

Total No. of Questions : 12]

[Total No. of Pages : 2

P1114

[3564]-159

B.E. (Production)

PLANT ENGINEERING AND MAINTENANCE (Elective - I)

(2003 Course) (411085)

Time : 3 Hours]

[Max. Marks : 100

Instructions to the candidates:

- 1) *Answer three questions from Section I and three questions from Section II.*
- 2) *Answers to the two sections should be written in separate books.*
- 3) *Neat diagrams must be drawn wherever necessary.*
- 4) *Use of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam tables, is allowed.*
- 5) *Assume suitable data, if necessary.*

SECTION - I

Unit - I

- Q1)** a) What factors will be considered for the site selection for the following.
i) Steel Industry ii) Two wheeler manufacturing unit. [8]
b) Environmental and Ecological aspects are assuming growing importance while making decision on plant location. Explain and illustrate with suitable examples. [8]

OR

- Q2)** a) Describe the factors that should be taken into account in deciding the location of plant. [8]
b) In your opinion which aspects should be covered by a plant engineering department in a manufacturing unit. [8]

Unit - II

- Q3)** a) Discuss in brief main steps involved in systematic layout planning. [10]
b) Write short notes on: i) Use of computer in planning and evolving layout.
ii) Symptoms of bad layout. [8]

OR

- Q4)** a) Briefly explain two disposal methods of solid waste. [8]
b) Explain in short the various fire prevention practices. [10]

Unit - III

- Q5)** a) 'Reciprocal relationship' exists between plant layout and material handling. Comment? [8]
b) What factors you will consider if you are asked to improve the material handling system? [8]

P.T.O.

OR

- Q6)** a) Write short notes on: i) Maintenance of auxiliary services ii) Duties of safety officer. [8]
b) Explain in brief the recycling of disposal in industries? [8]

SECTION - II

Unit - IV

- Q7)** a) How can maintenance organisation be made more effective in today's industrial growth environment. [8]
b) Briefly describe the maintenance information system used for maintenance functions. [8]

OR

- Q8)** a) How does condition monitoring influence the maintenance activity function? Explain - [8]
b) What should be the objective of maintenance management for successful working of a maintenance department? [8]

Unit - V

- Q9)** a) How can the chemical effect be useful in assessing the condition of equipment? Explain briefly. [8]
b) Describe the various types of lubrication system used in practice? [8]

OR

- Q10)** a) Discuss the factors which need to be considered for implementation of an efficient spare parts control system? [8]
b) Discuss the various maintenance material management policies being followed presently. [8]

Unit - VI

- Q11)** a) What is reliability? Discuss various reliability models used in practice for maintenance of equipments? [8]
b) Write short notes on
i) Total Productive Maintenance (TPM)
ii) Reliability Centered Maintenance (RCM) [10]

OR

- Q12)** a) Explain how computers can be helpful in discharge of maintenance functions. [10]
b) What is MTBF? Describe a typical example where MTBF concept can be applied? [8]



P1112

[3564]-155

B.E. (Production & Prod. S/W)

MANUFACTURING AUTOMATION AND CONTROL

(2003 Course)

Time : 3 Hours]

[Max. Marks : 100

Instructions to the candidates:

- 1) *Answer 3 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 logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.*
- 6) *Assume suitable data, if necessary.*

SECTION - I

- Q1)** a) A pump has a displacement of 20 cm³/rev. is driven at 1440 rpm and 120 bars. The volumetric efficiency is 0.90 and overall efficiency is 0.8. Calculate: **[6]**
- i) Pump delivery in litres per minute.
 - ii) The input power at pump shaft in kW.
 - iii) Drive torque at pump shaft.
- b) Explain three basic types of filtering methods used in hydraulic systems. **[6]**
- c) Explain with neat sketch, the working of four way two position direction control valve. **[4]**

OR

- Q2)** a) A mass of 3000 kg is to be accelerated from rest to a velocity of 2 m/s over a distance of 65 mm. Calculate the bore diameter of cylinder if the coefficient of friction between load and guide is 0.15. **[6]**
- b) For a swash plate type pump following data operates:
- Number of pistons = 6.
- Piston diameter = 30 mm.
- Pitch circle diameter of cylinder = 180 mm.
- Input power = 8 kW.
- Volumetric efficiency = 90%.
- Mechanical efficiency = 85%.

P.T.O.

Calculate theoretical pump displacement and angle of swash plate if the maximum pressure and speed at which pump operates is 160 bar and 1440 rpm. respectively. [6]

- c) Draw a neat sketch of balanced piston relief valve and explain its working. [4]

Q3) a) A hydraulic system has a circuit demand for flow 30 litres per minute between 5 to 15 seconds at 170 bar, and 25 litres per minutes between 25-40 seconds. Design size of accumulator and pump if the total cycle time is 55 sec. Assume isothermal expansion and compression of gas. [10]

- b) Draw a neat sketch and explain working of sequencing circuit. [6]

OR

Q4) a) A hydraulic system requires 280 litres per minute at 30 bar pressure for some part of cycle and 25 litres per minute at 250 bar pressure for another part of cycle. Calculate the size of pump and input energy to pump if intensifier is used in circuit. [4]

- b) Explain with neat sketch functions of various elements used in hydraulic reservoir. [8]

- c) What is cylinder cushioning? What is its purpose? [4]

Q5) a) Draw a pneumatic circuit to actuate the cylinder if sensors C & D are in same state (ON or OFF) as that of sensor B and sensor A is in opposite state. [8]

- b) How pneumatic actuators differ from hydraulic actuators? [4]

- c) What is a function of twin pressure valve? Draw any suitable pneumatic circuit showing its application. [6]

OR

Q6) a) Explain the NOR/OR and AND/NAND gates with suitable examples. [10]

- b) Explain with neat sketches the cylinder mountings used in pneumatic systems. [8]

SECTION - II

Q7) a) Explain the operation of PLC with suitable sketch. [8]

- b) Draw pin diagram of 8085 microprocessor and explain the function of each block. [8]

OR

- Q8)** a) Draw a ladder diagram that can be used to start a motor and then after a delay of 100 seconds start a pump. When the motor is switched off there should be a delay of 10 seconds before the pump is switched off. [8]
- b) Explain for microprocessor, the roles of [8]
- i) Accumulator.
 - ii) Memory address.
 - iii) Program counter registers.
- Q9)** a) A PI controller has $K_p = 6$, $K_i = 2S^{-1}$. The controller output for no error ($P_i(O) = 25\%$). Plot the controller output as a function of time for an error given by figure 1. [10]

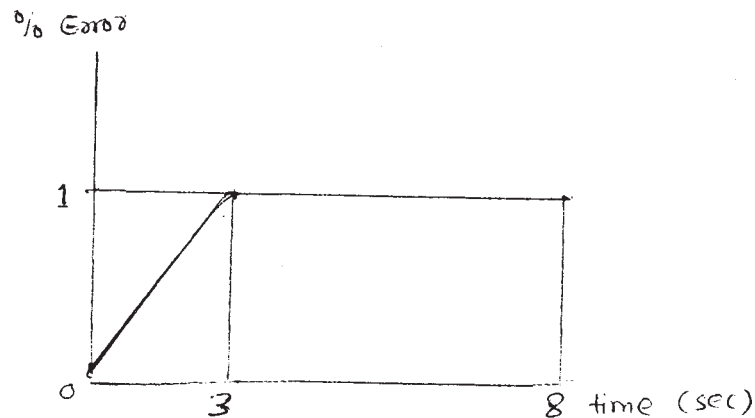


Figure 1

- b) Explain analog to digital conversion. [6]

OR

- Q10)** a) Explain with suitable example the use of counters in PLC? [8]
- b) What are the criteria for selection of a PLC? [4]
- c) A sensor gives a maximum analogue output of 5V. What word length is required for an ADC if there is to be resolution of 10 mV? [4]
- Q11)** a) Explain use of automation in assembly system. What do you mean by design for automated assembly? [8]
- b) Explain with neat sketch vibratory bowl feeders. [6]
- c) What factors should be considered while deciding the type of transfer device to be used in automated system? [4]

OR

Q12) Write short notes on:

[18]

- a) Automated warehouse.
- b) Indexing mechanisms.
- c) Low cost automation.



Total No. of Questions : 12]

[Total No. of Pages : 2

P1111

[3564]-153

B.E. (Production)

PRODUCTION MANAGEMENT

(2003 Course)

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) Assume suitable data, if necessary.*

SECTION - I

Unit - I

- Q1)** a) Differentiate between production & production management. Explain in brief objectives of production management. [8]
b) Explain the different stages of product design (Development) process. [8]

OR

- Q2)** a) Explain product life cycle in detail. [8]
b) Draw a functional organisational structure for a multi-product organisation for a large scale business. Explain in brief. [8]

Unit - II

- Q3)** a) What are the principles of Material Handling? Explain. [8]
b) How material handling equipments are classified? Explain different material handling equipments used in industries. [8]

OR

- Q4)** a) What are the different quantitative methods/models used in solving facility layout problem. [8]
b) Explain different types of plant layouts. [8]

Unit - III

- Q5)** a) What is manpower forecasting? What are the factors which affect manpower forecasting? [9]
b) What are the different manpower forecasting techniques used in industry? Explain any two in detail. [9]

OR

P.T.O.

- Q6)** a) Define productivity and explain Productivity Improvement Programme (PIP) in detail. [9]
b) With the help of block diagram the process of capacity planning. [9]

SECTION - II

Unit - IV

- Q7)** a) Explain Hall's frame work of "Value Added Engineering". [8]
b) Explain present senario of world class manufacturing in Indian Industry. [8]

OR

- Q8)** a) What are the seven wastes suggested by Shigeo (1981) & how these are eliminated? [8]
b) Explain with block diagram manufacturing Excellence & World Class Manufacturing (WCM) concept. [8]

Unit - V

- Q9)** a) Explain in brief authorization and control in maintenance management. [8]
b) Differentiate between Preventive & Breakdown maintenance. [8]

OR

- Q10)** a) Explain the concept of Total Productive Maintenance (TPM) in brief. [8]
b) How maintenance cost is estimated? Explain. [8]

Unit - VI

- Q11)** a) Explain, what is "Green Manufacturing"? [9]
b) Define Energy Conservation, with its opportunities & measures in brief. [9]

OR

- Q12)** a) "Environment & Ecology is badly affected by rapid industrialization". Explain this statement in brief. [9]
b) Explain the features of Lean Manufacturing with its benefits & demerits. [9]



P1179

[3564] - 20

B.E. (Production)

MATERIALS MANAGEMENT (Elective - I)

(1997 Course) (411085)

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 logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.*
- 6) Assume suitable data, if necessary.*

SECTION - I

- Q1)** a) Explain ABC analysis. [8]
b) Explain various types of inventories. [8]
- Q2)** a) Explain various elements of inventory carrying cost. [8]
b) Derive an equation for 'Economic Order Quantity'. State the assumptions. [8]
- Q3)** a) Explain lead time. State the elements of lead time. [8]
b) A company uses 150 numbers of an item per month. Each units costs the company Rs. 50. The procurement cost is computed at Rs. 36 and the inventory carrying cost is 18% of average inventory investment. Calculate economic order quantity and number of orders. [8]
- Q4)** Write short note on: (Any Three) [18]
a) Vendor Rating.
b) Vendor development.
c) Two documents in purchasing activities.
d) JIT purchasing.

SECTION - II

- Q5)** a) Explain safety stock. What are different factors to be considered while considering safety stock. [8]
b) Explain 'Fixed Order Quantity' system of replenishment. [8]
- Q6)** a) Explain 'Fixed Order Interval' system of replenishment. [8]
b) Explain 'Two Bin System' of replenishment. [8]
- Q7)** a) Explain the disposal system to dispose off the surplus and obsolete items. [8]
b) A company uses 24000 units of an item per year. Each item is produced at Rs. 16 per unit. The set up cost calculated is Rs. 96. The inventory carrying cost is 15% of average inventory investment. Determine economic batch quantity and number of production run. [8]
- Q8)** Explain and differentiate between: [18]
a) Centralised store and decentralised store.
b) Annual stock taking and continuous stock taking.



Total No. of Questions : 12]

[Total No. of Pages : 3

P1205

[3564]-172

B.E. (Production and Industrial Engineering)

DIE AND MOULD DESIGN

(2003 Course) (411122)

Time : 3 Hours]

[Max. Marks : 100

Instructions to the candidates:

- 1) *From Section-I solve Q. 1 or Q. 2, Q. 3 or Q. 4, Q. 5 or Q. 6 and from Section-II solve Q. 7 or Q. 8, Q. 9 or Q. 10, Q. 11 or Q. 12.*
- 2) *Answers to the two sections should be written in separate answer book.*
- 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

Unit - I

- Q1)** a) What are the problems in rolling? Explain it with neat sketch. [9]
b) Explain the difference between direct and indirect extrusion. [7]

OR

- Q2)** Write short note on any three : [16]
a) Wire drawing die.
b) Impact extrusion.
c) Defects and remedies in rolling.
d) Roll passes design for any structural shape.

Unit - II

- Q3)** a) What is OBI? What are the advantage, limitation and application of OBI? [8]
b) How presses are classified on the basis of number of slide explain with neat diagram. [8]

OR

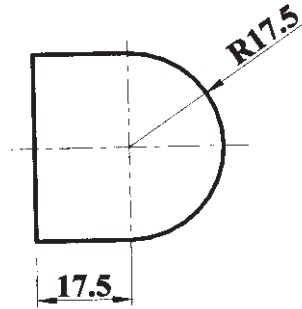
- Q4)** a) Explain difference between compound and combination die with neat sketch. [8]
b) Differentiate mechanical and hydraulic presses. [8]

P.T.O.

Unit - III

Q5) Design simple die for the component shown in fig.1

[18]



Material: 1mm thick
Shear strength: 280MPa
Fig:- 1

OR

Q6) Progressive die design.

- a) Draw assembly drawing with locating element of a progressive die for the component shown in fig.2 [6]
- b) Draw strip layout and find out material utilization. [4]
- c) Find out cutting force at each station and press tonnage. [4]
- d) Design and draw die. [4]

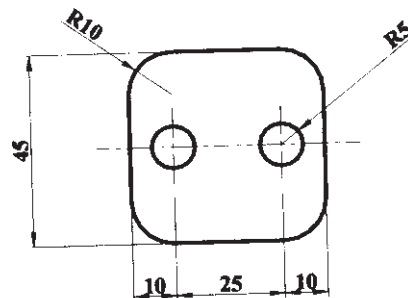


Fig: 2
Material: Al, 2mm thick
Shear strength 190MPa

SECTION - II

Unit - IV

- Q7)** a) Explain the difference between close die forging and open die forging. [8]
- b) Explain with neat sketch working of board drop hammer also state its advantages and disadvantages. [8]

OR

Q8) Write short note on any three : [16]

- a) Forgeability.
- b) Rotary swaging.
- c) Isothermal forging.
- d) Friction in forging.

Unit - V

Q9) Explain with neat sketch (any three) : [16]

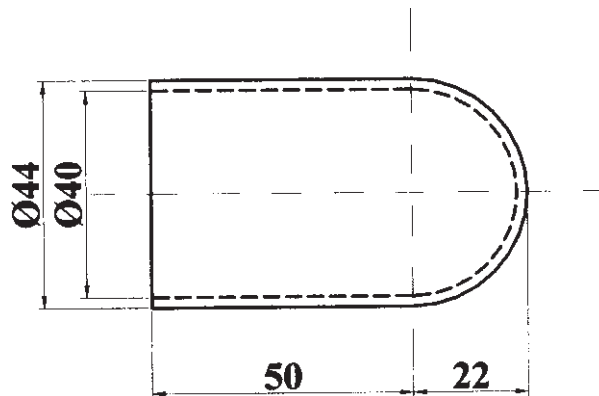
- a) Types of plastic.
- b) Transfer moulding.
- c) Compression moulding.
- d) Injection moulding for thermoplastics.

OR

Q10)a) Explain with neat sketch blow moulding process. [10]

b) How injection moulding machines are specified? [6]

Q11) For the component shown in fig. an injection mould is required. Design the single impression mould for component. [18]



OR

Q12)a) Explain ejection system in injection moulding. [10]

b) Explain any four types of gate. [8]



Total No. of Questions : 12]

[Total No. of Pages : 2

P1204

[3564]-170

B.E. (Production Sandwich)

ERGONOMICS AND HUMAN FACTORS IN ENGINEERING

(411122) (2003 Course)

Time : 3 Hours]

[Max. Marks : 100

Instructions to the candidates:

- 1) Answer three questions from Section-I and three questions from Section-II.*
- 2) Answers to the two sections should be written in separate books.*
- 3) Figures to the right indicate full marks.*

SECTION - I

Q1) Solve the following : **[18]**

- a) Write a note on luminance ratio.
- b) Find out relationship between standard performance and AWL.
- c) Differentiate between discomfort glare and disability glare.
- d) Discuss relationship between human error, mental workload and display design.

OR

Q2) a) Define Ergonomics. State objective and doctrine of ergonomics. **[10]**

b) Explain the basis of ergonomic problem identification. **[8]**

Q3) a) What is bio-mechanics? Explain in brief. **[8]**

b) Explain the significance of warnings in brief. **[8]**

OR

Q4) a) What are requirements for designing a reasonably safe product? **[8]**

b) What are human machine systems? Explain its types and their characteristics. **[8]**

Q5) a) Differentiate between static dimensions and dynamic dimensions. **[8]**

b) Explain various limits for MMH task design. **[8]**

OR

Q6) a) Explain science of seating. How to promote lumbar lordosis? **[8]**

b) Explain the principle of arrangement of components. **[8]**

P.T.O.

SECTION - II

- Q7)** a) Explain the principles of ergonomics design. [4]
b) Describe considerations for multifunction hand controls [8]
c) Is it necessary in hand tool design to avoid tissue compression stress? [4]

OR

- Q8)** a) Explain the concept of control response ratio in detail. [8]
b) Explain the significance of special control devices in ergonomics design. [8]
- Q9)** a) Differentiate between aerobic capacity and anaerobic capacity. [8]
b) Describe cardiovascular and respiratory response in work physiology. [8]

OR

- Q10)** a) Write a note on work cycles and rest cycle. [4]
b) Describe factors affecting energy consumption. [4]
c) Write a note on energy consumption and efficiency during work. [8]
- Q11)** Explain the following PMTS in details determining the variants and suitability of each : [18]
a) Work Factor System.
b) Methods Time Measurement.
c) MOST.

OR

- Q12)** a) Explain VDT. Explain its contribution in HFE. [6]
b) Describe Mento Factor System and its significance. [6]
c) Discuss effects of noise on performance. [6]

☒☒☒☒

P1203

[3564]-169

B.E. (Production and Industrial Engineering)

MECHATRONICS AND ROBOTICS

(2003 Course) (411121) (Theory)

Time : 3 Hours]

[Max. Marks : 100

Instructions to the candidates:

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

SECTION - I

- Q1)** a) Identify the various elements that might be present in a control system involving a thermostatically controlled electrical heater. [6]
- b) What is filtering? Classify and explain the filters according to the frequency ranges they transmit or reject. [6]
- c) What is DAC? Explain the terms used to specify a DAC. [6]

OR

- Q2)** a) If a thermocouple gives an output of $0.5\text{mV}/^{\circ}\text{C}$. What will be the word length required when its output passes through an ADC if temperatures from 0 to 200°C are to be measured with a resolution of 0.5°C ? [6]
- b) Explain the following : [6]
- i) Summing Amplifier.
 - ii) Integrating Amplifier.
- c) While dealing with the transmission of low level DC signals from sensors, the gain of an operational amplifier used to amplify them may drift and so the output also drifts. What are the ways to overcome this problem? [6]

- Q3)** a) Define : [12]
- i) TTL.
 - ii) CMOS.
 - iii) Digital Logic.
 - iv) Parity method for error detection.

P.T.O.

- b) Explain for a microprocessor, the roles of [4]
i) Accumulator.
ii) Status.

OR

- Q4)** a) What is Karnaugh map? For what it is used? [4]
b) Explain what logic gates might be used to control the following situations: [4]
i) There is an output when switch A is closed and either switch B or switch C is closed.
ii) There is an output when either switch A or switch B is closed and either switch C or switch D is closed.
iii) There is an output when either switch A is opened or switch B is closed.
iv) There is an output when switch A is opened and switch B is closed.
c) Draw a block diagram of a basic microcontroller and explain the function of each subsystem. [8]
- Q5)** a) What is an Instruction set? State and explain any four commonly used instructions that may be given to a microprocessor. [8]
b) Explain the following : [8]
i) Buffers.
ii) Handshaking.
iii) Polling and interrupts.
iv) Serial interfacing.

OR

- Q6)** a) Write an algorithm and a program in assembly language for determination of highest pressure among the list of given pressures. [8]
b) Describe the functions that can be required of an interface. [4]
c) Explain the function of an initialization program for a PIA. [4]

SECTION - II

- Q7)** a) Explain the basic structure of a PLC. [6]
b) Define ladder diagram. Explain any three logic functions with the help of ladder diagram. [4]
c) Explain the following terms of transducer performance : [6]
i) Non-linearity error.
ii) Dead band.
iii) Output Impedance.

OR

- Q8)** a) Explain with example, the following with respect to PLC : [9]
- i) Latching.
 - ii) Sequencing.
 - iii) Timers.
- b) What is the principal difference in measurement of an angular displacement between the results obtained by an Incremental shaft encoder and an absolute shaft encoder? [4]
- c) Explain in detail the Pyroelectric sensor. For what purpose a dual element is needed? [3]
- Q9)** a) Explain how a thyristor can be used to control the level of a DC voltage by chopping the output from a constant voltage supply. [4]
- b) Explain the following : [9]
- i) Hydraulic power supply.
 - ii) Spool Valve.
 - iii) Control of single acting cylinder.
- c) Draw a mechanical system which can be used to : [3]
- i) Operate a sequence of microswitches in a timed sequence.
 - ii) Move a tool at a steady rate in one direction and then quickly move it back to the beginning of the path.
 - iii) Transform a rotation through some angle into a linear displacement.

OR

- Q10)** a) Classify and explain the A.C. motors. [6]
- b) Explain Process control valves. [4]
- c) Explain the following mechanisms with specific example as an actuator : [6]
- i) Rack and pinion.
 - ii) Ratchet and pawl.
 - iii) Reversed belt drive.
- Q11)** a) Discuss the factors in the selection and design of grippers. [9]
- b) State the desirable features of sensors. List any six sensor devices used in robot workcells and discuss their uses. [9]

OR

- Q12)**a) Name the four types of path control and compare them with applications. **[6]**
- b) Discuss in detail, the essential features of Robot in following applications : **[12]**
- i) Loading/Unloading.
 - ii) Spray coating.
 - iii) Continuous arc welding.



P1200

[3564] - 154

B.E. (Prod. S/W)

MACHINE TOOL DESIGN

(411082) (2003 Course)

Time : 3 Hours]

[Max. Marks : 100

Instructions to the candidates:-

- 1) Attempt one question from each unit of Section - I and Section - II.*
- 2) Answers to the two sections should be written in separate books.*
- 3) Figures to the right indicate full marks.*
- 4) Neat diagrams must be drawn wherever necessary.*
- 5) Use of non-programmable electronic pocket calculator and statistical tables is allowed.*
- 6) Assume suitable data, if necessary.*

SECTION - I

UNIT - I

- Q1)** a) Discuss in detail with suitable example the modern trends in the designing of machine tool. **[7]**
- b) Show that for geometric progression ratio (ϕ), the value lies between 1 & 2. Also prove that maximum loss of economic cutting speed is constant in geometric progression. **[9]**
- c) Write a note on "Optimum Ray Diagram". **[4]**

OR

- Q2)** a) Design the gear box with the following data: **[14]**
- Number of speed steps : 8
- Number of transmission stages: 3
- Geometric progression ratio (ϕ) : 1.55
- Minimum speed: 45 rpm
- Power of motor: 2 KW
- Speed of motor : 1440 rpm
- Draw the structural diagram, speed chart and layout of the gear box.
- b) What are the design considerations in design of feed gear box? **[6]**

P.T.O.

UNIT - II

- Q3)** a) Why rigidity is important consideration in machine tool structure? How rigidity can be improved in an existing machine tool. [7]
b) During the drilling operation on a radial drilling machine, analyze the different forces acting on the radial arm. Explain the procedure to design the radial arm. [8]

OR

- Q4)** a) Give the comparative evaluation of machine tool structures on the basis of: [8]
i) Materials for machine tool structures
ii) Static and dynamic stiffness
iii) Profiles of machine tool structures.
b) Derive the expression for the optimum design criterion for selection of mild steel and cast iron as material for machine tool structures, based on strength and rigidity. [7]

UNIT - III

- Q5)** a) Show that the rigidity of the hydro-dynamically lubricated slides is always less than that of hydro-static slide way. [7]
b) The lead screw of a lathe having square threads is required to exert an axial force of 25 kN to the carriage. The thrust is carried by the means of a collar. Length of lead screw is 1500 mm. The coefficient of friction at the collar and nut are 0.1 and 0.12 respectively. The ratio of height of nut to the screw diameter is 2.5. Allowable bearing pressure on threads is 4 N/mm² and factor of safety is 6. Design the screw and nut. If the screw rotates at 25 rpm, find the power required to drive it. [8]

OR

- Q6)** a) Give the classification and explain the different types of slide-ways used in machine tools. [7]
b) Describe the various methods used for compensation of wear on guides. [8]

SECTION - II

UNIT - IV

- Q7)** a) Discuss the common requirements of spindle support. [7]
b) Why it is essential to preload the bearings of spindle mountage? [5]
c) Explain with sketches the methods of preloading a ball screw. [8]

OR

- Q8)** a) Comment on the selection of antifriction bearing as spindle support. [7]
b) Describe the various elements of a spindle unit used in milling machine. Draw the neat sketch of the arrangement. [8]
c) Compare hydrostatic and hydrodynamic bearings in machine tools. [5]

UNIT - V

- Q9)** a) What do you understand by stick-slip motion? Explain with a suitable example. [7]
b) What do you understand by open and close type hydraulic circuits? Explain the factors used for selecting fluids for hydraulic system. [8]

OR

- Q10)** a) With the help of schematic diagram explain the working principle of hydraulic pre-selective control system. [7]
b) What are the advantages and disadvantages of hydraulic devices and hydraulic control system in machine tools? [8]

UNIT - VI

- Q11)** a) Compare NC, CNC and conventional machine tools on the basis of performance, reliability, rate of production, maintenance and economical considerations. [8]
b) Write brief note on “Retrofitting of Machine Tools”. [7]

OR

- Q12)** a) Explain the methodology of matrix for optimizing the machine tool layout. [7]
b) What is meant by regenerative chatter? Explain it with reference to any type of machine tool. [8]



P1181

[3564]-26

B.E. (Prod/SW)

**INDUSTRIAL RELATIONS & MANUFACTURING
MANAGEMENT**

(1997 Course) (411125)

Time : 3 Hours]

[Max. Marks : 100

Instructions to the candidates:

- 1) Answer any 3 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 logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.*
- 6) Assume suitable data, if necessary.*

SECTION - I

- Q1)** a) Discuss the role of trade unions in maintaining good industrial relations. Differentiate between Recognised & Registered trade union. [8]
- b) Discuss the salient features of 'The Indian Trade Union Act'. [8]
- Q2)** a) Discuss the provisions for settlement of dispute under the 'Industrial Dispute Act, 1947'. [8]
- b) Explain the nature of grievances of industrial workers and the procedure laid down for their redressal. [8]
- Q3)** a) What is collective bargaining? Discuss its effect on the industrial relations. [8]
- b) What are financial & non financial incentives? How they improve the industrial relations? [8]
- Q4)** Write short notes on any three : [18]
- a) Causes & effect of strained labour relations.
 - b) Characteristics of Indian Industrial Labour.
 - c) Lay-off & retrenchment.
 - d) Group wage system.
 - e) Industrial psychology.

SECTION - II

Q5) a) Explain the role played by the following departments in manufacturing management. [9]

- i) Design
- ii) Marketing
- iii) Purchase.

b) Find out sequence of jobs that will minimize the total elapsed time on machines A & B. Also find out that value. [7]

Job	–	1	2	3	4	5
Machine A	–	13	16	8	10	15
Machine B	–	9	15	10	9	9

Q6) a) State the role played by safety engineering in industry. State it's objectives. [8]

b) Discuss the types of Maintenance. [8]

Q7) a) Write the characteristics of 'Project type production' & compare it with Batch type production. [8]

b) Discuss the main functions of production planning & control. [8]

Q8) Write short notes on (any three) : [18]

- a) Man power & capacity planning.
- b) MRP I & II.
- c) Productivity measurement.
- d) Factory site selection.
- e) Break-even analysis.



P1180

[3564]-25

B.E. (Production)

ADVANCES IN MATERIAL PROCESSING

(1997 Course) (Elective - II)

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.*

SECTION - I

- Q1)** a) Differentiate Hot, warm, cold forging method. [9]
b) Explain with neat sketch isothermal forging & compare it with precision forging. [8]
- Q2)** a) Explain with neat sketch the different types of circuit used in EDM for spark generation. [9]
b) What is mean by high speed machining? State their salient features. [8]
- Q3)** a) What is dynamic turning? Compare it with ordinary turning operation. [8]
b) Draw the typical die motion in rotary forging? Explain how to get the forged product through it? [8]
- Q4)** a) Explain with neat sketch. [8]
i) Hot machining
ii) Hard turning.
b) Explain with neat sketch how will you achieve high grindability in modern grinding operation. [8]

SECTION - II

- Q5)** a) Write note on : [9]
i) Methods to remove rust and scale from ferrous products.
ii) Thermal spray coating.
b) Explain with neat sketch the steriolithography process along with advantages. [8]

P.T.O.

- Q6)** a) Describe the statistical analysis of forming process. [8]
b) What are the different type of paint? Explain the selection of paint system. [9]
- Q7)** a) What is continuous casting? Describe with sketch & application. [8]
b) What is fine blanking? Explain with suitable example and figure, how fine blanking is useful? [8]
- Q8)** a) Explain thermoforming and compare it with casting process for plastic product. [8]
b) Explain with neat sketch the injection process for plastic product. [8]



P1164

[3564]-250

B.E. (Instrumentation)

PROCESS INSTRUMENTATION - II

(1997 & 2003 Course)

Time : 3 Hours]

[Max. Marks : 100

Instructions to the candidates:

- 1) *Answer 3 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 logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.*
- 6) *Assume suitable data, if necessary.*

SECTION - I

- Q1)** a) For a typical heat exchanger liquid temperature is to be brought to T_2 °C from T_1 °C. Mention the equation which involves steam mass flow as manipulated variable. Draw instrumentation scheme for the same equation. **[10]**
- b) Which different control schemes you will suggest for question A? Which will be best one? Why? **[8]**

OR

- Q2)** a) Enlist main specifications (any 8) of a typical industrial chiller. **[8]**
- b) How chiller efficiency can be improved? **[4]**
- c) Draw basic block configuration of a typical chiller. Explain function of each block in details. **[6]**
- Q3)** a) Explain End point control method in 'Reactors'. Mention parameters used for indication of end of reaction. **[6]**
- b) Explain control scheme for controlling a reactor with End point control method. **[10]**

OR

- Q4)** a) Write basic difference in requirement of control system for Batch Reactor and continuous Reactor. **[8]**
- b) What is recipe? Why it is important for reactors? **[8]**

P.T.O.

- Q5)** a) Enlist different types of compressors and their control methods. Explain any one in details. [8]
 b) At compressor discharge side which type of manual valve (if used) will be preferred? Why? Suggest a simple solution to provide automatic draining of compressor. [8]

OR

- Q6)** a) How safety is provided for a rotary pump when pump fluid is liquid? Explain. If fluid is viscous which safety device will be used? [8]
 b) Explain how following system will work : [8]

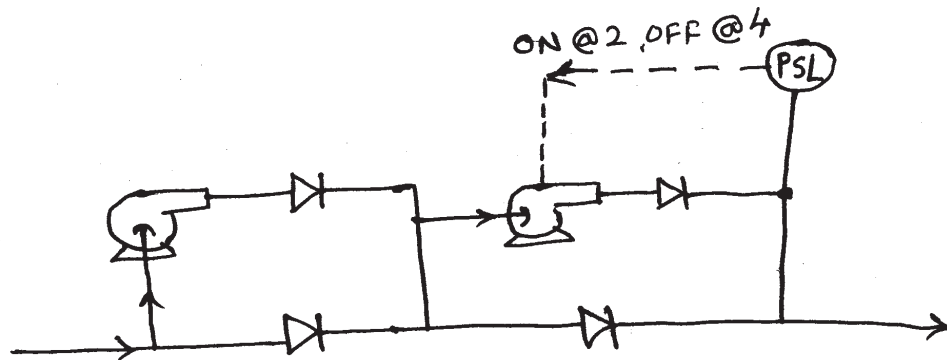


Fig. Q6-B

SECTION - II

- Q7)** a) Explain safety interlocks in Boiler. [12]
 b) What is Cross Limited Combustion Control? Explain with diagram. [6]

OR

- Q8)** a) Explain different methods of steam temperature control in Boiler. [6]
 b) What is use of superheater and desuperheater in Boiler? [6]
 c) What is use of preheater, FD, ID fans in Boiler? [6]

- Q9)** a) Develop instrumentation scheme for a distillation column where controlled variables are : Column Pressure, Level in accumulator, column bottom level. [8]
 b) Write energy balance equations with reference to given information for a distillation column : [4]

i) Given

Vapor boil-up rate - V_B

Heat addition at bottom - Q_B

Heat of vaporization in reboiler - ΔH

- ii) Distillate flow rate - D
Vapor flow rate - V above the feed tray internal reflux - Li.
- c) Select proper CM pair that will not produce much interaction from given RGA : [4]

$$A = B \begin{array}{c|cc} & C & D \\ \hline A & 0.2 & 0.8 \\ B & 0.8 & 0.2 \end{array}$$

OR

Q10) Write a complete start up procedure for a typical distillation column control system. [16]

- Q11)** a) Name typical four types of control schemes used for Evaporators. [4]
b) Explain with neat sketch any two control schemes; mentioned in part A. [12]

OR

- Q12)** a) Enlist different types of dryers. Explain instrumentation for a typical rotary dryer. [8]
b) Draw and explain instrumentation for a typical Magma crystallizer. [8]



P1163**[3564]-249**

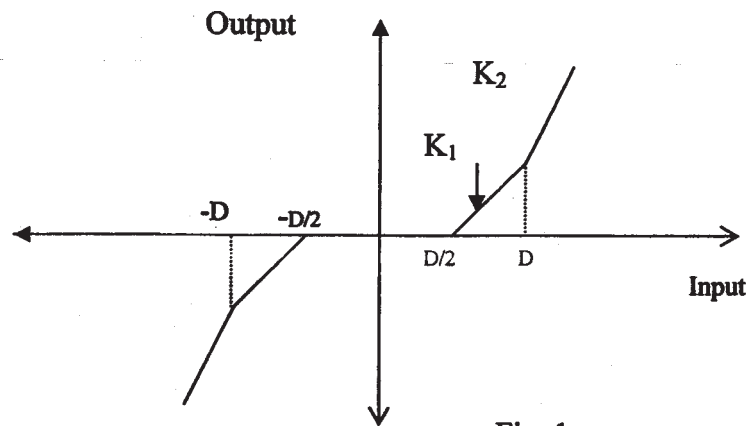
B.E. (Instrumentation & Control)
ADVANCED CONTROL SYSTEM
(Elective - I) (2003 Course)

*Time : 3 Hours]**[Max. Marks : 100**Instructions to the candidates:*

- 1) Answer 3 questions from Section I and 3 questions from Section II.
- 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 logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.
- 6) Assume suitable data, if necessary.

SECTION - I

- Q1)** a) Explain Jump Resonance with reference to soft spring and hard spring. [6]
- b) Find the Describing Function for the Nonlinear system having characteristic as shown in figure 1. [12]

**Fig. 1****OR**

- a) Explain the characteristics of phase plane method and its procedure. [8]

- b) Find Frequency and Amplitude of Limit Cycle(s) for the system as shown in figure 2. [10]

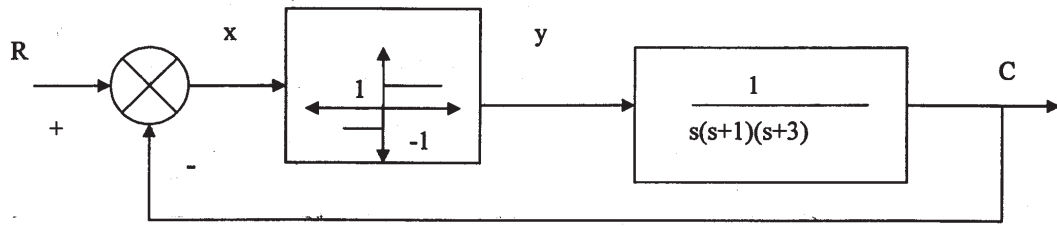


Fig. 2

- Q2) Obtain the range of gain 'K' for which given system shown in figure 3 is stable [16]

$$G(s) = \frac{10K}{s(s+2)(s+3)}$$

Investigate the stability of the system for $K = 0.1$.

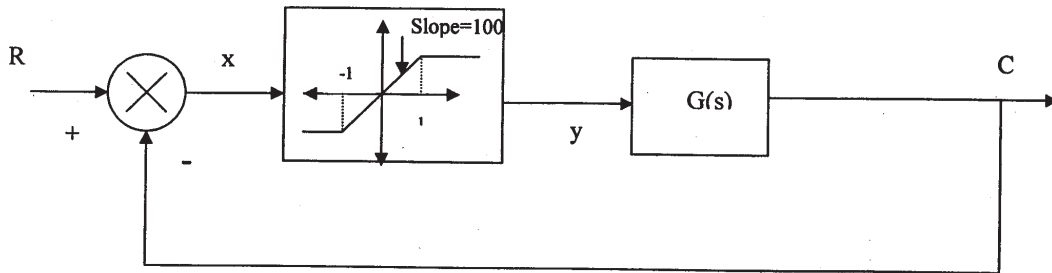


Fig. 3

OR

A control system has an amplifier which gets saturated and the characteristics is as shown in fig.4. If the linear part of the system has a transfer function

$$G(s) = \frac{50}{s(1+0.1s)(1+0.05s)}$$

Is there any possibility of oscillation? if yes, find the amplitude and frequency of oscillation. [16]

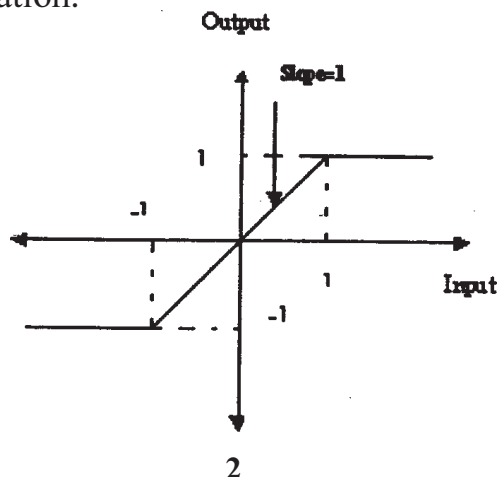


Fig. 4

Q3) Write short note on (Any Two)

[16]

- Adaptation gain in MRAS
- MIT rule MRAS
- MRAS and use of Lyapunov theory

OR

Design Model Reference Adaptive Systems (MRAS) control by using MIT rule for the pendulum system as shown in figure 5.

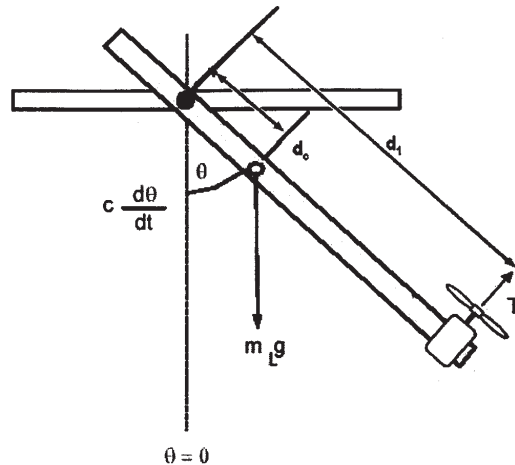


Fig. 5

Assume $J = 2$, $c = 0.06$, $d_1 = 2.89$, $d_c = 0.75$, $m = 2.44$ and $g = 9.81$

[16]

SECTION - II

Q4) a) In Self-Tuning Regulator (STR) following input output data has been obtained from real plant.

Time (t)	Input data [$u(t)$]	Output data [$y(t)$]
1	3.0	0.0
2	2.0	2.0
3	4.0	-1
4	3.0	2.0
5	2.0	0.71

Use any regression method to fit model with the structure

$$y(t) + ay(t-1) = bu(t-1) + e(t)$$

where $e(t)$ is error signal.

[10]

b) Explain Self tuning regulator with reference to controller design and parameter estimation mechanism.

[8]

OR

Write short note on following

[18]

- a) Direct self tuning regulator.
- b) Continuous time self tuners.
- c) Linear Quadratic self tuning regulator.

Q5) Enlist the different industrial products, which incorporate adaptive control techniques. Explain each in short. [16]

OR

- a) Explain Level control of a reactor using adaptive control technique. [8]
- b) Explain Asea Brown Boveri (ABB) adaptive controller with reference to parameter estimation, control design, prior information and industrial experiences. [8]

Q6) Obtain the control law that minimizes the performance index.

$$J = \int_0^{\infty} (x_1^2 + u^2) dt$$

for the system

$$\begin{bmatrix} \frac{dx_1}{dt} \\ \frac{dx_2}{dt} \\ \frac{dx_3}{dt} \end{bmatrix} = \begin{bmatrix} 0 & 1 & 0.5 \\ 0.5 & 0.5 & 0 \\ 0 & 1 & 0.5 \end{bmatrix} \begin{bmatrix} x_1 \\ x_2 \\ x_3 \end{bmatrix} + \begin{bmatrix} 0 \\ 1 \\ 0.5 \end{bmatrix} u$$

using reduced matrix Riccati equation.

[16]

OR

Consider the plant

$$\begin{bmatrix} \frac{dx_1}{dt} \\ \frac{dx_2}{dt} \end{bmatrix} = \begin{bmatrix} 0 & 1 \\ -1 & -0.7 \end{bmatrix} \begin{bmatrix} x_1 \\ x_2 \end{bmatrix} + \begin{bmatrix} 2 \\ 0 \end{bmatrix} u$$

- a) Comment on stability of the system.
- b) Comment on controllability and observability of the system.
- c) Select the values for matrices Q and R with the constraint that they are positive definite and design a controller for the plant so as to minimize

$$J = \frac{1}{2} \int_0^{\infty} (x^T Q x + u^T R u) dt$$

Also comment on the overall system stability.

[16]



P1128

[3564] - 156
B.E. (Production)
OPERATIONS RESEARCH
(2003 Course)

*Time : 3 Hours]**[Max. Marks:100**Instructions to the candidates:*

- 1) *From Section - I Solve Q1 or Q2, Q3 or Q4, Q5 or Q6 From Section - II Solve Q7 or Q8, Q9 or Q10, Q11 or Q12.*
- 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 calculator is allowed.*
- 6) *Assume suitable data if necessary.*

SECTION - I

- Q1)** a) Define the meaning of linearity in L.P.P. Explain the following terms.
- i) Basic variable.
 - ii) Basic solution.
 - iii) Basic feasible solution.
 - iv) Degenerate solution.
 - v) Optimal basic solution. **[8]**
- b) A company producing fertilizers for garden use, markets it in three standard packing of 2 kg., 5 kg., and 10 kg. The packing is done manually and each package is also inspected. The requirements of packing and inspection times for the three packing, their profitability and total time available during the day are given in the table below.

Packing size (kg)	Packing time (min)	Inspection time (min)	Profit/kg Rs.
2	10	5	0.50
5	15	6	0.40
10	20	8	0.30
Total available time	900	450	

Assume that the company can not produce more than 350 kg of fertilizer every day and has a capability of sell. Find the product mix which will give a maximum profit. **[10]**

P.T.O.

OR

- Q2)** a) Enlist advantages of duality. How will you solve following special cases?[8]
- i) Presence of redundant constraints.
 - ii) No feasible solution.
 - iii) Unboundedness.
 - iv) Tie for leaving basic variables.
 - v) Multiple optima.
 - vi) Degeneracy.
- b) Construct the dual of the following L.P.P. and solve for the basic solution. [10]

$$\text{Minimum } Z = 28 \times S_1 + 30 \times S_2 + 32 \times S_3$$

$$\text{Subject to } S_1 + S_2 + S_3 = 5000$$

$$S_1 \leq 1500$$

$$S_2 \geq 750$$

$$S_3 \geq 1000$$

$$S_1, S_2, S_3 \geq 0$$

- Q3)** a) How will you define a transshipment model? How it differs from transportation model? [6]
- b) Four suppliers have submitted sealed bids that quote the price per case of nets delivered to four regional stores of army. The bids are summarized in table below. Supplier S4 has quoted for Region A only.

Suppliers	Region A	Region B	Region C	Region D	Maximum supply
S1	30	25	40	35	800
S2	35	32	38	40	1000
S3	28	30	35	38	1500
S4	25	--	--	--	600
Required	1000	800	1200	750	

Formulate the problem as transportation model with all constraints and solve by VAM method and check for optimality by MODI method.[10]

OR

Q4) a) Show that the optimal solution is unchanged even if we add or subtract the same constant to entries of any row/ column of cost matrix of assignment problem. [6]

b) Solve the traveling salesman problem given by following data to minimize the cost per cycle. No route exists for the values not given. [10]

$$\begin{array}{cccc} C_{12} = 16 & C_{13} = 4 & C_{14} = 12 & C_{23} = 6 \\ C_{25} = 8 & C_{34} = 5 & C_{35} = 6 & C_{45} = 20 \end{array}$$

Q5) a) Define/ explain the following terms. [6]

- i) Linear function
- ii) Nonlinear function
- iii) Convex set
- iv) Concave set
- v) Constrained optimization
- vi) Global optimum

b) Solve by Gomory's cutting plane method and also by branch and bound algorithm. [10]

$$\begin{array}{ll} \text{Maximize } Z = X_1 + X_2 \\ \text{Subject to } 3 \times X_1 + 2 \times X_2 \leq 20 \\ 6 \times X_1 + 5 \times X_2 \leq 25 \\ X_1 + 3 \times X_2 \leq 10 \\ X_1, X_2 \text{ are non negative integers.} \end{array}$$

OR

Q6) a) State the Bellman's principle of optimality, Explain in brief following terms. [6]

- i) State
- ii) Stage
- iii) Recursive function.

b) A truck can carry total 10 tons load of products. Three types of products are available for transportation. Their weights and values are tabulated below. Assume that at least one of each type must be used for transport; determine loading which will maximize total value. [10]

Item (n)	Weight (Ton/unit)	Value Rs. (Thousand/unit)
1	1	20
2	2	50
3	2	60

SECTION - II

- Q7)** a) Write a note on the following. [6]
i) Geometric programming. ii) Goal programming.
b) Find the cost/period of individual replacement policy of an installation of 300 light bulbs, given the following. [10]
i) Cost of replacing an individual bulb is Rs. 2.
ii) Conditional probability of failure is given below.

Week number	0	1	2	3	4
Conditional cumulative probability of Failure	0	0.10	0.30	0.70	1.00

Calculate cost and the number of light bulbs that would fail during each week.

OR

- Q8)** a) Describe the following replacement policies. [6]
i) For items when money value remains constant.
ii) For items when money value changes with constant rate during the period.
b) Initially all items in a system are new. Each item has a probability p of failing immediately before the end of first month of life and a probability of q of failing immediately before end of the second month (i.e. all items fail by the end of second month). If all items are replaced as they fail, show that the expected number of failure $F(x)$ at the end of month x is given by [10]

$$F(x) = \frac{N}{1+q} [1 - (-q)^{x+1}]$$

where N is the number of items in the system and $q = (1-p)$.

- Q9)** a) Explain the following terms of games theory. [6]
i) Two person zero sum game. ii) Value of game.
iii) Saddle point.
b) A self service store employs one cashier at its counter. Nine customers arrive on an average every five minutes while cashier can serve ten customers in five minutes. Assume Poisson distribution for arrival rate and exponential distribution for service time to calculate the following. [10]
i) Average time of customer is in the system.
ii) Average number of customers in queue.
iii) Average time a customer spends in the system.
iv) Average time customer waits before being served.

OR

Q10) a) Explain the following with reference to queuing models [6]

- i) M/M/1
- ii) Service discipline.

b) Solve the following game and find the value of the game. [10]

	Y_1	Y_2	Y_3	Y_4
X_1	19	6	7	5
X_2	7	3	14	6
X_3	12	8	18	4
X_4	8	7	13	-1

Q11) a) Define the terms : [6]

- i) Event.
- ii) Activity.
- iii) Float.
- iv) Slack.
- v) Critical activity.
- vi) Dummy activity.

b) Consider a PERT network data given in the table. Draw the network. Determine the variances and expected time for completion of project.

[12]

Predecessor	Successor	Optimistic time	Most likely time	Pessimistic time
10	20	6	9	12
10	50	4	7	8
20	30	14	17	20
20	40	7	10	13
20	50	3	5	9
30	70	13	18	25
40	70	12	18	25
40	60	10	14	16
50	60	9	11	12
60	70	17	20	25

OR

- Q12)** a) Differentiate between CPM and PERT. [6]
- b) List of activities for erecting a section in factory is given in table below. Job A must precede all other while Job E must follow others. Apart from this, jobs can run concurrently. [12]

Code Job	Job description	Normal		Crash	
		Duration (days)	Cost (Rs.)	Duration (days)	Cost (Rs.)
A	Lay foundation and build wall	5	3000	4	4000
B	Tile roofing	6	1200	2	2000
C	Fitting electric wiring	4	1000	3	1800
D	Plumbing work	5	1200	3	2000
E	Connect services to finish	3	1600	3	1600

- Draw the network and identify critical path.
- Crash the network fully to find out minimum duration.
- If the indirect cost is Rs. 300 per day, determine time cost trade off.



P1127

[3564] - 164

B.E. (Production Engg.)

ROBOTICS

(2003 Course) (Elective - II)

Time : 3 Hours]

[Max. Marks:100

Instructions to the candidates:

- 1) Answer : Q1 or 2, Q3 or 4, Q5 or 6 from Section I Q7 or 8, Q9 or 10, Q11 or 12 from Section II.
- 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.

SECTION - I

- Q1)** a) Draw a neat sketch of kinematic chain of a robot manipulator and state Denavit - Hartenberg matrix to relate successive link co-ordinate frames. [8]
- b) Describe role of robot in FMS. [8]

OR

- Q2)** a) Classify robots. [8]
- b) Compare work volumes of cartesian robot & spherical robot. [8]
- Q3)** a) Explain use of wrist and its various motions. [8]
- b) Comment on movement of wrist in space. [8]

OR

- Q4)** a) Differentiate between stepper motor and d. c. servomotor. [8]
- b) Explain working of optical encoder used in robots. [8]
- Q5)** a) Describe role of sensors in working of robot and selection of sensors. [9]
- b) Describe with sketch magnetic gripper. [9]

OR

- Q6)** a) The 9×9 array of pixels indicating each element as a gray level value of the pixel is given below. [10]

P.T.O.

6	7	6	7	8	12	12	12	8
9	11	13	13	13	11	13	13	9
10	13	10	15	15	15	14	11	10
9	13	14	16	16	15	15	14	10
8	13	14	16	17	15	15	14	9
9	11	15	15	15	15	15	14	8
7	14	14	14	14	14	14	14	7
8	7	6	10	12	12	8	8	8
6	7	8	9	10	11	12	13	13

- i) Construct a histogram for the array and obtain the appropriate threshold value.
 - ii) Convert the picture into black and white image.
- b) Describe Tactile sensors with sketch. [8]

SECTION - II

- Q7)** a) Explain following commands [8]
 GRASP 10, 100
 DEPART P1 50
 SPEED 40 IPS
 MOVE P2
- b) Explain various elements in calculation of cycle time and production rate for a single machine robotic cell. [8]

OR

- Q8)** a) Describe lead through programming technique. [8]
- b) What are various languages used for programming of robots. State their advantages. [8]
- Q9)** a) Describe application of robots in
 i) Assembly ii) Spot welding. [8]
- b) Comment on safety aspects while using robots. [8]

OR

- Q10)** a) Describe [8]
 i) Robots in handling radio active materials.
 ii) Robots for spray painting.
- b) Describe three laws of robots and safety considerations. [8]

- Q11)** a) Write note on Telerobots. [8]
b) Describe applications of telerobots. [10]

OR

- Q12)** a) How are different elements connected in Telerobots. [8]
b) i) Write short note on control of Telerobots through computer. [5]
ii) What are mobile robots? [5]



Total No. of Questions : 6]

[Total No. of Pages : 4

P1124

[3564]-177

**B.E. (Production S/W)
PROJECT MANAGEMENT
(2003 Course) (411125)**

Time : 3 Hours]

[Max. Marks : 100

Instructions to the candidates:

- 1) Answers to the two sections should be written in separate books.*
- 2) Figures to the right indicate full marks.*
- 3) Use of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.*
- 4) Assume suitable data, if necessary.*
- 5) All questions are compulsory.*

SECTION - I

- Q1)** a) Define Project. Explain different parameters involved in project identification. **[12]**
- b) What are the considerations to establish project under public sectors?[4]

OR

- a) What do you understand by Project Management? How project management is different from standard routine production? **[12]**
- b) Explain Socio-Economic factors for considering project establishment? **[4]**

- Q2)** a) Explain different types of projects? What are the benefits occurring for establishing project in MIDC Area? **[10]**
- b) What are the factors involved in balancing project? Why it is needed? **[6]**

OR

Explain following with respect to project management: **[16]**

- i) Modernization
- ii) Replacement
- iii) Expansion
- iv) Diversification

P.T.O.

- Q3)** a) A bottling plant required to establish in Pune region. Marketing & sales department identified a estimated sales of 2000 bottles per day. Prepare a detailed feasibility report. [12]
- b) Define the term Budgeting. What are the requirements for an effective budgeting? [6]

OR

- a) Explain criteria for pre-investment decision to establish a new project? [12]
- b) Why import substitution projects are required? List the items you suggest for import substitution. [6]

SECTION - II

- Q4)** a) What are the sources of finance for developing new project? How retained equity earnings help to develop sources? [10]
- b) Explain following terms with respect to sources of finance. [6]
- i) Debentures
 - ii) International Financial Corporation
 - iii) Trade Credit

OR

- a) Explain Project Appraisal Concepts with respect to Techno Commercial & Rate of Return approach. [10]
- b) Calculate Rate of Investment from following data. [4]
- Sales = Rs. 1,80,000/-
Profit = Rs. 18,000/-
Investment or capital employed = Rs. 90,000/-.
- c) What are non-financial benefits occurring for running projects? [2]

- Q5)** a) A cast iron foundry employs thirty persons. It pays rate of payment Rs. 10 per hour. Find labour cost/month considering 25 days of working in a month. [4]
- b) Explain the method of computing project cost by using cost of contract, labour & equipment cost. [12]

OR

- a) What is the need of development and codification of cost data? Explain its significance in Project Management? [12]
- b) Explain Activity Based Costing by suitable example. [4]

Q6) A small project is composed of seven activities whose time estimates are given below:

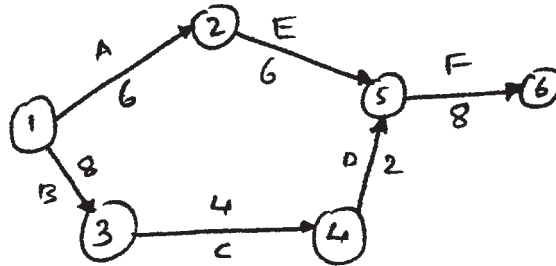
Activity		Estimated duration in weeks		
i	j	Optimistic	Most likely	Pessimistic
1	2	1	1	7
1	3	1	4	7
1	4	2	2	8
2	5	1	1	1
3	5	2	5	14
4	6	2	5	8
5	6	3	6	15

Answer the following: [18]

- a) Draw project network.
- b) Find expected duration and variance of each activity.
- c) Calculate early and late occurrence times for each node and slack.
- d) What is expected project length.
- e) What is standard deviation and variance of project length.
- f) What is the probability that the project will be completed —
- i) Atleast 3 weeks earlier than expected.
- ii) No more than 3 weeks later than expected.
- g) What due date has about 90% chance of being met?

OR

The PERT shown in following fig. consists of 6 activities which takes 22 days. Normal cost and crash cost against each activity are given in table.



Activity	Normal		Crash	
	Time	Cost	Time	Cost
A	6	300	4	900
B	8	200	7	250
C	4	400	3	600
D	2	500	1	800
E	6	500	4	900
F	8	100	6	400

Find out the crash cost to complete the project in 17 days. Indirect cost works out to be Rs. 200 per day. [18]

□□□

Total No. of Questions : 6]

[Total No. of Pages : 3

P1123

[3564]-176

B.E. (Production S/W)

INDUSTRIAL & COMMERCIAL LAWS

(2003 Course) (411125) (Elective - II)

Time : 3 Hours]

[Max. Marks : 100

Instructions to the candidates:

- 1) Answers to the two sections should be written in separate books.*
- 2) Figures to the right indicate full marks.*
- 3) Your answers will be valued as a whole.*
- 4) All questions are compulsory.*

SECTION - I

Q1) Discuss the salient features of 'The Industrial Disputes Act, 1947' with all important definitions. **[17]**

OR

- a) Elucidate the concept and scope of 'Industry' as stated under the Industrial Disputes Act, 1947. **[8]**
- b) Distinguish between: **[9]**
 - i) Award & Settlement
 - ii) Lockout and Strikes
 - iii) Lay off & retrenchment.

Q2) a) Discuss the provisions made with in the 'Indian Trade Unions (Amendment) Act, 1947'. **[9]**

b) Discuss the Mode of Registration of Trade Union. **[7]**

OR

Write short notes on: **[16]**

- a) Advantages of a Registered Trade Union.
- b) Political fund of a Registered Trade Union.
- c) Office-bearers of a Trade Union.
- d) Offences and Penalties under the Trade Union Act.

P.T.O.

- Q3)** a) Mention the objectives of 'The Factories Act, 1948'. [5]
b) Mention the important (any 10) definitions under the factories act, 1948 along with definitions of 'Hazardous Process' & 'Worker'. [12]

OR

- a) "The Factories Act, 1948 is an Act of Social Welfare Legislation". Comment with special reference to the provisions relating to the welfare of worker. [9]
b) Discuss the provisions of the Factories Act relating to 'annual leave with wages'. [8]

SECTION - II

- Q4)** a) Discuss the objective, scope and application of the Employees' Provident Fund & Misc. Provisions Act, 1952. [9]
b) Describe Employees' 'Deposit-linked Insurance Scheme'. [8]

OR

- a) Describe Employees' Family Pension Scheme. [8]
b) Write short notes on (related to EPF & Misc. Provision Act, 1952) [9]
i) Contribution
ii) Central Board
iii) Duties of Inspector to carry out the purpose of the act.

- Q5)** Discuss the salient features of 'The MRTP Act, 1969' with all amendments & important definitions. [17]

OR

- a) Discuss the role of MRTP Commission in detail. [9]
b) What is the meaning of unfair and restrictive trade practices? Which are the provisions to curb these practices? [8]

- Q6)** a) Define 'Contract of Sale of Goods'. What are the Feature/Characteristics of a contract to Sell Goods? [8]
- b) Define a 'Condition' and 'Warranty'. When is a 'Breach of Condition' treated as a 'Breach of Warranty'? [8]

OR

- a) What are the Rules relating to the 'Transfer of Ownership' in Goods under a 'Contract of Sales of Goods'? [8]
- b) Who is 'Unpaid Seller'? What are his Rights? [8]

□□□

Total No. of Questions : 12]

[Total No. of Pages : 3

P1122

[3564]-175

B.E. (Production S/W)
SUPPLY CHAIN MANAGEMENT
(2003 Course) (411125) (Elective)

Time : 3 Hours]

[Max. Marks : 100

Instructions to the candidates:

- 1) Answers to the two sections should be written in separate answer books.*
- 2) Figures to the right in bracket indicate full marks.*
- 3) Solve Q1 or Q2, Q3 or Q4, Q5 or Q6, Q7 or Q8, Q9 or Q10, Q11 or Q12.*
- 4) Assume any data, if necessary & state it clearly.*

SECTION - I

- Q1)** a) Identify cycles & push-pull boundary in supply chain when you are purchasing AMUL ice-cream chocolate cone from a shop located near garden. **[9]**
- b) What are competitive & supply chain strategies of an organisation? Define strategic fit & mention the steps to achieve it. **[9]**

OR

- Q2)** a) Discuss the process of understanding the customer and supply chain uncertainty. **[9]**
- b) Discuss in brief the drivers affecting supply chain performance and mention the obstacles in achieving the performance. **[9]**

- Q3)** a) Discuss the procedure of forecasting the demand. **[6]**
- b) What is aggregate planning problem? Which type of information is needed for this planning? Which decisions are taken based on this information? **[10]**

OR

- Q4)** a) What are the different methods of forecasting? Discuss them briefly. **[9]**
- b) By managing the capacity and the inventory, how the firm can control the 'supply'? **[7]**

P.T.O.

- Q5)** a) Differentiate between lot size based and volume based quantity discounts in supply chain. When quantity discounts are justified? [9]
b) Discuss the role of safety inventory in supply chain. How the appropriate level of safety inventory is decided? [7]

OR

- Q6)** a) Discuss the meaning of 'Product Availability'. How it is measured? Describe the two types replenishment policies. [9]
b) Explain the Managerial Levers to improve the supply chain profitability. [7]

SECTION - II

- Q7)** a) Mention the various factors influencing the design of Supply Chain Network. How the exchange rates & import duties affect the location decision in supply chain? [9]
b) Discuss the role of transportation in Supply Chain Network. Mention the various modes of transportation with their strengths & weaknesses. [9]

OR

- Q8)** a) Discuss the importance of information and information technology in supply chain. [9]
b) Discuss the role of information technology in forecasting and in inventory management. [9]

- Q9)** a) List out major obstacles for co-ordination in supply chain. Discuss in brief. [8]
b) What is bullwhip effect? How the lack of co-ordination in supply chain affects the performance of a firm? [8]

OR

- Q10)** a) How the design of distribution network in various types of industry has been affected due to evolution of E-business? [8]
b) Discuss the actions taken by Manager to overcome the obstacles and to achieve co-ordination in supply chain. [8]

- Q11)*** a) What is role & importance of Revenue Management in Supply Chain? [8]
- b) Changing the distribution network affects the supply chain cost. Discuss. [8]

OR

- Q12)*** a) What is a 'Decision Tree'? Summarise the basic steps in decision tree analysis. [8]
- b) What is Discounted Cash Flow Analysis? Why it is used in supply chain management? How the flexibility is evaluated in supply chain? [8]

□□□

Total No. of Questions : 12]

[Total No. of Pages : 3

P1121

[3564]-174

B.E. (Production S/W & Industrial Engg.)
PLANT ENGINEERING & FACILITY LAYOUT
(2003 Course) (411125) (Elective - II)

Time : 3 Hours]

[Max. Marks : 100

Instructions to the candidates:

- 1) Answer 3 questions from Section-I and 3 questions from Section-II.*
- 2) Answers to the two sections should be written in separate books.*
- 3) Neat diagrams must be drawn wherever necessary.*
- 4) Use of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.*
- 5) Assume suitable data, if necessary.*

SECTION - I

Unit - 1

- Q1)** a) Explain the scope and importance of plant Engineering functions in industrial activities. [8]
- b) Explain any three important factors of each that influence the location for the following products. [8]
- i) Food Processing Industries.
 - ii) Paint Industries.

OR

- Q2)** a) Explain how plant Engineering functions effects as productivity and profitability? [8]
- b) What are the different factors affecting site selection? [8]

Unit - 2

- Q3)** a) What is plant layout? Discuss the objectives & advantages of a good layout? [8]
- b) What is systematic (plant) layout planning? Explain significance of PQ chart determining methods of flow analysis? [10]

P.T.O.

OR

- Q4)** a) Write a short notes on: [10]
- i) Symptoms of bad layout.
 - ii) Use of computer in planning and evolving layouts.
- b) With the help of suitable example, bring out the co-relation between types of production and types of layout. [8]

Unit - 3

- Q5)** a) Explain the following principles of material handling: [8]
- i) Space utilization
 - ii) Gravity
 - iii) Simplification
 - iv) System
- b) Highlight importance of material handling training in a modern manufacturing organisation. [8]

OR

- Q6)** a) What are different charts that are used for analysing material flow? Discuss any one in detail with example. [8]
- b) Explain how material handling will help to increase the productivity? [8]

SECTION - II

Unit - 4

- Q7)** a) Explain with suitable example the concept of the 'Unit load'. [8]
- b) How you will use Travel Chart for locating facilities in plant, explain with example. [8]

OR

- Q8)** a) What are different quantitative types models used in facility location? Explain any one in detail? [8]
- b) What are the different objectives of locating the facilities in the plant layout explain? [8]

Unit - 5

- Q9)** a) Explain the importance of auxiliary services while finalizing the plant layout. [8]
b) What do you understand by 'Industrial Safety Acts'? Explain any three act in detail. [10]

OR

- Q10)** a) Write short notes on: [10]
i) Industrial pollution.
ii) Sewage and waste disposal.
b) Why effluent water treatment plant are necessary? Explain. [8]

Unit - 6

- Q11)** a) What is the importance and scope of maintenance function in industry? [8]
b) How does condition monitoring influence the maintenance activity function? Explain. [8]

OR

- Q12)** a) Briefly explain the objectives of planned preventive maintenance? [8]
b) Describe the types of maintenance being practised in the present day industrial setups. [8]

□□□

Total No. of Questions : 12]

[Total No. of Pages : 2

P1120

[3564]-173

B.E. (Production & Industrial Engg.)
ADVANCED PRODUCTION TECHNOLOGY
(2003 Course) (411090) (Elective - II)

Time : 3 Hours]

[Max. Marks : 100

Instructions to the candidates:

- 1) Answer 3 questions from each section.*
- 2) Attempt Q1 or Q2, Q3 or Q4, Q5 or Q6 from Section-I.*
- 3) Attempt Q7 or Q8, Q9 or Q10, Q11 or Q12 from Section-II.*
- 4) Neat diagrams must be drawn wherever necessary.*
- 5) Assume suitable data, if necessary.*
- 6) Figures to the right indicate full marks.*
- 7) Use of non-programmable electronic calculator is allowed.*

SECTION - I

- Q1)** a) Explain the outline of Toyota Production System. [10]
b) Discuss the basic elements of Just in Time system. [8]

OR

- Q2)** a) Explain the Kanban system used in Toyota Production System (TPS). [10]
b) How will you determine the number of Kanbans in TPS? Explain it. [8]

- Q3)** a) What is the importance of Value Stream Mapping? State its characteristics. [8]
b) Explain Single Minute Exchange of Die concept in competitive manufacturing system. [8]

OR

- Q4)** a) Explain the concept of benchmarking process with suitable example.[8]
b) Explain the procedure of single piece flow in competitive manufacturing system. [8]

P.T.O.

- Q5)** a) State the objectives of productivity measurement. [8]
b) Explain performance Objectives-Productivity (PO-P). [8]

OR

- Q6)** a) Explain the concept of Management by objectives. [8]
b) Explain the productivity measurements in medium scale industries.[8]

SECTION - II

- Q7)** a) Explain the simulation packages available in Manufacturing Industries. [8]
b) Explain the elements of Artificial Intelligence system. [10]

OR

- Q8)** a) What are the types of simulations? Explain any one. [8]
b) Explain Knowledge based expert systems in Manufacturing. [10]

- Q9)** a) Explain the concept of system design and its applications. [8]
b) What is meant by Design synthesis and functional analysis of design.[8]

OR

- Q10)** a) Explain morphology of Design and its feasibility analysis. [8]
b) How the strength and surface topography are used for design of a system? [8]

- Q11)** a) Discuss the levels of development in Technology Management. [8]
b) How technology management is done in manufacturing industries?[8]

OR

- Q12)** a) Explain innovation process in the process of Technology change. [8]
b) Explain the concept of technological environment in Technology Management. [8]

□□□

Total No. of Questions : 6]

[Total No. of Pages : 8

P1119

[3564]-171

B.E. (Production S/W)

FINANCIAL MANAGEMENT & COSTING

(2003 Course) (411122)

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 must be drawn wherever necessary.*
- 3) Figures to the right indicate full marks.*
- 4) Use of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.*
- 5) Assume suitable data, if necessary.*
- 6) All questions are compulsory.*

SECTION - I

Q1) a) Explain sources of finance? What are the financial functions to be performed for successful financial management? **[8]**

b) The following fig. relate to the trading activities of a concern for the year ended in March 2009:

Sales Rs. 10,00,000, Purchases Rs. 7,00,000, Opening Stock Rs. 1,10,000, Closing Stock Rs. 1,40,000, Sales Returns Rs. 40,000, Selling and Distribution Expenses Rs. 30,000, Administrative Expenses Rs. 38,000, Depreciation Rs. 10,000, Other charges Rs. 20,000, Provision for taxation Rs. 70,000, Non-operating income Rs. 18,000, Non-operating expenses Rs. 3,000.

Prepare Income Statement. **[8]**

OR

The ABC Company's financial statements contain following information:

	Rs.	Rs.
	31-3-2008	31-3-2009
Current liabilities	6,40,000	8,00,000

P.T.O.

10% Debentures	16,00,000	16,00,000
Equity Shares Capital	20,00,000	20,00,000
Retained earnings	4,68,000	8,12,000
Cash	2,00,000	1,60,000
Sundry Debtors	3,20,000	4,00,000
Temporary Investments	2,00,000	3,20,000
Stock	18,40,000	21,60,000
Prepaid expenses	28,000	12,000
Total Current Assets	<u>25,88,000</u>	<u>30,52,000</u>
Total Assets	56,00,000	64,00,000

Statement of Profit
for the year ended in March, 2009

Sales		Rs.
		40,00,000
Less: Cost of goods sold	28,00,000	
Less: Interest	<u>1,60,000</u>	
		<u>29,60,000</u>
Net profit for 2009		10,40,000
Less: Taxes @ 50%		<u>5,20,000</u>
		5,20,000

Dividend declared on equity shares Rs. 2,20,000

From the above facts and figures, calculate:

- Liquidity Ratios - Current Ratio, Acid Test Ratio.
- Solvency Ratios - Debt Equity Ratio, Interest Coverage Ratio.
- Profitability Ratios - Net Profit Ratio, Return on Capital Employed.
- Activity Ratios - Stock turnover Ratio, Total Assets turnover Ratio.

[16]

Q2) a) What do you understand by capital expenditure? What are the types of capital expenditure? [6]

b) From the following information, select the best Project using Payback Period. [10]

	Project A	Project B	Project C
Cost (Rs.)	2,40,000	3,20,000	3,50,000
Life	10 years	12 years	14 years
Estimated scrap value (Rs.)	20,000	20,000	28,000
Annual Profit less taxation (Rs.)	26,000	31,000	28,000

OR

A company has investment opportunity costing Rs. 40,000 with following expected net cash flow i.e. after taxes and before depreciation:

Year	Net cash flow Rs.
1	7000
2	7000
3	7000
4	7000
5	7000
6	8000
7	10000
8	15000
9	10000
10	4000

Using 10% as the cost of capital, determine following:

- Net present value at 10% Discount factor.
- Internal Rate of Return with the help of 10% Discounting and 15% Discount factor.

[16]

Present Value of Rs. 1

Year	10% Discounting factor	15% Discounting factor
1	0.909	0.870
2	0.826	0.756
3	0.751	0.658
4	0.683	0.572
5	0.621	0.497
6	0.564	0.432
7	0.513	0.376
8	0.467	0.327
9	0.424	0.284
10	0.386	0.247

- Q3)** a) Define funds. Explain the transactions that does not affect flow of funds. [6]
- b) Differentiate between funds flow statement and Income Statement. [6]
- c) What are the objectives of funds flow statement. [6]

OR

Explain following with respect to working capital: [18]

- a) Concept and design of working capital.
- b) Types of working capital.
- c) Sources of working capital.

SECTION - II

- Q4)** a) Compute prime cost, works cost, cost of production, total cost and profit from following facts. [8]

Item	Rs.
Direct Materials	5000
Direct Labour	3500
Factory Expenses	1500
Administration Expenses	800
Selling Expenses	700
Sales	15000

- b) Explain following terms in view of material losses. [8]

- i) Normal waste
- ii) Abnormal waste
- iii) Scrap
- iv) Defectives

OR

- a) Calculate the earnings of workers A, B, C under straight piece rate system and Merrick's multiple piece rate system from following particulars: [12]

Normal Rate per hour Rs. 1.80

Standard time per unit 1 min

Output per day

Worker A : 384 units

Worker B : 450 units

Worker C : 552 units

Working hours are 8 hrs per day.

Standard level of performance = 83%

- b) A machine costing Rs. 11,000 is estimated to have a life of 10 years and scrap value is estimated to Rs. 1,000 at the end of its life. Calculate the amount of depreciation. [4]

- Q5)** a) Define overhead. What do you mean by term under/over absorption of production overheads? How does it arise? How does it treated in cost accounts? [8]
- b) Indicate which of following is true or false with proper explanation.[8]
- i) Predetermined rate of absorption of overhead helps in quick preparation of cost estimates and quoting prices.
 - ii) Direct labor hour rate of absorption of overhead is suitable where most of production is done by using machines.
 - iii) Basis of apportionment of cost of steam is wages of each department.
 - iv) Variable overhead cost is a period cost.

OR

A manufacturing company uses two identical large and four identical small machines. Each large machine occupies one quarter of workshop and fully employs three workers. Each small machine occupies half the space of a large machine and fully employs two workers. The workers are paid by piece work.

Each of the six machines is estimated to work 1440 hours per year, while the effective working life is taken as 12,000 working hours for each large machine and 9000 working hours for each small machine. Large machines cost Rs. 20000 each and small machines Rs. 4000 each. Scrap values are Rs. 4000 and Rs. 100 respectively. Repairs and maintenance, oil are estimated to cost for each large machine Rs. 4000 and for each small machine Rs. 1200 during its effective life.

Power consumption costs 5 paise per unit and amounts for a large machine 20 units per hour and for small machine 2 units per hour.

The manager is paid Rs. 4800 a year and workshop supervision occupies $\frac{1}{2}$ of his time which is divided equally among six machines.

Details of other expenses are:

- a) Rent and rates to workshop Rs. 6400 a year.
- b) Lighting to be apportioned in the ratio of workers employed is Rs. 1820 a year.

Taking a period of three months as a basic, calculate machine hour rate for large & small machine respectively.

Show all steps and calculations. [16]

Q6) a) A standard cost card of a company is given below:

Element of cost	Quantity or Hour	Rate Rs.	Standard cost or Sales
1. Direct Material			
Material A	40 units	2.00	80
Material B	20 units	3.00	60
Less: Normal loss (10%)	6 units	Scrap value	12
Normal Output	54 units		128
2. Direct labor	50 hrs	1.50	75
3. Overheads			
Variable	10 hrs	2.00	20
Fixed	10 hrs	1.00	10
Total cost			233
Profit 20%			46.60
Selling Price			279.60

Calculate standard cost per unit and standard selling price per unit.[6]

b) Following data is obtained from a production unit.

	Budgeted	Actual
Number of working days	25	27
Production in units	20000	22000
Fixed overheads	30000	31000

Budgeted fixed overhead rate is Rs. 1.00 per hour and actual hrs worked were 31,500.

Calculate:

- | | |
|-------------------------|-----------------------------|
| i) Efficiency variance | ii) Capacity variance |
| iii) Calendar variance | iv) Volume variance |
| v) Expenditure variance | vi) Total overhead variance |

[12]

OR

- a) Bengal Chemical Co. Ltd. produces a chemical. In the process 2% of total weight put in is lost and 10% scrap from the process.

The products dealt are as follows:

Process I	
Passed on to next process	75%
Sent to warehouse for sale	25%

Expenses Incurred :

	Rs.	Tons
Raw material	1,20,000	1,000
Manufacturing wages	20500	
General expenses	10300	

Prepare Process Cost Accounts showing cost per ton. [10]

- b) Define by products? Give atleast 5 examples of by products from industry? [2]
- c) What are various methods of accounting by products? Briefly explain each of methods. [6]

□□□

Total No. of Questions : 6]

[Total No. of Pages : 4

P1202

[3564]-168

B.E. (Production S/W)

OPERATIONS RESEARCH & MANAGEMENT

(2003 Course) (411126)

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 must be drawn wherever necessary.*
- 3) Figures to the right indicate full marks.*
- 4) Use of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.*
- 5) Assume suitable data, if necessary.*
- 6) All questions are compulsory.*

SECTION - I

- Q1)** a) 'Mathematics of OR is mathematics of Optimisation'. Explain. **[4]**
- b) Define following terms in L.P.P. **[6]**
- i) Objective function
 - ii) Redundant constraint
 - iii) Feasible region
 - iv) Basic variable
 - v) Basic solution
 - vi) Degenerate solution
- c) Food 'X' contains 6 units of vitamin A per gram and 7 units of vitamin B per gram and costs 12 paise per gram. Food 'Y' contains 8 units of vitamin A per gram & 12 units of vitamin B per gram & costs 20 paise per gram. The daily minimum requirement of vitamin A & B is 100 units and 120 units. Find minimum cost of diet to satisfy requirement of vitamin A & B. **[8]**

OR

- a) Explain Big-M Method of solving L.P.P. **[8]**
- b) What is duality? What is a significance of dual variables in Simplex solution? **[4]**
- b) Discuss the concept of Sensitivity Analysis in L.P.P. **[6]**

P.T.O.

Q2) a) Obtain an optimal solution to transportation problem. [10]

	D ₁	D ₂	D ₃	D ₄	Supply
S ₁	19	30	50	10	7
S ₂	70	30	40	60	9
S ₃	40	8	70	20	18
Demand	5	8	7	14	

b) Discuss the travelling salesman problem. [3]

c) What is degeneracy in transportation problem? [3]

OR

a) What are transshipment problems? How they are solved? [5]

b) 'Assignment problem is inherent degenerate transportation problem'. Explain. [3]

c) Solve the following assignment problem for minimisation. [8]

	I	II	III	IV	V
A	6	7	5	9	4
B	7	5	10	9	6
C	5	4	3	6	5
D	8	3	5	6	4
E	4	2	5	6	6

Q3) a) Find the sequence that minimises the total time required in performing the following jobs on three machines in the order ABC. Processing time in minutes are given below. [8]

Job →	I	II	III	IV	V
Machine A	8	10	6	7	11
Machine B	5	6	2	3	4
Machine C	4	9	8	6	5

b) Derive an EOQ formula for uniform demand rate without shortages & instantaneous replenishment. [8]

OR

- a) Explain the principal assumptions made while dealing with sequencing problems. [8]
- b) Find the optimal order quantity for a product for which the price-breaks are as follows. [8]

Q	Unit cost (Rs.)
$0 < Q < 500$	Rs. 10/-
$500 < Q < 750$	Rs. 9.25/-
$750 \leq Q$	Rs. 8.75/-

The monthly demand for product is 200 units, the cost of ordering is Rs. 100/- & holding cost is 2% of the unit cost.

SECTION - II

- Q4)** a) A machine costs Rs. 8000/- to install. The resale price of machine at the end of each year & running cost for each year are given in table below.

Year	-	1	2	3	4	5	6	7	8
Resale Price	-	5000	3000	2000	1200	800	500	500	500
Running Cost	-	1000	1500	2000	2500	3000	3500	4000	4500

How often should a new machine with identical characteristics be replaced in order to minimise average total cost per year? [8]

- b) State the advantages & limitations of Simulation. [8]

OR

- a) The Cake shop manufactures 30 cakes/day. The sale of these cakes depends upon demand which has following data.

Sales (No. of cakes)	-	27	28	29	30	31	32
Probability	-	0.10	0.15	0.20	0.35	0.15	0.05

The production cost and sale price of each cake are Rs. 40/- and Rs. 50/- respectively. Any unsold cake is to be deposed off at a loss of Rs. 15/- unit. There is a penalty of Rs. 5/- per unit if the demand is not met. Using following random numbers estimate total profit/loss for next 10 days. 10, 99, 65, 99, 95, 01, 79, 11, 16, 20. [10]

- b) Discuss in brief the replacement policy for items that fail suddenly. [6]

- Q5)** a) Explain Kendall's notation for representing queuing model. [6]
 b) Explain the costs involved in queuing system & derive an expression for Minimum Cost Service Rate. [6]
 c) Explain in brief theory of Dominance in Games. [4]

OR

- a) Two players A & B play a game of matching coins in which each has 3 coins: 10, 25, & 50 paise. Each player selects a coin without knowledge of other players' choice. If the sum of the coins is even, A wins B's coin & if it is odd, B wins A's.
 i) Prepare pay off Matrix. [3]
 ii) Find the value of Game. [6]
 b) Assume a single channel service system of a library in a school. From the past experiences it is known that on an average every hour 8 students visits. Issue of the books is on an average rate of 10 per hours. Determine the following.
 i) Probability of the assistant librarian being idle. [2]
 ii) Probability that there are at least 3 students in the system. [2]
 iii) Expected time that a student is in queue. [3]

Q6) A project data is given below:

Activity	1-2	1-3	1-4	2-5	2-6	3-7	4-8	5-9	6-9	7-8	8-9
Duration	2	2	0	2	5	4	5	6	3	4	6
Manpower requirement	5	4	0	2	3	6	2	8	7	4	3

- a) Draw the network, show the critical path & determine project duration. [9]
 b) There are 11 persons employed on this project. Carry out approximate man-power levelling so that the fluctuations of work force requirement from day to day is as small as possible. [9]

OR

- a) Discuss in detail the uncertainty & related calculations in project scheduling. [8]
 b) Define the following in project Management. (Any five) [10]
 (i) Slack for an event, (ii) Dummy activity, (iii) Crashing of network, (iv) Gantt chart, (v) Direct & Indirect cost, (vi) Forward pass computations, (vii) Backward pass computations.

□□□

Total No. of Questions : 12]

[Total No. of Pages : 3

P1118

[3564]-166

B.E. (Production)

ADVANCED MATERIAL PROCESSING

(2003 Course) (Elective - II)

Time : 3 Hours]

[Max. Marks : 100

Instructions to the candidates:

- 1) Attempt one question from each unit in Section-I and Section-II.*
- 2) Answers to the two sections should be written in separate answer books.*
- 3) Neat diagrams must be drawn wherever necessary.*
- 4) Figures to the right indicate full marks.*

SECTION - I

Unit - I

- Q1)** a) Explain with neat sketches the development in drill tool geometry for higher productivity. [8]
- b) Explain the concept of chip morphology for high speed machining. [8]

OR

- Q2)** a) Explain with neat sketch the principle for interrupted grinding and differentiate stock removal grinding (SRG) & form finish grinding (FFG). [8]
- b) Explain what is oscillating turning process and compare it with the conventional turning process. [8]

Unit - II

- Q3)** a) Explain with graph the influence of the following parameters on MRR in case of 'Rotary ultrasonic machining'. [8]
- | | |
|-----------------|-----------------------------|
| i) Frequency | ii) Amplitude |
| iii) Feed force | iv) Concentration of slurry |
- b) For drilling ϕ 0.15mm size hole upto 16mm deep which method you adopt for it. Explain it. [8]

P.T.O.

OR

- Q4)** a) Explain with neat sketch the electro chemical grinding process. [8]
b) Explain with neat sketch the thermal energy method. [8]

Unit - III

- Q5)** a) Explain the procedure for manufacturing of square pipe of steel material by high energy rate forming. [9]
b) Explain what is ring rolling operation? Classify them, write advantages, limitations & application. [9]

OR

- Q6)** a) Explain the procedure for preparation of blanks for three roll forming. [9]
b) What is powder forging? Explain the process consideration in it. [9]

SECTION - II

Unit - IV

- Q7)** a) What is continuous casting process? What are the controlling parameter in continuous casting process if part is casted by continuous casting process? [8]
b) Describe the reciprocating mould process & explain it's benefits over conventional process of casting. [8]

OR

- Q8)** a) Explain Asarco process for casting of brass components. [8]
b) Explain direct chill process for casting of Aluminium & Aluminium alloy ingots. [8]

Unit - V

- Q9)** a) Which process & material do you recommend for the production of the following parts? Justify the selection. [9]
i) Bottles
ii) Refrigerators liners
iii) Bucket

- b) Explain what is a slip casting process & sequence of operation in that process for processing or casting of ceramic parts. Write advantages & limitation. [9]

OR

- Q10)** a) Explain with sketches the different stages in manufacturing of ordinary glass bottle by blow moulding. [10]
b) Explain with neat sketch the injection molding process for plastic components. [8]

Unit - VI

- Q11)** a) Explain in brief the various stages involved in [8]
i) Bulk micro machining
ii) Surface micro machining
b) Explain the different methods for surface cleaning. [8]

OR

- Q12)** a) Write note on: [10]
i) Ceramic coating
ii) Defects in paint coating
b) Explain in brief the steps involved in LIGA process. [6]

□□□

Total No. of Questions : 12]

[Total No. of Pages : 4

P1117

[3564]-163

B.E. (Production)

CAD / CAM / CIM

(2003 Course)

Time : 3 Hours]

[Max. Marks : 100

Instructions to the candidates:

- 1) Attempt one question from each unit from Section-I and Section-II.*
- 2) Answers to the two sections should be written in separate answer books.*
- 3) Neat diagrams must be drawn wherever necessary.*
- 4) Figures to the right indicate full marks.*

SECTION - I

Unit - I

- Q1)** a) Consider a rectangle ABCD having coordinates A(2, 2), B(2, 8), C(6, 8), D(6, 2). Determine the new position rectangle by using following transformation. **[8]**
- i) Rotate by 60° anticlockwise @ the point A.
 - ii) Scaling by 2 times in x direction & 1.5 times in y direction.
- b) What are different primitives used in solid modeling? **[8]**

OR

- Q2)** a) Explain with neat sketches the constructive solid geometry & boundary representation in solid modeling. **[10]**
- b) Explain Euler operations — MBFV, MEKL, KFEVMG with figure. **[6]**

Unit - II

- Q3)** a) Explain FMS by considering volume-variety. Compare FMS with other manufacturing system. **[8]**
- b) Write short note on: **[10]**
- i) Feed back control system used in CNC.
 - ii) AGV system in FMS.

P.T.O.

SECTION - II

Unit - IV

- Q7)** a) Explain with neat diagram concept of 3D printing. [8]
b) What is meant by Rapid tooling? Explain different manufacturing processes used for rapid tooling. [8]

OR

- Q8)** a) Explain with neat sketch solid base curing process. [8]
b) Explain with neat diagram different stages of stereolithography. [8]

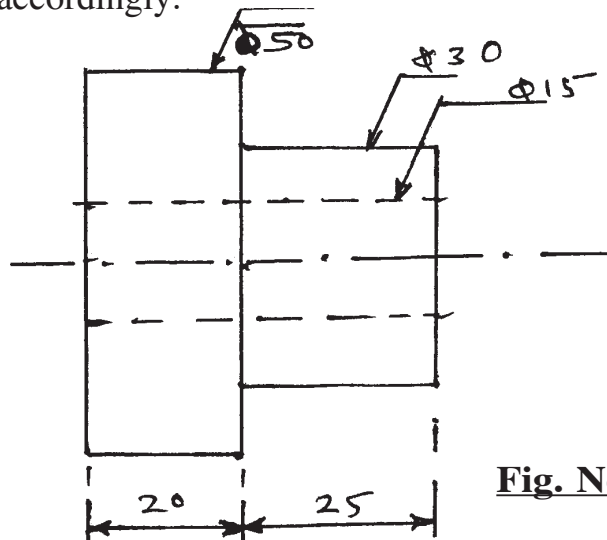
Unit - V

- Q9)** a) Apply the rank order clustering technique to arrange the parts and machines into groups from the part machine incidence matrix given below. [8]

		Part					
Machine		A	B	C	D	E	F
1		1	1		1		
2						1	
3				1		1	
4			1		1		1
5		1					
6				1			

The part operations performed on the machine are represented by 1 in the matrix and a blank means no operations.

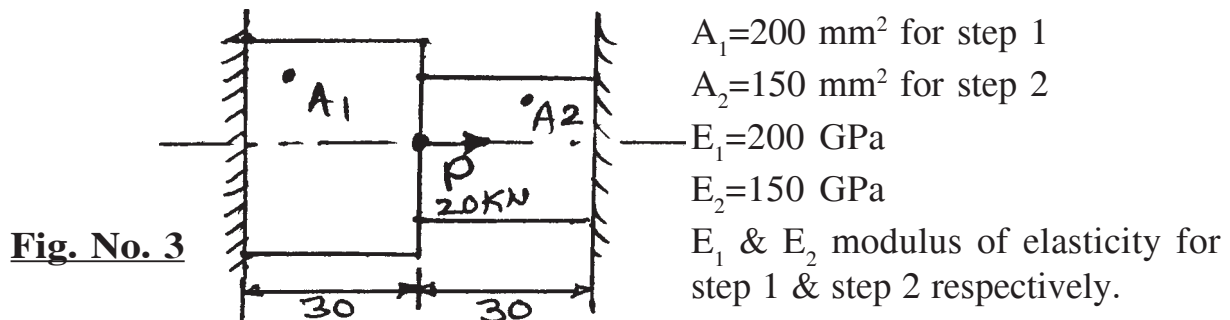
- b) Apply opitz coding system for a following drawing and write down the code accordingly. [6]



- c) What is importance of FEA in today's era? [4]

OR

- Q10)** a) A stepped bar is made of two materials joined together as shown in Fig. No. 3. The bar is subjected to a pull as shown in fig. 20 kN. Determine the displacement, reaction force at support, stresses of each of the section using a 1D spar element. [12]



- b) What do you mean cellular manufacturing? Explain in brief. [6]

Unit - VI

- Q11)** a) Explain the scope of integration of CIM model of digital equipment corporation (DEC). [8]
 b) Discuss the strategic development of Design for quality & it's influence on various stages of design & manufacture. [8]

OR

- Q12)** a) Explain IBM models in brief. [8]
 b) Compare sequential engineering with concurrent engineering. Explain it with a block diagram. [8]

□□□

Total No. of Questions : 12]

[Total No. of Pages : 4

P1307

[3564] - 162

B.E. (Production)

PROCESS PLANNING & TOOL SELECTION

(2003 Course)

Time : 3 Hours]

[Max. Marks : 100

Instructions to the candidates:

- 1) Answer three questions from Section - I and three questions from Section - II.***
- 2) Answers to the two sections should be written in separate answer books.***
- 3) Neat diagrams must be drawn wherever necessary.***
- 4) Figures to the right indicate full marks.***
- 5) Assume suitable data, if necessary.***

SECTION - I

- Q1)*** a) Explain the functions of product Engineering department. [8]
b) Draw and explain the Diagram relating the operation classifications to the complete manufacturing sequence. [8]

OR

- Q2)*** a) What is mean by Market Research? Explain its role in product design.[8]
b) Explain the following terms [4]
i) Process Picture. ii) Routing.
iii) Part Print. iv) Equipment.
c) Explain the criteria for analysis in selection of best process. [4]

- Q3)*** a) What key points should be considered in determining the nature of the work to be performed on the workpiece? [8]
b) Explain the following terms [4]
i) Flaws. ii) Lay.
iii) Datum. iv) Surface irregularity.
c) What is mean by dimensions having directions? [4]

OR

- Q4)*** a) What are the three basic methods by which surface roughness is measured? Explain each. [8]

P.T.O.

- b) What is mean by Geometry of form? Explain Squareness and Roundness with specified and interpreted sketches. [8]

Q5) a) What is the purpose of tolerance chart? Define the following terms in relation to tolerances [8]

- i) Unequal bilateral tolerance.
 - ii) Tolerance stack.
- b) Draw the locating system for the steel tube of I.D. ϕ 40 mm and O.D. ϕ 60 mm and length 150 mm. [4]
- c) What are the rules for mechanical by proper use of Holding Forces. [6]

OR

Q6) a) Explain Alternate Location Theory with example of cylindrical work piece. [8]

- b) Draw the locating system for a square workpiece having a hole of ϕ 40 mm and height 30 mm. Side of square is 60 mm. [ϕ 40 mm Hole at centre of square face]. [4]
- c) Explain the causes of workpiece variations. [6]

SECTION - II

Q7) a) Explain briefly the relationship between process selection and machine selection. [4]

- b) What are the circumstances under which a machine selection is necessary? [6]
- c) What are the advantages and limitations of sleeves and socket. [6]

OR

Q8) a) Compare the merits of fixed gages and comparators. [4]

- b) What are the special features of special collet. [6]
- c) What are major advantages of General purpose machines. [6]

- Q9) a)** What dictates the operation sequence? Discuss briefly the conditions under which operations may be combined.

Where do secondary operations generally occur in the major process sequence. [8]

- b) What is the role of expert system in generative Computer Aided Process Planning [CAPP] system? [8]

OR

- Q10)a)** “Selection of the incorrect basic process material can often be the cause of extra operations”. Justify this with suitable example. [6]

- b) Compare Auxilliary Process operations and supporting operations. [4]

- c) What is the effect of operation speed on performance and Economy? [6]

- Q11)** Prepare the process sheet for the component as shown in fig. 1. It requires a batch of 1000 Nos. The process sheet must contain detailed manufacturing plan with operation sequence, Equipment, tooling, process parameters and sample calculation of operation time. [18]

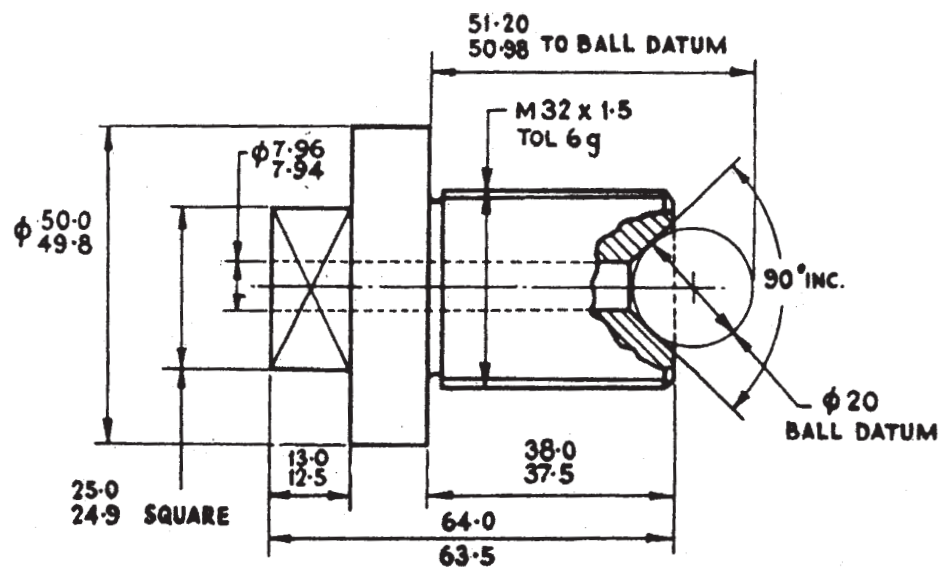
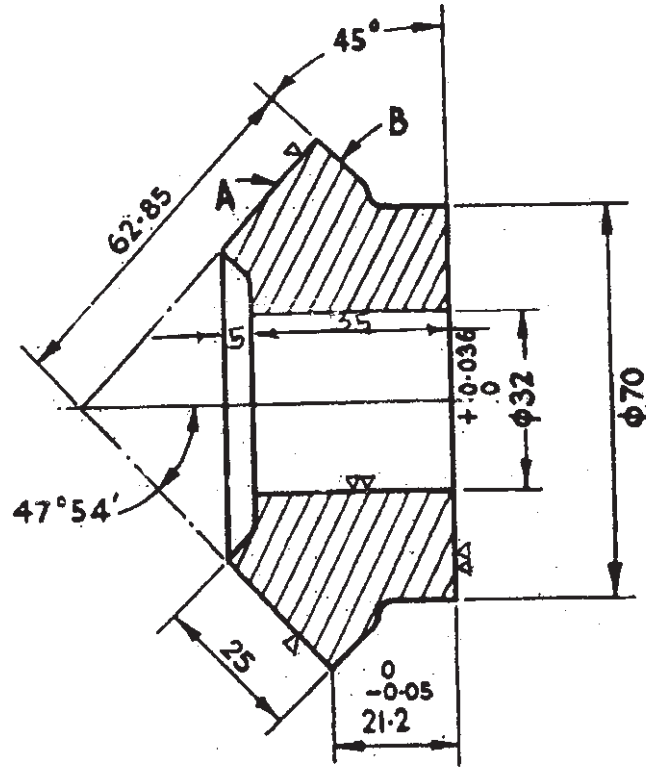


FIG. NO. 1, MATERIAL: M.S. BAR STOCK.
SPINDLE

OR

Q12) Prepare the process sheet for the component as shown in fig. 2. The required quantity : 5000 Nos. / Month. Write detailed manufacturing plan operation sequence, Equipment and Tooling selection, process parameters with sample calculation. [18]



MATERIAL :- C.I.

FIG. No. 2 . CAST GEAR BLANK.



Total No. of Questions : 12]

[Total No. of Pages : 6

P1116

[3564]-161

B.E. (Production)

MATERIALS & FINANCIAL MANAGEMENT

(2003 Course) (411087)

Time : 3 Hours]

[Max. Marks : 100

Instructions to the candidates:

- 1) Answer 3 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 logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.*
- 6) Assume suitable data, if necessary.*

SECTION - I

Unit - 1

- Q1)** a) 'Profitability' of a company depends to a large extent on effectiveness of its materials management functions. Discuss. **[4]**
- b) Annual Demand for an item 'x' is 52000 units. It is ordered in quantities of 2600 and standard deviation of demand during lead time is hundred units. The lead time is one week. Calculate
- i) Service level
 - ii) Safety stock
 - iii) Re-order point

The safety factor 'z' for service level are:

Service level (%)	Safety factor 'z'
90	1.28
95	1.65
98	2.05
99.86	3.00
99.99	4.00

[8]

P.T.O.

- c) A textile mill produces a special cloth which was demanded at relatively uniform rate of 180000 metre per year. The production process can be set up at a cost Rs. 175 and produces a cloth at rate of 2500 metre per day. The holding cost for a metre of cloth is estimated to be Rs. 0.40 per year.
- Compute economic production lot.
 - How long the process must be run to produce this quantity?
 - What will be the maximum inventory level assuming that inventory is zero when process initiated? (Assume 250 working days)

[6]

OR

- Q2)** a) Explain the importance of materials management in manufacturing organisation. [6]

- b) The housekeeping department of 5-STAR Hotel uses approximately 400 towels per day. The actual amount varies with number of customers. Usage can be approximated by normal distribution that has mean 400 and standard deviation on nine towels per day. The supplier delivers the towel every third day. If the hotel policy is to maintain a stockout risk of 2%.

What is the minimum number of towels that must be on hand at Re-order time and how much of that can be considered as Safety Stock? [6]

- c) The demand for an item is deterministic and constant over time at 600 units per year. The item cost is Rs. 50 per unit and the cost of placing an order is Rs. 5 and the item cost is Rs. 50 per unit. The inventory carrying cost is 20% of average inventory investment and shortage cost is Rs. 1 per unit per month.

If stockouts are permitted, Determine

- Optimal order quantity and the units can be backordered at shortage cost indicated.
- Maximum inventory level.

What will the company lose if 'No Stockouts' are permitted? [6]

Unit - 2

- Q3)** a) Explain the term vendor rating and vendor development in relation to supply chain. [8]
- b) Explain the role of transportation in logistic and supply chain management. [8]

OR

- Q4)** a) Explain Multi-Echelon system of supply chain. [8]
- b) Explain the following terms in relation to warehouse management. [8]
- i) Consolidation
 - ii) Break-Bulk
 - iii) Cross docking
 - iv) Mixing

Unit - 3

- Q5)** a) Explain and state the various reasons for importing the goods from foreign supplier. [6]
- b) Explain various alternatives to disposed off the salvable waste. [6]
- c) Explain types of LOC. [4]

OR

- Q6)** a) Explain various process to disposed off Non Salvable waste. [8]
- b) Explain waste management philosophy (technique) in relation with new product design and environment. [8]

SECTION - II

Unit - 4

- Q7)** a) Describe the salient features of traditional and modern approaches to financial management. [6]
- b) State and explain any four liquidity ratios. [4]
- c) What are current assets? State any two important characteristics of current assets. What are their implications for working capital management? [6]

OR

Q8) a) State the objectives of financial management. [4]

b) What are the sources of working capital? [4]

c) The following is the profit and loss account of 'S and S' electronics Ltd. for the year ended 31st March 2008. Compute [8]

i) Gross profit ratio

ii) Operating ratio

iii) Operating profit ratio

iv) Net profit ratio

* Profit and Loss Account

Debtors		Creditors	
	Rupees		Rupees
To Opening stock	2,50,000	By sales Rs.9,55,000	
To Purchase, Rs.5,33,000		Less return, Rs.15,000	9,40,000
To Less Returns, 8,000	5,25,000	By closing stock	1,50,000
To Wages	8,000		
To Carriage	5,500		
To Gross profit	3,01,500		
	10,90,000		10,90,000
To administrative Expenses	30,000	By Gross profit account	3,01,500
To Selling & distributive Expenses	1,33,000	By dividend received	15,000
To Non Operating Expenses	45,000	By profit on sales of fixed assets	12,000
To Net profit	1,20,500		
	3,28,500		3,28,500

Unit - 5

Q9) a) Explain the meaning and formulation of 'Product Cost' for the purpose of income measurement and determination of financial position. [6]

b) The following is the summary of receipts and issues of the materials in a factory during. January, 2009.

Jan.1. Opening Balance; 500 units @ Rs. 25 per unit
Jan.3 Issue 70 units
Jan.4 Issue 100 units
Jan.8 Issue 80 units
Jan.13 Received from supplier; 200 units @ Rs. 24.50 per unit
Jan.14. Returned to store; 15 units @ Rs. 24 per unit
Jan.16 Issue 180 units
Jan.20 Received from supplier; 240 units @ Rs. 24.75 per unit
Jan.24 Issue 304 units
Jan.25 Received from supplier; 320 units @ Rs. 24.50 per unit
Jan.26 Issue 112 units
Jan.27 Returned to store; 12 units @ Rs. 24.50 per unit
Jan.28 Received from supplier 100 units @ Rs. 25 per unit

It is revealed that on 15th January & 27th January there was a shortage of 9 and 12 units respectively. Workout on the basis of 'FIFO' system. [10]

OR

Q10) a) What is labour turnover? Explain various methods to measure labour turnover. What are the causes and costs associated with labour turnover? [6]

b) Explain any two methods of depreciation. [4]

c) What are the conditions that favour the adoption of 'LIFO' system of materials pricing? Explain its working. [6]

Unit - 6

Q11) a) Explain the concept of absorption of factory overheads. [6]

b) Define and explain the concept of standard cost and standard costing. [6]

- c) 'XYZ' Company uses a standard cost system and manufacture the product 'p'. The standard cost per 1000 kg of output is as follows:

Material	Quantity (kg)	Price (Rs.)
A	800	5
B	200	8
C	200	2

In March 2009, the company produced 2,00,000 kg. of output.

The actual consumption was as follows:

Material, A — 1,57,000 kg @ Rs. 4.80

Material, B — 38,000 kg @ Rs. 8.40

Material, C — 36,000 kg @ Rs. 2.20

Calculate:

[6]

- i) Material Cost Variance
- ii) Material Price Variance
- iii) Material Usage Variance

OR

Q12) a) What are the most important areas of management decisions opened up by the application of marginal costing method? [6]

b) What is NPV and IRR? Compare these two techniques. [4]

c) XYZ Ltd. has budgeted activity level of 60000 direct labours and budgeted production overheads of Rs. 1,20,000. Calculate the under absorbed and over absorbed overheads. State the reasons. The data is as follows: [8]

- i) 60000 direct labour hours are worked and actual overheads were Rs. 1,04,000.
- ii) 53,000 direct labour hours worked and actual overheads were Rs. 1,10,000.
- iii) 53,000 direct labour hours are worked and the actual overheads were Rs. 1,00,000.

□□□

Total No. of Questions : 11]

[Total No. of Pages : 3

P1115

[3564]-160

B.E. (Production)

**MATERIAL HANDLING TECHNOLOGY &
EQUIPMENT DESIGN**

(2003 Course) (411085) (Elective - I)

Time : 3 Hours]

[Max. Marks : 100

Instructions to the candidates:

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

SECTION - I

Unit - 1

- Q1)** a) Explain different tools and techniques of industrial engineering to develop material handling system. **[8]**
- b) Explain the following factors for analyzing material handling problems. **[8]**
- i) Engineering factors
 - ii) Economic factors

OR

- Q2)** a) Explain various selection criterias for manual, mechanized and automated material handling system. **[12]**
- b) Explain 'Unit load' concept. **[4]**

Unit - 2

- Q3)** Explain various types of line restricted material handling systems with neat sketch. State the applications. **[16]**

P.T.O.

OR

- Q4)** Explain various types of area restricted material handling systems with neat sketches state the applications. [16]

Unit - 3

- Q5)** a) Explain Drag and Flight conveyor system with neat sketch state their applications. [9]
b) Explain various lifting and lowering material handling equipments.[9]

OR

- Q6)** Write short note on: [18]
a) Pneumatic Conveyor System
b) Gantry Crane
c) Two wheeled hand trucks

SECTION - II

Unit - 4

- Q7)** a) Explain various alternatives by which the automation in material handling can be effectively carried out. [8]
b) Explain the design considerations of bulk material handling equipment. [8]

OR

- Q8)** a) Explain 'Automation in Material Handling'. [8]
b) Explain the use of robots in material handling. [8]

Unit - 5

- Q9)** a) Explain various types of AGVS. [12]
b) Explain AGVS control systems. [6]

OR

- Q10)** a) Explain AGVS routing method. [6]
b) Explain AGVS guidance system. [12]

Unit - 6

Q11) Write short note on:

- a) Safety considerations in material handling. [6]
- b) Ergonomic considerations in MH system. [6]
- c) Computer applications in MH system. [4]

□□□

Total No. of Questions : 12]

[Total No. of Pages : 3

P1201

[3564]-158

B.E. (Production)

POWDER METALLURGY

(2003 Course) (411085) (Elective - I)

Time : 3 Hours]

[Max. Marks : 100

Instructions to the candidates:

- 1) Answer Q1 or Q2, Q3 or Q4, Q5 or Q6 from Section-I and Q7 or Q8, Q9 or Q10, Q11 or Q12 from Section-II.*
- 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.*

SECTION - I

- Q1)** a) What are the various particle shapes that are obtained by different powder production techniques? Explain the following terms - Apparent Density, Flow rate, Green Spring. [8]
- b) Explain Hoganas process of Iron powder production with all process parameters. State clearly the particle shape that is obtained in the process. [8]

OR

- Q2)** a) What do you understand by pre-alloy & pre-mix powder? What are the advantages & limitations of each type? How powder of Stainless steel is produced? [8]
- b) How high purity Copper powder is produced? What is the particle shape obtained? Also explain compressibility & Green strength. [8]
- Q3)** a) Differentiate between Hydraulic & Mechanical process. [5]
- b) Discuss Powder Rolling in brief. [5]
- c) What are the different types of dies that are used for compaction? What are inserts? Suggest any one die material for cold compaction. [6]
- d) Name 2 commonly used lubricants. [2]

P.T.O.

OR

- Q4)** a) What is Isostatic compaction? Explain it with its advantages & limitations. [6]
b) State the various areas where friction exists in cold compaction. What are the limitations of lubricants? [6]
c) Describe sizing & coining. What are the requirements of die material to be used for Hot Compaction? [6]
- Q5)** a) Describe purposes of sintering. Explain various sintering stages. [6]
b) Explain with a neat diagram, continuous furnace used for sintering. Also state clearly, in this furnace why dewaxing zone is kept separate from sintering section of the furnace. [6]
c) What is Infiltration? Describe in brief. [4]

OR

- Q6)** a) What are the advantages of Batch type of furnace? [4]
b) What is 'Liquid phase sintering'? Under what condition it takes place? [4]
c) Explain the purposes of protective atmosphere. [4]
d) With a suitable graph, explain how properties change during sintering. [4]

SECTION - II

- Q7)** a) Explain HIP in detail. [8]
b) Explain Powder Forging stating clearly the difference between Powder Forging & Conventional Forging. [4]
c) What are the limitations of cold compaction? [4]

OR

- Q8)** Write short notes on: [16]
a) Encapsulation.
b) Problems of Hot compaction.
c) Powder extrusion.
d) Roll compaction.
e) Post Sintering Operations.

Q9) With the help of a neat flow chart, describe production of the following. Mention all important parameters. [18]

- a) Cemented Carbide tools
- b) Friction material
- c) Tungsten filament

OR

Q10) With the help of a neat flow chart, describe production of the following. Mention all important parameters. [18]

- a) Electrical contact materials.
- b) Diamond Impregnated tools.
- c) Ferrites.

Q11) Answer the following: [16]

- a) Describe steam treatment in detail.
- b) What are the different categories of powder particles? What are Nano size particles? What are the problems in handling such nano size particles?
- c) State limitations of Powder Metallurgy.
- d) Name any 2 engineering components that are produced by Powder metallurgy with justification.

OR

Q12) Answer the following: [16]

- a) What is Impregnation? Where it is used?
- b) Why Salt bath furnace is not suitable for heat treatment of P/M parts?
- c) Mention 2 most important advantages & limitations of Powder Metallurgy according to you.
- d) Which hardness test would you suggest to take hardness of P/M part which is not hardened? Justify.

□□□