

Total No. of Questions : 8]

SEAT No. :

**P4596**

[Total No. of Pages : 3

**[4957] - 1017**

**S.E. (Mechanical/Automobile)**

**ENGINEERING METALLURGY**

**(2012 Pattern) (Semester - II)**

*Time : 2 Hours]*

*[Max. Marks :50*

*Instructions to the candidates:*

- 1) *Solve Question no 1 or 2, Question no 3 or 4, Question no 5 or 6, Question no 7 or 8.*
- 2) *Figures to the right indicate full marks.*
- 3) *Draw neat, well labelled sketch wherever necessary.*

- Q1)** a) Draw a neat, well labelled schematic eutectic system phase diagram. **[4]**
- b) Give only one major effect of the following elements on metallurgical properties of iron: Carbon, Aluminium, Tungsten and Nickel. **[4]**
- c) Explain any 5 of the following terms : **[5]**
- i) Dendrite
  - ii) Pearlite
  - iii) Impurity
  - iv) Solid solution
  - v) Coring
  - vi) Flow lines in forged components
  - vii) Microscopy
  - viii) Cementite

OR

- Q2)** a) Explain how etching reveals the microstructure of a metallographic specimen which is polished to mirror finish? **[4]**
- b) What is 'tie line'? During interpretation of phase diagrams, what information do we obtain by using lever rule? **[4]**
- c) Specify giving values of temperature, the critical temperatures in Iron-Iron Carbide equilibrium diagram. Explain the changes that occur at these critical temperatures. **[5]**

**P.T.O.**

- Q3)** a) Differentiate between annealing and Normalising on the basis of cooling rate, microstructure, grain size and strength. [4]
- b) Draw a schematic diagram showing continuous cooling curve for Annealing, Martempering and hardening superimposed on TTT diagram. [4]
- c) Explain how inhibitors help in prevention of corrosion. What are its types? [4]

OR

- Q4)** a) Differentiate between Nitriding and carburising. [4]
- b) Explain any one corrosion prevention method. [4]
- c) What is inter-granular corrosion? [4]

- Q5)** a) What is the effect of graphite flakes in cast iron on properties of grey cast iron? [4]
- b) What is 'malleabilising' heat treatment? To which type of cast iron is it given? [4]
- c) Write short note on Nodular cast iron. [5]

OR

- Q6)** a) Why is Grey cast iron found commonly in columns but not in structural beams? [4]
- b) Can the graphite structure in grey cast iron be substantially changed by heat treatment? Explain. [4]
- c) What is meant by 'inoculation' in context of cast irons? Why is it done? [5]

- Q7)** a) What is cartridge brass? Is it single phase or dual phase? Comment on its ductility and corrosion resistance. [4]
- b) What is precipitation hardening of Aluminium alloys? [4]
- c) Write a short note on bearing materials. [4]

OR

- Q8)** a) Explain why 1% tin is added in Admiralty brass? [4]
- b) Explain the meaning of the word 'Temper' in case of Aluminium alloys. [4]
- c) Following are some of the properties that can be considered good in case of Aluminium or its alloys : [4]
- i) Malleability.
  - ii) Strength to weight ratio.
- Suggest an application each, which makes the best use of above properties.



Total No. of Questions : 8]

SEAT No. :

**P4597**

[Total No. of Pages : 2

**[4957] - 1031**

**S.E. (Electrical)**

**POWER GENERATION TECHNOLOGY**

**(2012 Pattern)**

*Time : 2 Hours]*

*[Max. Marks : 50*

*Instructions to the candidates :-*

- 1) Neat diagrams must be drawn wherever necessary.*
- 2) Figures to the right indicate full marks.*
- 3) Your answers will be valued as a whole.*
- 4) Use of logarithmic table slide rule, Mollier charts, electronic pocket calculator and steam table is allowed.*
- 5) Assume suitable data, if necessary.*

- Q1)** a) Explain the importance of feed water in thermal power plants. Describe it's treatment. **[6]**
- b) With the help of neat diagram explain combined cycle Power Plant.**[6]**

OR

- Q2)** a) Differentiate between outdoor and indoor storage in fuel handling system in thermal Power Plant. **[6]**
- b) Describe the procedure for nuclear waste disposal in nuclear Power Plant. **[6]**

- Q3)** a) Explain the site selection of hydro Power Plant. **[6]**
- b) Explain the types of wind turbine electrical generators. **[7]**

OR

- Q4)** a) With neat diagram, explain pelton wheel turbine used in hydro Power Plant. **[7]**
- b) What are the environmental impacts of wind turbines. **[6]**

**P.T.O.**

- Q5)** a) Explain the terms: [6]  
i) Solar constant  
ii) Concentration ratio  
b) With the help of diagram, describe the PV I-V curve under standard test conditions. [7]

OR

- Q6)** a) Describe the types of solar collector and compare them. [8]  
b) Explain a photovoltaic generic cell. [5]
- Q7)** a) Explain how biomass energy can be converted to electricity. [8]  
b) Explain micro hydel plant. [4]

OR

- Q8)** a) What are the requirements of grid connected renewable system? [6]  
b) Write a short note on ocean energy. [6]



Total No. of Questions : 12]

SEAT No. :

**P4588**

[Total No. of Pages : 4

[4957] - 112

**S.E. (Mechanical / Mechanical S/W)**

**METALLURGY**

**(2008 Pattern) (Semester - I)**

*Time : 3 Hours]*

*[Max. Marks :100*

*Instructions to the candidates:*

- 1) *Answer any three questions from each section.*
- 2) *Answers to the two sections should be written in separate answer books.*
- 3) *Figures to the right indicate full marks.*
- 4) *Draw the neat sketch whenever necessary.*

**SECTION - I**

- Q1)** a) Explain the recrystallization and Polygonisation. [4]
- b) Explain phenomenon of strain hardening on the basis of theory of dislocation. [4]
- c) Represent the following planes and directions in cubic system (Any Two) [4]
- i) (111)
  - ii) (101)
  - iii) (221)
- d) What is the role of dislocation in the plastic deformation of metal? [4]

OR

- Q2)** a) Differentiate between the following (Any one) [4]
- i) Slip and Twinning
  - ii) hot and cold working.
- b) Derive the equation for critical resolve shear stress during slip in a single crystal. [4]
- c) How plastic deformation in polycrystalline material is different from single crystal. [4]
- d) Why annealing is done after cold working? [4]

**P.T.O.**

- Q3)** a) What is creep curve? Explain the stages of creep [4]  
b) Define the following : [4]  
i) Toughness  
ii) Malleability  
iii) UTS  
iv) Modulus of resilience.  
c) Define fatigue. Explain the processes used to improve fatigue life. [4]  
d) Rockwell Hardness Test with reference to load, indenter and application. [4]

OR

- Q4)** a) Differentiate between charpy and Izod impact tests. [4]  
b) Why are impact test specimens notched? What is the effect of temperature on impact strength? [4]  
c) Obtain the relationship between engineering stress, strain and true stress, strain. [4]  
d) With a neat sketch explain the procedure for vickers hardness test. [4]
- Q5)** a) Draw neatly labeled Fe-Fe<sub>3</sub>C diagram and explain the three reactions associated with it. [6]  
b) Draw and label microstructures of Mild steel, Medium steel and hypereutectoid steel. [6]  
c) What is stainless steels ? Classification of stainless steels. [6]

OR

- Q6)** a) Differentiate between Nodular and malleable cast iron and give two applications of each type. Explain the manufacturing of one of them. [6]  
b) What is critical temperature ? What do you understand by A<sub>0</sub>, A<sub>1</sub>, A<sub>2</sub>, A<sub>3</sub> and A<sub>cm</sub>? [6]  
c) Classify the steels on the basis of : [6]  
i) Carbon percentages.  
ii) Degree of deoxidation.  
iii) Depth of hardening.

## SECTION - II

- Q7)** a) What are the advantages and limitations or disadvantages of nitriding over carburising? [6]  
b) What are the Products of Austenite? [6]  
c) What is Hardenability? How is it measured ? [6]

OR

- Q8)** a) What is the tempering of steels? Why are hardened steels tempered ? Explain the changes in properties that occur during tempering ? [6]  
b) Differentiate between Carburising and Nitriding. [6]  
c) What is hardenability? Explain any one method of envaluating it. Discuss the factors influencing hardenability. [6]
- Q9)** a) Explain the automization process of powder manufacturing with neat sketch. [4]  
b) What is Sintering process? Explain in detail with continuous sintering furnace, used for large scale of production. [4]  
c) List the powder production processes and explain any one of them.[4]  
d) What are the properties required for the material to be bearing material. Write note on Babbitts alloys. [4]

OR

- Q10)**a) Define brass and types of brasses. Explain any one. [4]  
b) Give composition, properties and application of the following metals[4]  
i) Gun metal  
ii) Muntz metal  
c) What are the advantages and limitations of Powder Metallurgy Process. [4]  
d) Write short note Refractory materials. [4]
- Q11)**a) Write short note on Shape Memory Alloys. [4]  
b) Write short note on : Ferrites. [4]  
c) Write short note on : Cryogenic materials. [4]  
d) Explain with suitable example Nano materials. [4]

OR



- Q12)**a) Differentiate between fibre reinforced and particle reinforced composites. [4]
- b) Write a note on dispersion strengthened composites and state the applications. [4]
- c) Explain the effects of cryogenic temperature on mechanical properties of materials. [4]
- d) Explain different types of biomaterials. [4]



Total No. of Questions : 12]

SEAT No. :

**P4589**

[Total No. of Pages : 3

**[4957] - 118**

**S.E. (Mech., Mech. S/W, Prod., Prod. S/W, Auto)**

**ELECTRICAL TECHNOLOGY**

**(2008 Pattern)**

*Time : 3 Hours]*

*[Max. Marks :100*

*Instructions to the candidates:*

- 1) Answer any three questions from each section.*
- 2) Answers to the two sections should be written in separate books.*
- 3) Neat diagrams must be drawn wherever necessary.*
- 4) Figures to the right indicate full marks.*
- 5) Use of electronic pocket calculator is allowed.*
- 6) Assume suitable data if necessary.*

**SECTION - I**

- Q1)** a) Explain one wattmeter method for measurement of reactive power in a three phase balanced load with the help of connection diagram and phasor diagram. [6]
- b) Explain electricity tariff and its objectives. Discuss HT and LT tariff. [6]
- c) A three phase, 400 V load has a power factor of 0.7 lag. Two wattmeters are used to measure power which shows the input to be 10 KW. Find the reading of each wattmeter. [6]

OR

- Q2)** a) Discuss two wattmeter method for measurement of active power in a three phase balanced load with the help of connection diagram and phasor diagram. [6]
- b) Explain the construction and working of single-phase energy meter with the help of neat diagram. [6]
- c) What are demerits of low power factor? State power factor improvement methods and explain any one of them. [6]

***P.T.O.***

- Q3)** a) Derive an expression for torque developed in a three phase induction motor under running conditions. Hence obtain the condition for maximum torque. [8]  
b) Discuss three phase transformer connections with the help of suitable diagrams. Mention possible applications of these connections. [8]

OR

- Q4)** a) Discuss the typical layout of distribution transformer substation with the help of single line diagram. Mention specifications of distribution transformer in your backyard. [8]  
b) A 6-pole, 50 Hz, 3-phase induction motor runs at 960 rpm when the torque on the shaft is 200 N-m. If the stator losses are 1500 W and friction and windage losses are 500 W, find (i) rotor copper loss (ii) efficiency of the motor. [8]

- Q5)** a) Explain the construction and working of a shaded pole induction motor with the help of neat sketches. Mention its applications. [8]  
b) Derive equation of induced E.M.F. in an alternator. Mention typical specifications of an alternator of your choice. [8]

OR

- Q6)** a) Why is a single phase induction motor not self starting? How is it made self started? State its types and applications. [8]  
b) Define the term: Voltage regulation of an alternator. Discuss the synchronous impedance method of determining voltage regulation of an alternator for various types of loads. [8]

### SECTION - II

- Q7)** a) State only two applications of each following d.c. motor. [3 × 1 = 3]  
i) D.C. shunt  
ii) D.C. series  
iii) D.C. compound  
b) Explain with neat circuit diagram of 'Field Control' method of speed control of d.c. shunt motor. [6]  
c) State need of starter for d.c. motor starting. With the help of neat circuit diagram explain three point starter used for D.C. shunt motor. Also explain function of following parts : [9]  
i) NVC  
ii) Hold on coil  
iii) Overload coil

OR

- Q8)** a) Why d.c. series motor is never started on no load condition? [3]  
b) A 200V, 4 pole, lap wound armature d.c. shunt motor has 200 armature conductors and flux per pole of 25 mwb. Determine the back emf and speed of operation of the motor when draw 22A current from the supply. [6]  
(Given : armature resistance =  $0.4\Omega$  and shunt field resistance =  $100\Omega$ )  
c) Explain construction, working features, characteristic and industrial three applications of 'Universal Motor'. [9]

- Q9)** a) Construction, output characteristics of IGBT. Also state two applications of IGBT. [8]  
b) Construction, working, symbol and applications of TRIAC. [8]

OR

- Q10)**a) Draw V.I characteristic, symbol and state applications of [8]  
i) GTO  
ii) DIAC  
b) Construction details V-I characteristic, symbol, methods to turn ON and applications of SCR. [8]
- Q11)**a) Compare Individual Drive and Group Drive method used in industry. [8]  
b) Explain V/F control of three phase induction motor. [8]

OR

- Q12)**a) What is chopper circuit? With the help of suitable diagram : [8]  
i) Step down chopper (Type A chopper)  
ii) Step-up chopper (Type B chopper)  
b) State and explain advantages of electrical drive. [8]



Total No. of Questions : 12]

SEAT No. :

**P4591**

[Total No. of Pages : 3

**[4957] - 165**  
**S.E. (E&TC Engineering)**  
**POWER DEVICES AND MACHINES**  
**(2008 Pattern)**

*Time : 3 Hours]*

*[Max. Marks :100*

*Instructions to the candidates:*

- 1) Answers to the two sections should be written in separate answer books.*
- 2) Neat diagrams and waveforms must be drawn wherever necessary.*
- 3) Figures to the right side indicate full marks.*
- 4) Use of nonprogrammable calculator is allowed.*
- 5) Assume suitable data if necessary.*

**SECTION - I**

- Q1)** a) Compare power MOSFET with BJT? [5]  
b) Explain construction & steady state characteristics of power BJT. [7]  
c) Explain reverse recovery characteristics of a power diode. [6]

OR

- Q2)** a) Compare power diode with schottky diode. [5]  
b) Explain construction & steady state characteristics of power MOSFET. [7]  
c) Draw and explain Gate Drive Circuit for IGBT. [6]

- Q3)** a) Explain construction & steady state characteristics of SCR. What is the effect of gate current? [10]  
b) The gate triggering circuit of a SCR has a source voltage of 15V and the gate cathode characteristics has a straight line slope of 130. If gate power dissipation is 0.5W. calculate : [6]  
i) Triggering voltage.  
ii) Triggering current.  
iii) Gate series resistance.

OR

**P.T.O.**

- Q4)** a) Explain construction & steady state characteristics of TRIAC with different modes of operation. [10]  
 b) Draw & explain synchronized UJT triggering circuit for SCR with waveforms [6]
- Q5)** a) A single phase semi converter is operated from 120V, 50Hz AC supply. The load resistance is 10  $\Omega$ . If the average output voltage is 25% of the maximum possible average output voltage, determine: [6]  
 i) Firing angle  
 ii) Average output current  
 iii) rms output current  
 b) Draw single phase fully controlled rectifier for R-L load and explain its rectifier mode & inverter mode of operations with waveforms. Also derive expressions for average output voltage. [10]

OR

- Q6)** a) What are types of AC voltage controller? Draw & explain single phase full wave AC voltage controller for R load & derive an expression for its output voltage. Also draw the following waveforms : [10]  
 i) gate pulses  
 ii) output voltage  
 iii) output current,  
 iv) voltage across SCR1  
 b) A single phase full wave ac voltage controller has a resistive load of  $R = 10\Omega$  and the input voltage is  $V_s = 120V(\text{rms}), 50 \text{ Hz}$ . The delay angles of thyristors T1 and T2 are equal:  $\alpha_1 = \alpha_2 = \pi/2$ . Determine  
 i) the rms output voltage & current [6]  
 ii) the input PF

### SECTION - II

- Q7)** a) Explain basic DC chopper with R load and derive expressions for average o/p voltage & rms o/p voltage. [10]  
 b) Explain step up chopper and derive expressions for its average o/p voltage. [8]

OR

- Q8) a)** Explain I- $\Phi$  bridge inverter for R load with circuit & waveforms. Derive expression o/p rms voltage? [8]
- b) Single phase full bridge inverter has a resistive load of  $R = 3\Omega$ , dc input voltage is 48V. Calculate: [10]
- rms o/p voltage & current
  - rms o/p voltage at the fundamental frequency  $E_1$
  - Output power  $P_o$
  - rms o/p voltages at second ( $V_{o_2}$ )
  - rms o/p voltages at third harmonic ( $V_{o_3}$ )

- Q9) a)** Explain construction & working of a DC motor. [10]
- b) Explain torque-speed & torque-current characteristics for dc series motor. [6]

OR

- Q10)a)** Explain V/F control method for an induction motor. [8]
- b) Explain construction, working & characteristics of DC servomotor. [8]
- Q11)a)** State various protection methods for motors? Explain phase fail protection method for dc motor in detail. [8]
- b) Draw & explain various types of 3-phase transformer connection along with relation between phase & line voltages and currents. [8]

OR

- Q12)a)** Compare stepper motor with ordinary DC motor. [4]
- b) Explain construction, working & characteristics of BLDC motor. [8]
- c) Compare DC motor with BLDC motor. [4]



Total No. of Questions : 12]

SEAT No. :

**P4592**

[Total No. of Pages : 3

[4957] - 173

**S.E. (Instru.)**

**PRINCIPLES OF SENSORS AND TRANSDUCERS**

**(2008 Pattern)**

*Time : 3 Hours]*

*[Max. Marks :100*

*Instructions to the candidates:*

- 1) *All questions are compulsory.*
- 2) *Neat diagram must be drawn wherever necessary.*
- 3) *Figures to the right indicate full marks.*
- 4) *Use of Logarithmic tables, electronic Pocket calculator and steam table is allowed.*
- 5) *Your answer will be valued as a whole.*
- 6) *Assume suitable data if necessary.*
- 7) *Solve sections in separate answer sheet*

**SECTION - I**

- Q1)** a) Define with example **[10]**
- |                        |                        |
|------------------------|------------------------|
| i) Sensor              | ii) Transducer         |
| iii) Active Transducer | iv) Passive Transducer |
| v) Calibration         |                        |
- b) Explain selection criteria of sensor. **[8]**

OR

- Q2)** a) Explain performance characteristics of sensors. **[10]**
- b) Classify following transducers as active or passive transducers **[4]**
- |                           |                              |
|---------------------------|------------------------------|
| i) LVDT                   | ii) Thermocouple             |
| iii) Strain Gauge         | iv) Piezoelectric sensors    |
| v) Capacitive level probe | vi) P <sup>H</sup> electrode |
| vii) Turbine flow meter   | viii) RTD                    |
- c) Displacement sensor's output ranges from 1kOhm to 5kOhm for the displacement of 0 to 1000mm. find the sensitivity of sensors. If error is  $\pm 2\%$  find the output of sensor at 700mm displacement. **[4]**

**P.T.O.**



- Q3)** a) Explain working principle of manometer. How range can be improve with inclined manometer? [6]  
b) Explain temperature measurement using fluid expansion system. [4]

OR

- Q4)** a) List four units of force and give their conversion factor. [4]  
b) Explain diaphragm as pressure sensor with neat sketch. [8]  
c) Explain flat spiral spring with neat sketch. [4]

- Q5)** a) Explain level to pressure measurement. [8]  
b) Explain any hydrometer with neat sketch. [8]

OR

- Q6)** a) Explain flow measurement using pitot tube. [8]  
b) Explain Air bubbler method for level measurement. [8]

### SECTION - II

- Q7)** a) Explain working RTD with neat sketch. [8]  
b) Explain working of LVDT with neat sketch. [8]

OR

- Q8)** a) Explain strain gauge with neat sketch. [8]  
b) Explain eddy current type tachometer. [8]

- Q9)** a) Explain working of thermocouple with neat sketch. [8]  
b) Explain electromagnetic flow meter with neat sketch. [8]

OR

- Q10)**a) Explain combinational  $p^H$  electrode with neat sketch. [8]  
b) Explain photovoltaic transducers. [8]

- Q11)**a) Explain self balancing system. [9]  
b) Explain magnetic tape recorder. [9]

OR

- Q12)**a) Explain Feedback transducer systems. [9]  
b) Explain data display and recording system. [9]



Total No. of Questions : 12]

SEAT No. :

**P4593**

[Total No. of Pages : 4

**[4957] - 201**  
**S.E. (Computer & IT)**  
**DISCRETE STRUCTURS**  
**(2008 Pattern) (Semester - I)**

*Time : 3 Hours]*

*[Max. Marks :100*

*Instructions to the candidates:*

- 1) *Section I : Attempt Q. No. 1 or Q. No. 2, Q. No. 3 or Q. No. 4, Q. No. 5 or Q. No. 6.*
- 2) *Section II : Attempt Q. No. 7 or Q. No. 8 Q. No. 9 or Q. No. 10, Q. No. 11 or Q. No.12.*
- 3) *Answers to the two Sections should be written in separate answer books.*
- 4) *Neat diagrams must be drawn wherever necessary.*
- 5) *Assume suitable data, if necessary.*

**SECTION - I**

- Q1) a)** Write the truth table for the following statements : **[8]**
- i)  $(\sim p \vee q) \rightarrow q$
  - ii)  $\sim(p \wedge q) \vee (p \times q)$
- b) Define disjunctive and conjunctive Normal forms with examples and applications of Discrete Structures. **[8]**

OR

- Q2) a)** Among the integers 1 to 1000 : **[8]**
- i) How many of them are not divisible by 3, nor by 5, nor by 7?
  - ii) How many are not divisible by 5 and 7 but divisible by 3?
- b) Obtain the CNF and DNF of the following formulae given below:**[8]**
- i)  $p \wedge (p \rightarrow q)$
  - ii)  $\sim(p \vee q) \rightarrow (p \wedge q)$

**P.T.O.**

- Q3)** a) Define each of the following with examples : [8]
- i) Semi Group
  - ii) Group
  - iii) Abelian Group
  - iv) Cyclic Group
- b) For the following, determine whether the binary operation  $*$  is commutative or associative: on  $N$ , where  $a * b = \max(a,b)$  [8]

OR

- Q4)** a) Define each of the following with examples : [8]
- i) Rings
  - ii) Cosets
  - iii) Subrings
  - iv) Homomorphism of Groups
- b) Show that  $\{1, 2, 3\}$  under multiplication modulo 4 is not a group but that  $\{1, 2, 3, 4\}$  under multiplication modulo 5 is group. [8]
- Q5)** a) Let  $A = (1,2,3,4)$  and  $R = ((1, 2),(2,4),( 1,3 ),(3, 2))$ . Find the transitive closure of  $R$  by Warshall's algorithm. [8]
- b) Let  $A = \{a,b,c\}$ . show that  $(P(A),c)$  is a poset and draw its Hasse diagram. [8]
- c) Define Chains and Antichains. [2]

OR

- Q6)** a) Let  $R$  be a binary relation on the set of all positive integers such that  
 $R = \{ (a,b) \mid a- b \text{ is an odd positive integer} \}$   
 Is  $R$  reflexive, symmetric, antisymmetric, transitive?  
 Is  $R$  an equivalence relation? A partial ordering relation. [8]
- b) Function  $f, g, h$  are defined on a set [8]
- $$X = (1, 2, 3) \text{ as}$$
- $$f = ((1, 2), (2, 3), (3, 1))$$
- $$g = \{(1,2),(2,1),(3,1)\}$$
- $$h = ((1,1), (2,2),(3,1))$$
- i) Find  $f \circ g, g \circ f$ . Are they equal?
  - ii) Find  $f \circ g \circ h$  and  $f \circ h \circ g$ .
- c) Define partial function. [2]

## SECTION - II

- Q7) a)** Define Following with examples : [8]
- i) Graph
  - ii) Self loop and parallel edges
  - iii) Multiple Graphs
  - iv) Weighted Graph
- b) Prove that the number of vertices of odd degree in a graph is always even. [8]

OR

- Q8) a)** Determine the number of edges in a graph with 6 nodes, 2 of degree 4 and 4 of degree 2. Draw two such graphs. [8]
- b) Define Isomorphism in graphs and sub graph with example. Find whether  $K_6$  and  $K_{3,3}$  are isomorphic or not? [8]
- Q9) a)** Show that it is possible to draw a tree with 10 vertices which has vertices either of degree 1 or of degree 3. Draw the tree. Is it possible to draw the same type of tree with 11 vertices [8]
- b) Define tree and its properties. Is it possible to draw a tree with five vertices having degree 1, 1, 2, 2, 4? [8]

OR

- Q10) a)** Construct an optimal tree for the weight 8, 9, 10, 11, 13, 15, 22. Find the weight of the optimal tree. [8]
- b) Suppose data items A, B, C, D, E, F, G occur with the following probability distribution :

Data Item	A	B	C	D	E	F	G
Probability	10	30	05	15	20	15	05

Construct a Huffman code for the data. What is the minimum weighted path length? [8]

- Q11)**a) Find the permutation of the set  $A = \{1, 2, 3, 4\}$  taking the elements two at a times. [2]
- b) Suppose repetitions are not possible. [8]
- i) How many three digit numbers can be formed from six digits 2, 3, 4, 5, 7, 9?
- ii) How many of these numbers less than 400?
- iii) How many even?
- iv) How many are multiples of 5?
- c) Given a binary communication channel when  $A = \text{input}$  and  $B = \text{output}$ . Let  $P(A) = 0.4$ ,  $P(B/A) = 0.9$ ,  $P(B/\bar{A}) = 0.6$ . Find the mutual information (i) between  $A$  and  $B$ , (ii) between  $A$  and  $\bar{B}$ . [8]

OR

- Q12)**a) Four persons enter a bus in which there are six vacant seats. In how many ways can they take their places? [2]
- b) Given that a students had prepared, the probability of passing a certain entrance exam 0.99. Given that a student did not prepare, the probability of passing the entrance exam is 0.05. Assume that the probability of preparing is 0.7. The student fails in the exam. What is the probability that he or she did not prepare? [8]
- c) In a test an examinee either guesses or copies or knows the answer to multiple Choice questions with 4 choices, only one answer being correct. The probability that he makes a guess is  $1/3$ , the probability that he copies the answer is  $1/6$ . The probability that his answer is correct, given that he copies it is  $1/8$ . Find the probability that he knew the answer to that question, given that he correctly answers it. [8]



Total No. of Questions : 12]

SEAT No. :

**P4594**

[Total No. of Pages : 3

[4957] - 224

**S.E. (Polymer/Petroleum/Petrochemical)**

**MOMENTUM TRANSFER**

**(2008 Pattern)**

*Time : 3 Hours]*

*[Max. Marks :100*

*Instructions to the candidates:*

- 1) *Attempt Q1 or 2, Q3 or 4, Q5 or 6, Q7 or 8, Q9 or 10, Q11 or 12.*
- 2) *Figures to the right indicate full marks.*
- 3) *Use of electronic calculators is allowed.*
- 4) *Draw neat sketch where ever necessary.*

**SECTION - I**

- Q1)** a) For water at 30°C, convert a kinematic viscosity of 0.01 cm<sup>2</sup>/ sec to Centi-stoke , Pa-sec, poise and centipoise. [8]
- b) Distinguish between (i) Newtonian and Non-Newtonian fluids (ii) Adhesion and Cohesion (iii) Dynamic and Kinematic viscosity. [8]

OR

- Q2)** a) Give the applications of Newton's law of viscosity. [8]
- b) Draw the rheological diagram and show various types of fluids in it. Give at least two examples of each. [8]
- Q3)** a) Explain the applications of fluid kinematics. [9]
- b) Explain the velocity potential function and stream function. Derive the laplace equation for both functions. [9]

OR

**P.T.O.**

- Q4)** a) Write a short note on the stream function and the velocity potential function. [9]
- b) With a neat diagram show absolute pressure, positive and negative gauge pressures, standard atmospheric pressure with the gauge pressure. Convert pressure of 2000 Pa into GPa absolute and other any 2 pressure units. [9]
- Q5)** a) Derive Euler's equation of motion and hence obtain the Bernoulli equation from it. Explain the 4 modifications to the Bernoulli equation with examples. [8]
- b) A 35 cm throat diameter and 55 cm inlet diameter venturimeter is installed in a vertical pipe carrying water. The flow is in upward direction. The difference between the levels of throat and inlet is 85 cm. the water - mercury differential manometer gives deflection of 17.5 cm of mercury. Find the discharge of water. Take coefficient of discharge of meter as 0.98. [8]

OR

- Q6)** a) Explain principle and construction of Venturimeter. Derive the expression for flow rate through venturimeter. [8]
- b) A Pipeline carrying oil of specific gravity 0.9 changes in diameter from 200 mm at position 1 to 500 mm diameter at position 2 which is 4 meters at higher level. If the pressures at 1 and 2 are 100 KN/m<sup>2</sup> and 60 KN/m<sup>2</sup> respectively and the discharge is 0.2 m<sup>3</sup>/sec, determine the loss of energy in terms of head and justify the direction of flow. [8]

### SECTION - II

- Q7)** a) Explain the utility of Moody's Chart. [8]
- b) Explain the following : [8]
- Hydraulic diameter.
  - Equivalent length.
  - No slip condition.
  - Hydrodynamic rough boundary.

OR





Total No. of Questions : 12]

SEAT No. :

**P4595**

[Total No. of Pages : 3

**[4957] - 228**

**S.E. (Petroleum, Petrochemical & Polymer)**

**PARTICULATE TECHNOLOGY**

**(2008 Pattern)**

*Time : 3 Hours]*

*[Max. Marks :100*

*Instructions to the candidates:*

- 1) *Answers to the two sections should be written in separate answer books.*
- 2) *Answer Q.No. 1 or 2, 3 or 4,5 or 6, 7 or 8, 9 or 10, 11 or 12.*
- 3) *Neat diagrams must be drawn wherever necessary.*
- 4) *Figures to the right side indicate full marks.*
- 5) *Use of Calculator is allowed.*
- 6) *Assume Suitable data if necessary.*

**SECTION - I**

- Q1)** a) What do you understand by Single Particle? Explain the concept in brief. [8]
- b) Explain in detail rate of mixing. [8]

OR

- Q2)** a) What are the various techniques to measure particle size? Explain any one in detail. [8]
- b) Describe with neat sketch various screen analysis methods. [8]

- Q3)** a) A material is crushed in Blake Jaw crusher and the average particle size is reduced from 5 cm to 1.3 cm with consumption of 37 Watts-hr/ton. Calculate the energy required to crush the same material with average particle size from 8 cm to 3 cm by using Rittinger's and kick's laws. Assume mechanical efficiency remains constant. [6]
- b) Enlist various size enlargement processes. Explain any one in brief.[6]
- c) Derive the relationship between critical speed of ball mill with radius of ball mill and radius of ball. [6]

OR

**P.T.O.**

- Q4)** a) Calculate the power required to crush 100 ton/hr of limestone if 80 percent of the feed passes through a 2 inch screen and 80 percent of the product through a 1/8 inch screen. Data: work index of limestone is 12.74. [6]
- b) Discuss energy utilization in size reduction equipments. [6]
- c) Explain with neat sketch the construction and working of smooth roll crusher. [6]

- Q5)** a) A slurry containing 0.2 kg of solid per kg of water is to be thickened to sludge containing 0.7 kg of solid per kg of water in a continuous settling process. With five different concentration of slurry, the following results were obtained: [8]

Slurry (kg of solid/kg of water)	Sedimentation Rate (m/min)
0.2	0.01
0.235	0.0075
0.266	0.006
0.33	0.0042
0.4	0.0030

What should be the minimum area of thickener to effect a separation at rate of 0.625 kg of solid per second?

- b) Discuss principles involved in sedimentation process with a neat sketch. [8]

OR

- Q6)** a) Explain with neat sketch construction and working of batch thickener. [8]
- b) Explain in detail concept of flocculation. [8]

### SECTION - II

- Q7)** a) Discuss principle and working of spouted bed with neat diagram. [8]
- b) Discuss in detail fluidized bed catalytic cracking. [8]

OR

**Q8) a)** A packed bed of uniform spherical particles of diameter 2.5 mm and density  $4150 \text{ kg/m}^3$  is fluidized by means of liquid of density  $1000 \text{ kg/m}^3$  and dynamic viscosity  $0.001 \text{ pa.s}$ . [8]

Calculate

i) Minimum fluidization velocity using Ergun equation

ii) Ratio of settling to fluidization velocity in the bed

Take bed porosity = 0.4

b) With a neat diagram, discuss in detail various fluidization regimes. [8]

**Q9) a)** A plate and frame press gave a total of  $10 \text{ m}^3$  of filtrate in 2000 seconds and  $15 \text{ m}^3$  of filtrate in 4200 seconds when the filtration was stopped. Estimate the washing time if  $5 \text{ m}^3$  of wash water is used. The resistance of cloth may be neglected and a constant pressure is used throughout. [10]

b) Derive the relation for constant rate and constant pressure filtration for the flow. [8]

OR

**Q10)a)** Discuss the working of vacuum leaf filter with labeled diagrams. [8]

b) Explain in brief. [10]

i) Filter selection.

ii) Preliminary treatment of slurries before filtration.

**Q11)a)** Explain with construction and working of magnetic separator. [8]

b) Estimate the terminal settling velocity for 150 to 230 mesh particles of a limestone whose density is  $2800 \text{ kg/m}^3$  falling in water at  $30^\circ\text{C}$ .

Data : 150 mesh = 0.104 mm, 230 mesh = 0.063 mm, viscosity =  $0.801 \text{ cp}$ , density of water =  $995.7 \text{ kg/m}^3$ . [8]

OR

**Q12)a)** Describe in detail with neat diagram the principle, construction and working of cyclone separator with advantages, disadvantages and applications. [8]

b) Write a short note on : [8]

i) Capacity and effectiveness of screen.

ii) Liquid washing equipments.

