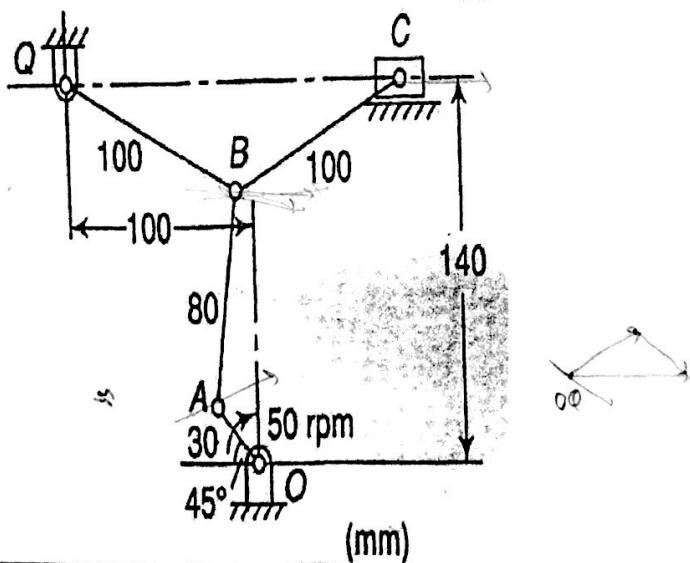
Q.5 Solve the following questions

- a) For the configuration shown in the following figure, enumerate and locate all the instantaneous centers of velocities and hence find the rpm of the link OA, if the velocity of slider "D" is 10 m / sec. OQ = 225 mm, QB = 200 mm, AB = 250 mm, OA = 150 mm, AC = 450 mm, CD = 325 mm. (Use instantaneous center method) 8



OR

- a) A toggle mechanism is shown in Fig. along with the dimensions of the links in mm. Find the velocities of the points B and C and the angular velocities of links AB, BQ and BC. The crank rotates at 50 rpm in the clockwise direction. 8



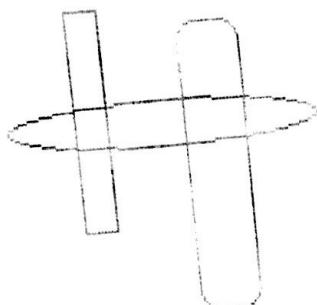
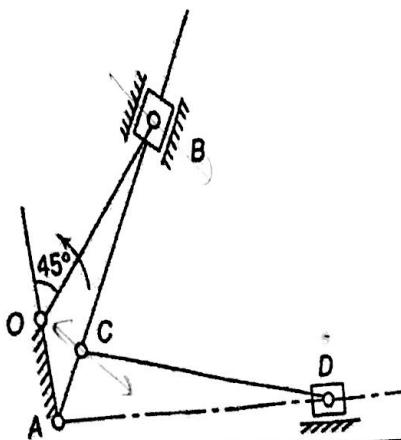
- b) What is Kennedy theorem. 4

- c) What are the properties of ICR. 4

Q.6 Solve the following questions

- a) A four-bar chain is represented by a quadrilateral ABCD in which AD is fixed and is 200 cm long. The crank AB 6.25 cm long rotates in a clockwise direction at 95.5 r.p.m. and drives the link CD 11.25 cm long by means of the connecting link BC 17.5 cm long. Draw the velocity when angle BAD = 60° and B and C lie on the same side of AD. Determine the 8

| | | |
|----|---|---|
| | angular velocity links BC and C.D. | |
| | OR | |
| a) | In the mechanism as shown In Fig. 0 and A are fixed. CD=200 mm, OA=60 mm, AC=50 mm and OB(crank)=150 mm, angle OAD=90°. Determine the velocity of the slider for counter-clockwise rotation of OB at 100 rpm. | 8 |
| b) | Describe angular velocity theorem | 4 |
| c) | Write down the advantages of velocity polygon method. | 4 |



3/1

Vishwakarma Institute of Technology
Title : Question Paper

Issue 01 : Rev No. 0 : Dt. 16/03/16

FF No. 868

Reg. No. _____

Bansilal Ramnath Agarwal Charitable Trust's
VISHWAKARMA INSTITUTE OF TECHNOLOGY, PUNE - 411037.
 (An Autonomous Institute Affiliated to Savitribai Phule Pune University)

Year: S.Y.B.Tech.

Examination : MSE

Subject : Manufacturing Processes

Branch : Mechanical

Max. Marks : 100

Subject Code : ME205TH

Day & Date : 7/10/17

Total Pages of Question Paper : 03

Time : 3 hrs 10.00 AM

Year:
 Subject
 Max. M
 Day & I

1. All
2. Neat
3. Figu
4. Use
5. Prec
6. Wh

Q I

Q.1

Attempt Following

- a Define casting terms and sketch cross section of sand mould which is ready for pouring. 8

(OR)

- b Explain steps involved in sand casting along with sketches. 8
 b Briefly explain the application of chaplets. And what are the essential conditions that are to be kept in mind while designing riser? 4
 c Justify the shape of sprue and why pouring basin is necessary? 4

Q II

Q.2

Attempt Following

- a Explain following casting defects and its typical causes with neat sketch- 8
 1. Misrun 2. Shrinkage cavity 3. Pinholes 4. Mould Shift

(OR)

- a Explain casting process which is used for manufacturing Large hollow metal pipes. 8
 b Distinguish between liquid and solid shrinkage as related to castings. Explain how these are taken care of in designing sand castings. 4
 c Discuss the materials that are generally used for preparing patterns. 4

Q III

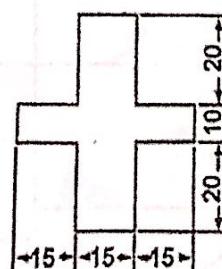
Q.3

Attempt Following

- a Explain different stages in drop forging process in production of a spanner. 8

(OR)

- a Briefly describe Open die and Closed die forging. 8
 b Consider single row single pass sheet metal layout for component shown in figure below. Assume front scrap = back scrap = scrap bridge = 2 mm. Calculate % utilization of sheet. 4



C60 Steel
3 mm thick

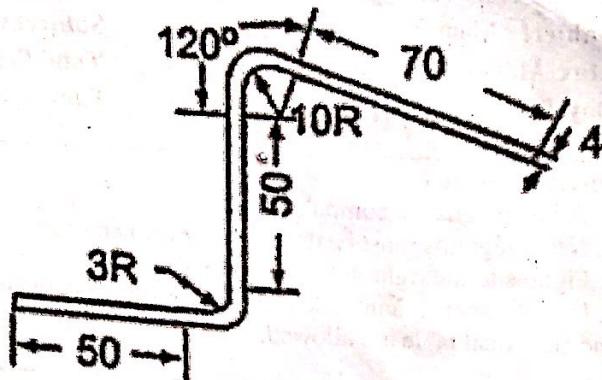
- c Describe wire drawing operation with a neat sketch. 4

Q.4 Attempt Following

- a Explain different types of rolling mill arrangements along with sketches.
- b Explain Hydrostatic Extrusion process with neat sketch.
- c Compare Hot working & Cold working Process.

(OR)

- c Explain operation of Progressive Die.
- d Calculate the length of sheet required to obtain the bend shown in figure 4 below.(All given dimensions are in mm)



Q.5

Attempt Following

- a What is indexing? Explain in detail compound indexing and find out index crank movement for cutting 12 teeth on a spur gear blank with direct indexing.

(OR)

- a Explain with schematic diagram the principle of thread cutting on a lathe. Note down relation between ratio of change gears to the work pitch and lead screw pitch. It is required to cut a screw having 7 mm pitch on a lathe having leadscrew of 4 threads per inch. Calculate change gears.

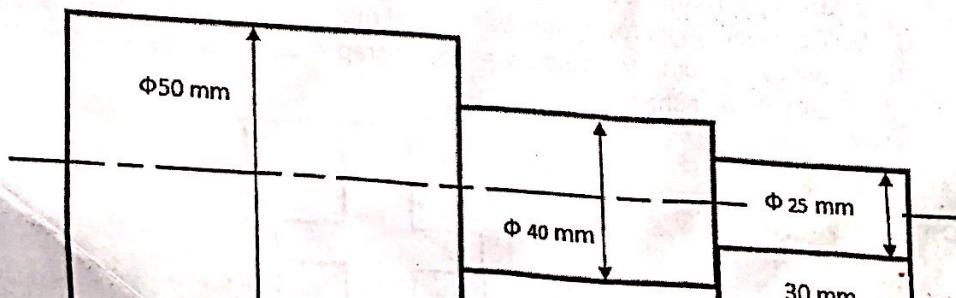
- b Give the details of super finishing processes
- c Draw sketches of following operations performed

1. Straddle Milling
2. Gang Milling
3. Form Milling
4. Angular Milling

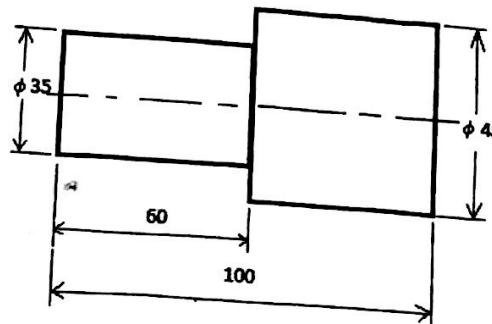
Q.6

Attempt Following

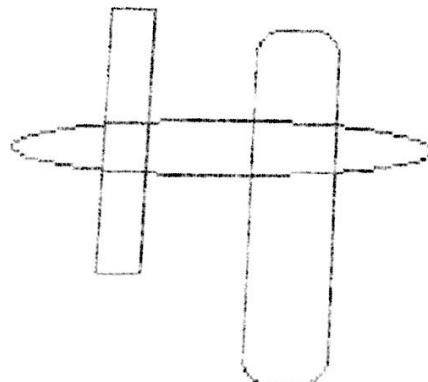
- a A component is shown to be machined from a stock of C40 steel, 50mm in diameter and 150mm long. Calculate the machining time required for completing the part. Assume Cutting speed of 40m/min, feed rate of 0.8 mm/rev and depth of cut of 3mm.



- a A component is shown to be machined from a stock of C40 steel, 60mm in diameter and 100 mm long. Calculate the machining time required for completing the part. Assume Cutting speed of 40 m/min, feed rate of 0.25 mm/rev and depth of cut of 2 mm.



- b Enlist methods used for taper turning. 4
- A shaft 1200 mm long has a taper of 1:200 for a length of 600 mm. The maximum diameter of shaft is 75 mm. Determine the minimum diameter of the shaft and the amount of setover.
- c Draw sketches of following operations performed 4
1. Reaming
 2. Counter Boring
 3. Trepanning
 4. Tapping



Reg.No. _____

Bansilal Ramnath Agarwal Charitable Trust's
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| | | | |
|-------------|-------------------------------|--------------------------------|-------------------------------|
| Year: | | Examination: | MSE |
| Subject: | S.Y. B.Tech. | Branch: | |
| Max. Marks: | Applied Thermodynamics 100 | Subject Code: | Mechanical ME202THL |
| Day & Date: | 4 Oct, 2017 | Total Pages of Question Paper: | 03 Time: 10.00 AM 3 hrs |

- Instructions to Candidates**
1. All Questions are compulsory.
 2. Neat diagrams must be drawn wherever necessary.
 3. Figures to the right indicate full marks.
 4. Use of non-programmable electronic pocket calculator, mollier charts, steam tables and statistical table are allowed.
 5. Precise and to the point answers are expected.
 6. Wherever required make suitable assumptions and clearly mention them.

Q I A. Define the following terms used in Thermodynamics preferably in single line; 8
 (i) System (ii) Surrounding, (iii) Boundary, (iv) State Space, (v) Process, (vi) Cycle, (vii) Temperature, and (viii) Heat

OR

- A. Differentiate between intensive and extensive property. Which of the following are intensive properties? 1. Kinetic Energy 2. Specific Enthalpy 3. Pressure 4. Entropy 8
 B. What is thermometry? List various temperature measurement methods. 4
 C. What are the limitations of Zeroth and First law of Thermodynamics? 5

Q II A. Give operational definition of Thermodynamic State of System and work 8
OR

- A. List the differences and similarities in the following used in Thermodynamics; 8
 (i) Point and Path functions, (ii) Microscopic and Macroscopic point of view
 B. Obtain from first principle most generalized S.F.E.E. for open system. 4
 C. Show that adiabatic work interaction in a fixed mass system is a point function. 5

Q III A. Show that the efficiency of all reversible engines between the same Temperature reservoirs is same. 8

OR

- A. Show that the violation of Clausius inequality leads to the violation of Kelvin Planck Statement of the Second Law. 8

C. Consider the following statements: In an irreversible process 1. Entropy always increases. 2. The sum of the entropy of all the bodies taking part in a process always increases. 3. Once created, entropy cannot be destroyed. Of these statements (a) 1 and 2 are correct (b) 1 and 3 are correct (c) 2 and 3 are correct (d) 1, 2 and 3 are correct. Why? 4

C. Is a process that is reversible and adiabatic necessarily isentropic? Explain. 5

Q IV A. A household refrigerator maintains a space at a temperature of 0°C. Every time the door is opened, warm material is placed inside, introducing an average 400 kJ of heat, but making only a small change in temperature of the refrigerator. The door is opened 25 times a day and the refrigerator operates at 25% of ideal COP. The cost of work is Rs.3.50 per kWh. What is the monthly bill of this refrigerator? The atmospheric temperature is at 30°C. 8

OR

(1)

- A. Two Carnot engines A and B are connected in series between two thermal reservoirs maintained at 1000 K and 100 K respectively. Engine A receives 1680 kJ of heat from the high-temperature reservoir and rejects heat to the Carnot engine B. Engine B takes in heat rejected by engine A and rejects heat to the low-temperature reservoir. If engines A and B have equal thermal efficiencies, determine;

- The heat rejected by engine B
- The temperature at which heat is rejected by engine A
- The work done during the process by engines A and B respectively.
- If engines A and B deliver equal work, determine
- The amount of heat taken in by engine B
- The efficiencies of engines A and B

- B. A heat engine is supplied with 250 KJ/s of heat at a constant fixed temperature of 227°C. The heat is rejected at 27°C. The cycle is reversible, if the amount of heat rejected is (a) 273 KJ/s (b) 200 KJ/s (c) 180 KJ/s (d) 150 KJ/s.

- Choose correct option from the above and Justify your answer.
- C. In which one of the following situations the entropy change will be negative (a) Air expands isothermally from 6 bars to 3 bars (b) Air is compressed to half the volume at constant pressure (c) Heat is supplied to air at constant volume till the pressure becomes three folds (d) Air expands isentropically from 6 bars to 3 bars.

- Choose correct option from the above and Justify your answer.

- Q V ✓ Obtain an expression for the below mentioned entities in a reversible Isochoric process between the states 1 and 2; (i) p-v-T relation, (ii) Change in thermal energy, (iii) Work interaction, (iv) Heat interaction, (v) Change in enthalpy, and (vi) Change in entropy. Also sketch the process on p-v and T-s plot.

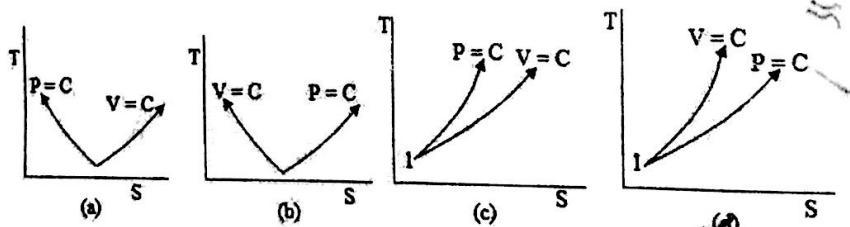
OR

- A. An ideal gas at temperature T_1 is heated at constant pressure to T_2 and then expanded reversibly, according to the law $pV^n = \text{constant}$, until the temperature is once again T_1 . Obtain by derivation the required value of n if the changes of entropy during the separate processes are equal?

- B. A 100W electric bulb was switched on in a 2.5mx3mx3m size thermally insulated room having a temperature of 20°C. The room temperature at the end of 24 hours will be? How?

- (a) 321°C (b) 341°C (c) 450°C (d) 470°C

- C. An ideal gas is heated (i) at constant volume and (ii) at constant pressure from the initial state 1. Which one of the following diagrams shows the two processes correctly? Why?



- Q VI A. A mass of an ideal gas exists initially at a pressure of 200kPa, temperature 300 K and specific volume $0.5\text{m}^3/\text{kg}$. The value of γ is 1.4. Determine; (a) Specific heats 100kPa according to the law $pV^{1.3} = \text{constant}$? (b) What will be the entropy change if the path is $pV^{1.5} = \text{constant}$? (c) What will be the entropy change process? (d) What is the inference you can draw from this example?

OR

- A. Two vessels, A and B, each of volume 3m^3 may be connected together by a tube of negligible volume. Vessel A contains air at 7bar, 95°C while B contains air at 3.5bar, 205°C. Find the change of entropy when A is connected to B. Assume the mixing to be complete and adiabatic.

4

5

8

8

4 X

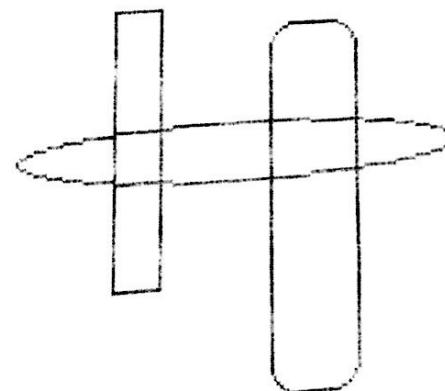
4

8 X

8

- B. Which one of the following statements is correct? Justify. 4
- (a) Compressibility factor is unity for ideal gases
 - (b) Compressibility factor is zero for ideal gases
 - (c) Compressibility factor is lesser than unity for ideal gases
 - (d) Compressibility factor is more than unity for ideal gases
- C. Which of the following statement about Van der Waal's equation is valid? Why? 4
- (a) It is valid for all pressure and temperatures
 - (b) It represents a straight line on pV versus v plot
 - (c) It has three roots of identical value at the critical point
 - (d) The equation is valid for diatomic gases only.

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Examination : MID SEMESTER EXAMINATION

Year: SY Btech.

Subject : Material Science

Branch : Mechanical

Max. Marks : 100

Subject Code : ME 203 THL

Day & Date : 6/10/17

Total Pages of Question Paper : 01 to 1

Time : 3 HRS. 10:30 am

Instructions to Candidate

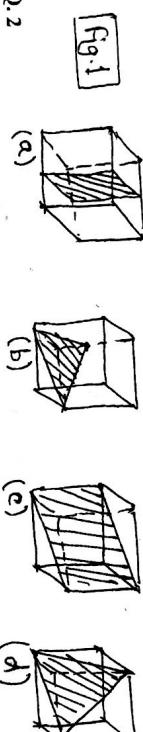
1. All questions are compulsory.
2. Neat diagrams must be drawn wherever necessary.
3. Figures to the right indicate full marks.
4. Use of nonprogrammable electronic pocket calculator, mollier charts, steam tables and statistical table are allowed.

Q.1
[16]**[A] Solve the following : (Any One)**16
08

- a) What is 'space lattice'? How is this concept used to define crystal structures?
b) Define the term 'Slip System'. What is its significance as regards to plastic deformation? Why FCC metals show good response to plastic deformation?

[B] Write the miller Indices for the shaded planes shown in Fig.1

08

**Q.2**
[16]**[A] Solve the following : (Any One)**16
08

- a) Define the term 'Critical Resolved Shear stress'. Derive Schmid's Law.
b) Define the terms : Burger's circuit and Burger's vector. How are they used to understand dislocations?

[B] Solve the following : (Any Two)

08

- a) Show the packing of atoms in a BCC structure. Calculate its packing factor.
b) Find the direction [1 2 0] in a cubic cell.
c) Mark the plane with Miller indices (1 1 0) in a unit cell.

Q.3
[16]**[A] Solve the following : (Any One)**

08

- a) What is Engineering stress strain diagram? What information do you get from it? Draw a Stress - strain diagram for a ductile material and show how yield point is located on it.
b) How is the term Hardness defined? How will you measure hardness of the guideways on a machine bed?

[B] Solve the following : (Any Two)

08

- a) What is the method of detecting a surface crack on shaft made from aluminum?
 b) What is Toughness ? Mention any application where this property of material is desired.
 c) Define the terms : 1) BHN 2) VPN 3) 64HRC 4) NDT

Q.4 [18]

[A] Solve the following : (Any Two)

- a) What is Impact strength ? What is the principle Charpy Impact Test ?
 b) A cylindrical test sample of diameter 12.8 mm is tested in tension up to fracture and found to have engineering fracture strength 450 MPa. If the diameter at the fracture is 10.7 mm, determine :

1. Ductility in terms of % reduction in area
2. True stress at fracture
3. True strain at fracture

A 10 mm diameter Brinell ball produced an indentation of diameter 1.62

mm in a steel alloy when a load of 500 kg is used. Compute BHN.

[B] A round specimen of wrought iron of diameter 12.5 mm and gauge length 100 mm was tested in tension up to fracture. Following observations were obtained : 1) Load up to yield point = 30 KN 2) Max. load = 45 KN

- 3) Load at fracture = 37 kN 4) Diameter at Neck = 10 mm 5) Total extension in specimen = 20.5 mm. From the data, calculate yield strength, ultimate tensile strength, % elongation and actual breaking stress.

Q.5

[A] Answer in Brief : (Any Two)

The Binary phase diagram is shown in (Fig. 2), Mark the various phase fields. Give all the invariant reactions that occur, stating their names.

- b) Define the term 'Liquidus' on a binary phase diagram. Is there any point on a Pb-Sn phase diagram where degrees of freedom are zero ?
 c) Explain the cooling process for the composition shown in Fig. 3, starting from point 1. *of Pb-Sn diagram & answer correctly*

12

[B]

- Answer in Brief : (Any Four)
- The Binary phase diagram is shown in (Fig. 2), Mark the various phase fields. Give all the invariant reactions that occur, stating their names.
- b) Define the term 'Liquidus' on a binary phase diagram. Is there any point on a Pb-Sn phase diagram where degrees of freedom are zero ?
 c) Explain the cooling process for the composition shown in Fig. 3, starting from point 1. *of Pb-Sn diagram & answer correctly*

[B] Write short Notes on : (Any Four)

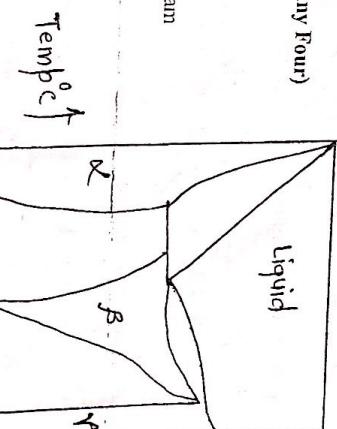
06

Q.6 [16]

[B] Write short Notes on : (Any Four)

06

- a) Gibb's Phase rule
 b) Application of Lever Rule
 c) Invariant Reactions
 d) Application of phase diagram
 e) Eutectic Alloy



16