

B.TECH. DEGREE EXAMINATION, DECEMBER 2012**Seventh Semester**

Branch : Mechanical Engineering

ADVANCED OPERATIONS RESEARCH (Elective I) (M)

(Regular/Supplementary/Mercy Chance)

Time : Three Hours

Maximum : 100 Marks

*Answer all questions.***Part A***Each question carries 4 marks.*

1. Explain the basic steps for a linear programming model formulation.
2. Explain the terms :
 - (a) Feasible solution.
 - (b) Basic solution.
 - (c) Basic feasible solution.
3. Write the mathematical form of transportation problem.
4. Write the steps for MOD 1 method.
5. Discuss the use of preemptive weights in goal programming.
6. Write the general goal programming model and give a brief explanation.
7. How does dynamic programming differ conceptually from L.P. ?
8. State Bellman's principle of optimality and give a brief explanation.
9. What is Monte Carlo simulation ? Describe the idea of experimentation (Random sampling) in simulation.
10. Differentiate between discrete and continuous distribution by considering an example for each. (10 × 4 = 40 marks)

Part B*Each question carries 12 marks.*

11. Use graphical method to solve the L.P. problem.

$$\text{Minimize } Z = 3x_1 + 2x_2$$

subject to constraints

$$5x_1 + x_2 \geq 10$$

$$x_1 + x_2 \geq 6$$

$$x_1 + 4x_2 \geq 12$$

$$x_1, x_2 \geq 0.$$

Or

Turn over

12. Use simplex method to solve the following L.P. problem :

$$\text{Maximize } Z = 4x_1 + 3x_2$$

subject to constraints

$$2x_1 + x_2 \leq 1000$$

$$x_1 + x_2 \leq 800$$

$$x_1 \leq 400$$

$$x_2 \leq 700$$

$$x_1, x_2 \geq 0.$$

13. Solve the following transportation problem

		Destination			Supply
		D ₁	D ₂	D ₃	
Source	S ₁	5	3	6	10
	S ₂	3	4	7	25
	S ₃	9	6	5	18
	S ₄	4	8	8	7
	Demand	30	15	15	60

Or

14. Solve the following transportation problem.

		Destination				Supply
		D ₁	D ₂	D ₃	D ₄	
Origin	O ₁	6	4	1	5	14
	O ₂	8	9	2	7	16
	O ₃	4	3	6	2	5
	Required	6	10	15	4	35

15. Solve the following goal programming problem, using graphical method.

$$\text{Minimize } Z = p_1 d_1^+ + p_2 d_2^- + p_3 d_3^-$$

$$\text{subject to } x_1 + x_2 + d_1^- + d_1^+ = 40$$

$$x_1 + d_2^- - d_3^+ = 20$$

$$x_1, x_2, d_1^-, d_1^+ \geq 0 \text{ for all } i.$$

Or

16. Solve the following goal programming using simplex method :

$$\text{Minimize } Z = p_1 d_1^- + p_2 (8d_2^- + 6d_3^-) + p_2 d_1^+$$

$$\text{subject to } 2x_1 + x_2 + d_1^- - d_1^+ = 16$$

$$x_1 + d_2^- - d_2^+ = 7$$

$$x_2 + d_3^- - d_3^+ = 10$$

$$\text{and } x_1, x_2, d_i^-, d_i^+ \geq 0 \text{ for all } i.$$

17. A truck can carry a total of 10 tonnes of any product. Three types of a product are available for shipment. Their weights and values are tabulated. Assuming that at least one of each type must be shipped. Determine the loading to maximize the total value. Consider it as dynamic programming problem.

Type	Value	Weight
A	20	1
B	50	2
C	60	2

Or

18. Construct a network for the data given in the table below i.e., the distances in km between cities 1, 2..... and 8.

[Note : The arcs 2 - 5 and 3 - 4 cross each other. Also 4 - 6 and 5 - 7 cross each other].

From	To	Distance in km
1	2	1
1	3	2
2	3	1
2	4	5
2	5	2
3	4	2
3	5	1
3	6	4
4	5	3
4	6	6
4	7	8
5	6	3
5	7	7
6	7	5
6	8	2
7	8	6

Turn over

Use Dijkstra's algorithm to find the shortest route between the following cities :

- (a) Cities 1 and 8.
- (b) Cities 1 and 6.
- (c) Cities 4 and 8.
- (d) Cities 2 and 6.

19. A bakery keeps stock of a popular brand of cake. Previous experience shows the daily demand pattern for the item with associated probabilities as given below :

Daily Demand (Number)	0	10	20	30	40	5
Probabilities	0.01	0.20	0.15	0.50	0.12	0.02

Use the following sequence of random numbers to simulate the demand for next 10 days.

Random numbers 25, 39, 65, 76, 12, 5, 73, 89, 19, 49.

Also estimate the daily average demand for the cakes on the basis of the simulated data.

Or

20. A book store wishes to carry a particular book in stock. The demand for the book is not certain and there is a lead time of 2 days for stock replenishment. The possibilities of demand are given below :

Demand (units/day)	0	1	2	3	4
Probability	0.05	0.10	0.30	0.45	0.10

Each time an order is placed, the store incurs an ordering cost of Rs. 10 per order. The store also incurs a carrying cost of Rs. 0.5 per book per day. The inventory carrying cost is calculated on the basis of stock at the end of each day. The manager of the book store wishes to compare two options for his inventory decisions.

A : Order 5 books when the present inventory plus any outstanding over falls below 8 books.

B : Order 8 books when the present inventory plus any outstanding order falls below 8 books.

Currently (beginning of 1st day) the store has a stock of 8 books plus 6 books ordered two days ago and are expected to arrive the next day. Carry out simulation run for 10 days to recommend an appropriate option. You may use random numbers in the sequences, using the first number for day one.

89, 34, 78, 63, 61, 81, 39, 16, 13, 73.

(5 × 12 = 60 marks)

F 3216

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Reg. No.....

Name.....

B.TECH. DEGREE EXAMINATION, DECEMBER 2012

Seventh Semester

Branch : Mechanical Engineering

MARKETING AND SALES MANAGEMENT (Elective I) (M)

(Regular / Supplementary / Mercy Chance)

Time : Three Hours

Maximum : 100 Marks

Answer **all** questions.

Part A

Each question carries 4 marks.

1. Comment on Exchange and transaction.
2. Explain the relationship between value and satisfaction.
3. What are the Components of a modern marketing information system ?
4. What do you mean by business strategic planning ?
5. What do you mean by relationship marketing ?
6. Explain the concept of international marketing.
7. Compare business market with customer market.
8. Marketing process does not end when production is brought : Discuss.
9. Explain the selection process of a sales person.
10. What are the objectives of sales management ?

(10 × 4 = 40 marks)

Part B

Each question carries 12 marks.

11. (a) What are the common methods of market segmentation ? Explain.

Or

- (b) What do you mean by marketing concept ? Explain the distinguishing features of marketing concept.

12. (a) What are the factors to be considered while selecting a marketing strategy.

Or

- (b) What are the requirements of a good marketing decision support system.

Turn over

13. (a) Explain the various phases of idea generation.

Or

(b) Explain the various phases of concept development and testing.

14. (a) Explain the various phases of a purchasing decision.

Or

(b) Explain various buying motives of a customer.

15. (a) Explain how a sales person can be motivated and controlled.

Or

(b) Discuss the principles of Personnel selling.

(5 x 12 = 60 marks)

(10 x 4 = 40 marks)

Part B

Each question carries 10 marks

11. (a) What are the common methods of market segmentation? Explain.

Or

(b) What do you mean by marketing concept? Explain the distinguishing features of marketing concept.

12. (a) What are the factors to be considered while selecting a marketing strategy?

Or

(b) What are the requirements of a good marketing decision support system?

Turn over

B.TECH. DEGREE EXAMINATION, DECEMBER 2012**Seventh Semester**

Branch : Mechanical Engineering

MACHINE DESIGN AND DRAWING—I (M)

(Regular/Supplementary/Mercy Chance)

Time : Three Hours

Maximum : 100 Marks

*Answer any two from Part A and two from Part B.**Suitably assume any missing data.***Part A***Each question carries 25 marks.*

1. A solid circular shaft, 15 mm in diameter is subjected to torsional shear stress that varies from 0 to 35 N/mm² and at the same time, is subjected to axial stress that varies from -15 to 30 N/mm². The frequency of variation of these stresses is equal to shaft speed. The shaft is made of steel (Ultimate stress 540 N/mm² and yield point stress 400 N/mm²) and corrected endurance limit of the shaft is 200 N/mm². Determine the factor of safety.
2. Design a knuckle joint to connect two circular rods subjected to axial tensile force of 50 kN. The rods are co-axial. Design the joint. Allowable stresses are $\sigma_t = 50\text{MPa}$ $\tau = 40\text{MPa}$ $\sigma_c = 80\text{MPa}$.
3. A flexible coupling is used to transmit 15KW power at 600 r.p.m. The starting torque of motor can be 150% of the rated torque. Design the coupling.
4. Design rivetted joint to connect two plates of 15 mm thick. The number of rivets in the outer rows is half the number of rivets in the middle row $\sigma_t = 75\text{MPa}$ $\sigma_c = 100\text{MPa}$ $\tau = 60\text{MPa}$. What is the efficiency of joint ?

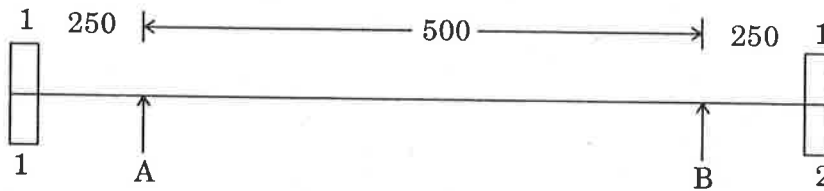
(2 × 25 = 50 marks)

Part B*Each question carries 25 marks.*

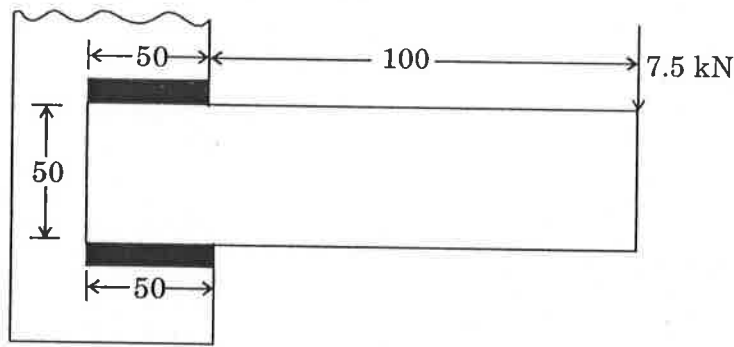
5. A safety valve 50 mm in diameter is to blow off at a pressure of 1.5 MPa. It is held in seat by means of helical compression spring with initial compression of 25 mm. The maximum lift of the valve is 10mm. The permissible shear stress of spring wire is 450 N/mm². Design the spring.

Turn over

6. The layout of a shaft carrying two pulleys 1 and 2 and support on two bearings A and B. The shaft transmits 7.5 kW power at 360 r.p.m. from pulley 1 to pulley 2. The diameters of pulley 1 and 2 are 250 and 500 mm respectively. The masses of pulley 1 and 2 are 10 and 30 kg respectively. The belt tensions act vertically downwards. Estimate suitable diameters of shaft.



7. A welded connection as shown in the figure is subjected to an eccentric force of 7.5 kN. Determine the size of weld if permissible shear stress for the weld is 100 N/mm^2 . Assume static conditions.



8. The torque developed by an engine is given by following equation $T = 14250 + 2200 \sin 2\theta - 1800 \cos 2\theta$ where T is the torque in N-m and θ is crank angle from IDC. The resisting torque of machine is constant throughout the work cycle. The coefficient of speed fluctuations is 0.01. The engine speed is 150 r.p.m.. A solid circular steel disk 50 mm thick is used as a fly wheel. The mass density of steel is 7800 kgf/m^3 . Calculate the diameter of flywheel disk.

(2 × 25 = 50 marks)

F 3213

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B.TECH. DEGREE EXAMINATION, DECEMBER 2012

Seventh Semester

Branch : Mechanical Engineering

WELDING TECHNOLOGY (Elective I) [M]

(Regular/Supplementary/Mercy Chance)

Time : Three Hours

Maximum : 100 Marks

Answer all questions.

Part A

Each question carries 4 marks.

1. What are the filler materials used in brazing ?
2. Brief seam welding.
3. Brief the uses of fluxes in welding.
4. Explain the preparation of acetylene gas.
5. Write a note on striking of arc.
6. Sketch characteristic curve of a constant voltage arc welding machine.
7. What are the advantages of friction welding ?
8. Brief electron beam welding.
9. Explain magnetic particle testing.
10. Explain residual stresses in welding.

(10 × 4 = 40 marks)

Part B

Each question carries 12 marks.

11. (a) Explain any three pressure welding processes.

Or

(b) (i) Explain the role of fluxes.

(5 marks)

(ii) Sketch Tin-lead binary diagram.

(7 marks)

12. (a) Sketch and explain right ward and left ward welding techniques.

Or

(b) (i) What is flux ?

(6 marks)

(ii) What is filler material ?

(6 marks)

Turn over

13. (a) Explain :

(i) TIG welding.

(6 marks)

(ii) MIG welding.

(6 marks)

Or

(b) (i) How do you classify different weld position ?

(7 marks)

(ii) SAW. Explain.

(5 marks)

14. (a) Explain various cold welding processes, their applications.

Or

(b) Write advantages and disadvantages of electro slag welding.

15. (a) Sketch and explain heat affected zone and unaffected zone.

Or

(b) (i) List the various causes of incomplete penetration in arc welding.

(5 marks)

(ii) Explain various destructive tests in welded joints.

(7 marks)

[5 × 12 = 60 marks]

B.TECH. DEGREE EXAMINATION, DECEMBER 2012

Seventh Semester

Branch : Mechanical Engineering

DYNAMICS OF MACHINERY (M)

(Regular /Supplementary / Mercy Chance)

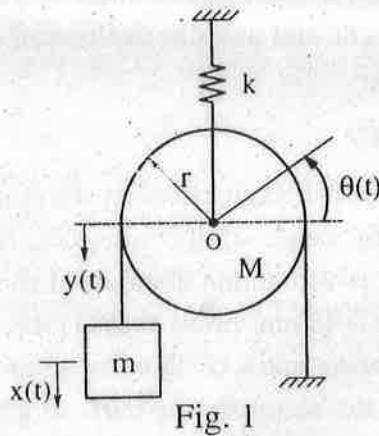
Time : Three Hours

Maximum : 100 Marks

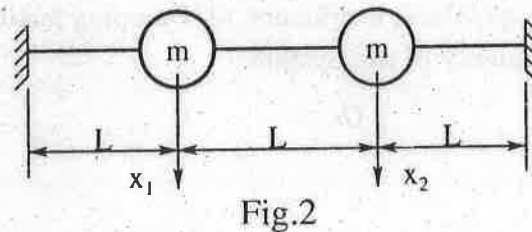
Part A

*Answer all the questions.
Each question carries 4 marks.*

1. Why two balance masses are required to balance a thick rotor compared with single balance mass used in the case of a thin rotor?
2. What is hammer blow ? Write an expression for calculating the Hammer blow. How its intensity can be reduced through coupled locomotives ?
3. Find the frequency of free Vibration of a connected System shown in Figure. 1.



4. Prove that with viscous damping the amplitudes of successive oscillations are in geometric progression.
5. Develop the equation of motion of the System shown in Fig.2.



Turn over

6. What you meant by mode shape ? Draw the mode shape of a two rotor System corresponds to its non zero frequency and mark the nodal point.
7. What you meant by impulse response function? Obtain the Impulse response function of a simple spring mass System.
8. Sketch the load deflection characteristics of a linear spring, a soft spring and a hard spring and describe its non-linear behaviour.
9. With the help of a typical plot describe sound spectra.
10. Derive a relation between sound pressure level and sound intensity level.

(10 × 4 = 40 marks)

Part B

Answer all questions.

Each question carries 12 marks.

11. Four masses A of W kg at 8 cm radius, B of 30 kg at 14 cm radius, C of 50 kg at 10 cm radius and D of 40 kg at 15 cm radius and they are forming a completely balanced System. The masses B and C revolve in planes 20 cm, 52 cm respectively measured from the plane of the mass A. The angle between the plane containing B and C is 90° , B and C make angle of 210° and 120° respectively with D in the same sense. Find (1) the weight and angular position of mass A, (2) the distance between the planes A and D.

Or

12. The following data refers to a twin V- engine: The angle between the cranks is 90° , weight of the crank is 1.5 kg, weight of each piston is 1.0 kg, weight of the connecting rod is 1.5 kg, length of the crank is 3 cm, length of the connecting rod is 24 cm and distance of the centre of gravity of the connecting rod from the gudgeon pin centre is 14 cm. Prove that (1) the primary force due to the reciprocating parts can be balanced by a rotating mass, (2) find the weight required to balance the rotating parts and the primary force due to the reciprocating parts at a radius of 10 cm and (3) if the engine runs at 1200 r.p.m, what is the maximum magnitude of the secondary force and the corresponding crank position ?
13. In a single degree freedom damped Vibration System, a suspended mass of 8 Kg. makes 30 oscillations in 18 seconds. Amplitude decreases to 0.25 of the initial value after 5 oscillations. Determine : (1) Stiffness of the spring, (2) Logarithmic decrement, (3) Damping factor, (4) Damping coefficient, and (5) Undamped natural frequency of the System.

Or

14. The following data relate to a reciprocating machine supported on four springs. Mass of the machine is 120 Kg, stroke is 90 mm, mass of the reciprocating parts is 2.5 Kg., and speed is 750 r.p.m. Springs are symmetrically placed w.r.t. the centre of mass of the machine. Neglecting the damping, find the combined stiffness of the springs so that the force transmitted to the foundation is $1/22$ of the impressed force. If under actual working conditions, the damping reduces the amplitude of the successive Vibration, by 25%, determine the force transmitted to the foundation at 750 r.p.m. and at the resonance. Also find the amplitude of Vibration at resonance.

Or

15. Determine the first two natural frequencies and the corresponding mode shapes for a multi-degree of freedom System shown in Figure. 3 using Holzer method.

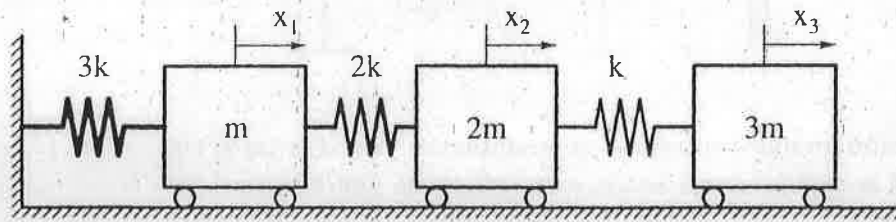


Fig. 3

Or

16. In a torsional System, the flywheel and the propeller are 1.5 m and 4.5 m away on the same side of the engine. The shaft diameter connecting from engine and flywheel is 50 mm and that between flywheel and the propeller is 40 cm. The mass moment of inertia of the engine, flywheel, and the propeller are 30 kg-m^2 , 70 kg-m^2 and 50 kg-m^2 respectively. Find the position of the nodes and frequencies of free torsional vibrations. Draw the mode shape corresponding to the higher frequency. Take $G = 80 \text{ GPa}$.
17. A rotor has a mass of 9.5 Kg. and is mounted midway on a 24 mm diameter horizontal shaft supported at the ends by two bearings. The bearings are 1.2 m apart. The shaft rotates at 2,000 r.p.m. If the centre of mass of the rotor is 0.12 mm away from the axis of rotation, find the amplitude of the steady state Vibration and the dynamic force transmitted to the bearing. Take $E = 200 \text{ GPa}$.

Or

Turn over

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Name.....

B.TECH. DEGREE EXAMINATION, DECEMBER 2012

Seventh Semester

Branch : Mechanical Engineering

GAS DYNAMICS AND JET PROPULSION (M)

(Regular/Supplementary/Mercy Chance)

Time : Three Hours

Maximum : 100 Marks

Use of approved gas tables and chart are permitted.

Part A

Answer all questions.

Each question carries 4 marks.

1. Differentiate between closed system and open system in gas dynamics.
2. State the assumptions in derivation of continuity equation.
3. Define critical speed of sound.
4. Write the governing equations for isentropic flow of an ideal gas.
5. List the basic characteristics of adiabatic flow with friction.
6. Which are the dimensionless numbers controlling heat transfer in fluid flow ?
7. What do you mean by 'normal shock' ?
8. Define shock thickness and shock strength.
9. What are the different types of energies in jet engines ?
10. List the applications of propulsion.

(10 × 4 = 40 marks)

Part B

Each question carries 12 marks.

11. (a) Explain the classification of flow of a fluid based on Mach number. What is Mach cone ?

Or

- (b) Derive the momentum equation for a control volume of flow of a compressible fluid, from fundamentals.

(12 marks)

12. (a) Derive the governing equations of steady one-dimensional isentropic flow with area change

Or

- (b) What is a De Laval nozzle ? Derive an expression for optimum area ratio, and nozzle efficiency.

(12 marks)

Turn over

13. (a) Discuss the effect of wall friction on flow properties in an isothermal flow with friction in a constant area duct.

Or

- (b) Discuss the governing equations of steady one-dimensional flow with heat transfer in constant area duct.

(12 marks)

14. (a) Derive the Rankine Hugoniat equations from fundamentals. State all the assumptions made.

Or

- (b) With neat sketch, explain Fanno and Rayleigh lines. Discuss the effect of heat transfer on flow parameters.

(12 marks)

15. (a) Explain :

- (i) Scramjet engine.
- (ii) Liquid propellant rockets.
- (iii) Comparison of propulsion systems.

(4 + 4 + 4 = 12 marks)

Or

- (b) Derive expressions for :

- (i) Thrust ;
- (ii) Thrust power ; and
- (iii) Propulsive efficiency of a jet engine.

(12 marks)

[5 × 12 = 60 marks]

F 3163

(Pages : 2)

Reg. No.....

Name.....

B.TECH. DEGREE EXAMINATION, DECEMBER 2012

Seventh Semester

Branch : Mechanical Engineering / Automobile Engineering

INDUSTRIAL ENGINEERING (MU)

(Regular/Supplementary/Mercy Chance)

Time : Three Hours

Maximum : 100 Marks

Part A

Answer all questions.

Each question carries 4 marks.

1. What are the fields of applications of Industrial Engineering?
2. What are the functions of an Industrial Engineering?
3. What are the functions and principles of material handling?
4. What are the factors to be considered for selecting material handling equipments?
5. What do you mean by flow process chart? Explain how it is constructed.
6. What is string diagram? Where it is used?
7. Enumerate the importance of industrial safety.
8. Explain the importance of communication in industry.
9. What do you mean by acceptance sampling?
10. Explain the significance of statistical quality control.

(10 × 4 = 40 marks)

Part B

Answer all questions.

Each question carries 12 marks.

11. (a) Explain the historical perspective of value engineering.

Or

- (b) Value analysis is a remedial process while value engineering is a preventive process. Discuss.

Turn over

12. (a) What are the general reasons for replacement? What are the factors to be considered for replacement?

Or

(b) Explain any two methods for replacement analysis.

13. (a) State and explain in brief the steps involved in method study procedure.

Or

(b) How job evaluation affects human relations in industry ?

14. (a) State the duties of the following in connection with industrial safety.

(i) Plant safety inspector.

(ii) Plant Supervisor.

Or

(b) What do you mean by ergonomics? Explain the objectives and applications of ergonomics.

15. (a) What do you mean by cost control? Explain the various steps involved in the process of cost control.

Or

(b) Explain the concepts of single sampling and double sampling plan.

(5 × 12 = 60 marks)

F 3172

(Pages : 2)

Reg. No.....

Name.....

B.TECH. DEGREE EXAMINATION, DECEMBER 2012

Seventh Semester

Branch : Mechanical Engineering/Automobile Engineering

REFRIGERATION AND AIR CONDITIONING (MU)

(Regular/Supplementary/Mercy Chance)

Time : Three Hours

Maximum : 100 Marks

Use of R and AC tables, charts and steam tables are permitted.

Part A

Answer all questions.

Each question carries 4 marks.

1. Distinguish between refrigerator and heat pump.
2. List the types of refrigerants.
3. How will you determine COP of a vapour compression system ?
4. Define 'under cooling'.
5. Briefly discuss the importance of cryogenics.
6. What is the difference between refrigeration and water cooling ?
7. Briefly discuss : flooded evaporators.
8. Define adiabatic efficiency of a reciprocating compressor.
9. Write a note on comfort chart.
10. Briefly discuss the principle of working of a humidifier. (10 × 4 = 40 marks)

Part B

Each question carries 12 marks.

11. Sketch and explain a Bell-Coleman Cycle. Derive an expression for COP and capacity work. (12 marks)
- Or*
12. Discuss the various refrigeration methods. Discuss any *three* conventional refrigeration systems. (12 marks)
 13. Discuss the method of multi-stage vapour compression system. Also discuss the process of multiple compression and evaporation system cascading. (12 marks)
- Or*
14. Explain the advanced vapour compression system, with a neat diagram. Also, represent the associated cycle on T-S and P-H diagrams. (12 marks)

Turn over

15. Explain the various properties of a refrigerant. Discuss the suitability of refrigerants to different applications.

(12 marks)

Or

16. With neat sketches, explain :

(a) Lithium bromide system.

(6 marks)

(b) Electrolux system.

(6 marks)

17. (a) Explain the different types of expansion devices used in refrigeration.

(6 marks)

(b) Differentiate between single-stage and multi-stage reciprocating compressors.

(6 marks)

Or

18. Explain the principle of working of :

(a) Hermetic ;

(b) Semi hermetic ; and

(c) Open type refrigeration compressors.

(12 marks)

19. Define 'Sensible' heat factor'. Discuss any *three* psychrometric processes and explain their applications.

(12 marks)

Or

20. Discuss :

(a) Year round air conditioning.

(4 marks)

(b) Air distribution.

(4 marks)

(c) Design of air duct systems.

(4 marks)

[5 × 12 = 60 marks]