

III B. Tech II Semester Regular Examinations, April - 2016

POWER SEMICONDUCTOR DRIVES

(Electrical and Electronics Engineering)

Time: 3 hours

Maximum Marks: 70

- Note: 1. Question Paper consists of two parts (**Part-A** and **Part-B**)
 2. Answering the question in **Part-A** is compulsory
 3. Answer any **THREE** Questions from **Part-B**

PART -A

- 1 a) What are the main factors which decide the choice of electrical drive for a given application? [3M]
 b) Describe the flux control method of series motor. [4M]
 c) Explain the first quadrant chopper controlled separately excited dc motor. [4M]
 d) Draw the block diagram of closed loop operation of induction motor drives. [3M]
 e) Define Slip power and its significance. [4M]
 f) When operating in true synchronous mode, why the frequency must be changed in small steps? [4M]

PART -B

- 2 a) Explain the different components of basic electrical drive system. [8M]
 b) Describe different braking methods employed for electrical motors. [8M]
- 3 a) Explain the operation of a separately excited dc motor supplied from 3-phase fully controlled rectifier with necessary diagrams. Assume Continuous conduction. [8M]
 b) A 220V, 1440rpm, 120A separately excited DC motor with armature resistance of 0.7Ω is fed from 3-phase fully controlled converter with an ac source line voltage 440V, 50 Hz supply. A star connected transformer is used to feed the armature so that motor terminal voltage equals rated voltage when converter firing angle is zero. Calculate the value of firing angle when motor is running at 1200 rpm at rated torque. [8M]
- 4 a) Explain the operation of a four quadrant chopper fed to the D.C series motor and also draw the current and voltage wave forms for continuous current operation. [8M]
 b) A 220v, 24A, 1000rpm separately excited dc motor having an armature resistance of 2Ω is controlled by a chopper. The chopping frequency is 500Hz and the input voltage is 230V. Calculate the duty ratio for a motor torque of 1.2 times rated torque at 500rpm. [8M]



- 5 a) Discuss speed control of induction motor from stator side with speed-torque curves. [8M]
- b) The parameters of a three phase 400 Volts, 50 Hz, 6 pole, 960 rpm, and star connected induction motor has the following parameters per phase referred to the stator. $R_1 = 0.4 \text{ Ohm}$, $R_2 = 0.20 \text{ Ohm}$, $X_1 = X_2 = 1.5 \text{ Ohm}$, $X_m = 30 \text{ Ohms}$. If the motor is controlled by variable frequency control at a constant flux of rated value, determine the motor speed and the stator current at half the rated torque and 25Hz. [8M]
- 6 a) Draw the circuit diagram and explain the operation of rotor- resistance control of Induction motor. Mention the advantages and disadvantages of the above method of control. [8M]
- b) Explain Static Kramer drive for a three phase induction motor. [8M]
- 7 a) Describe self-controlled and load-commutated inverter controlled synchronous motor drives in detail. [8M]
- b) Draw the block diagram of a closed loop synchronous motor drive fed from VSI. [8M]



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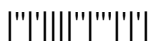
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PART -A

- 1 a) Explain in detail about components of load torques. [3M]
- b) Briefly explain different speed control techniques for D.C. motor. [4M]
- c) Describe the first quadrant chopper control of dc series motor. [4M]
- d) Why V/f ratio must be constant for a frequency controlled induction motor drive? Explain. [3M]
- e) Draw and explain the equivalent circuit of a wound rotor induction motor when voltage is injected in the rotor circuit. [4M]
- f) Compare self-controlled and load-commutated inverter controlled synchronous motor drives. [4M]

PART -B

- 2 a) Explain the four quadrant operation of a motor drive in general. [8M]
- b) Describe different braking methods employed for D.C. motors. [8M]
- 3 a) Explain the operation of 3-phase six pulse converter feeding DC series motor with neat diagram and relevant waveforms. [8M]
- b) A 200V, 875rpm, 150A separately excited dc motor has an armature resistance of 0.06ohm. It is fed from a three phase fully controlled rectifier with an ac source of 220V, 50Hz. Assuming continuous conduction, calculate [8M]
- (i) Firing angle for rated motor torque and 750rpm.
- (ii) Motor speed for $\alpha=160^\circ$ and rated torque.
- 4 a) Explain with circuit and waveforms of four quadrant chopper fed separately excited DC motor. [8M]
- b) A 230V, 960rpm and 200A separately excited dc motor has an armature resistance of 0.02Ω. The motor is fed from a chopper, which is capable of providing both motoring and braking operations. The source has a voltage of 230V. Assuming continuous conduction: When motor is operated in Dynamic braking, with Braking resistance of 2 ohm [8M]
- (i) calculate Duty ratio of chopper for a motor speed of 600 rpm and braking torque of twice the rated value.
- (ii) What will be the motor speed for a duty ratio of 0.6 and motor torque equal to twice its rated value?



- 5 a) Explain why stator voltage control is suitable for speed control of Induction motors in fan and pump drives. Draw and explain speed control of 3 phase Induction motor using AC Voltage Controller. [8M]
- b) The rotor resistance and stand still reactance referred to stator of a 3 phase, 4 pole, 50 Hz Squirrel cage Induction motor is 0.2 ohm and 0.8 ohm per phase respectively. The full load slip of the motor is 4 percent. Neglect stator resistance and leakage reactance. Determine how much stator voltage should be reduced in order to get a speed of 1200 rpm if the load torque remains constant. [8M]
- 6 a) Draw the circuit diagram and explain the working of a slip power recovery system using static Scherbius system for a three phase induction motor. [8M]
- b) Explain Static Kramer drive for a three phase induction motor. [8M]
- 7 a) Explain the operation of Load commutated CSI fed Synchronous motor drive. [8M]
- b) In variable frequency control of a synchronous motor why (V/f) ratio is maintained constant up to base speed and V constant above the base speed. Explain briefly with necessary waveforms. [8M]



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PART -A

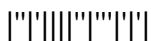
- 1 a) What are advantages of electrical drive? [3M]
- b) Discuss the drawbacks of rectifier control of dc series motor. [4M]
- c) List the advantages offered by dc chopper drives over line-commutated converter controlled dc drives. [4M]
- d) Draw the speed-torque characteristics of induction motor with variable frequency control. [3M]
- e) Why rotor resistance control is preferred in low power crane drives? [4M]
- f) What is the basic difference between true synchronous mode and self control mode for variable frequency control of Synchronous motor? [4M]

PART -B

- 2 a) What do you mean by regenerative braking of motor? Explain. [8M]
- b) Explain about nature and classification of different load torques. [8M]
- 3 a) Explain the operation of dual converter controlling the separately excited dc motor. [8M]
- b) A 220 V, 1500 rpm, 11.6 A separately excited motor is controlled by a 3-phase fully controlled rectifier with an ac source voltage of 230 V, 50 Hz. Enough filter inductance is added to ensure continuous conduction for any torque greater than 25 percent of rated torque, $R_a = 2\Omega$.
 - (i) What should be the value of the firing angle to get the rated torque at 1000 rpm?
 - (ii) Calculate the firing angle for the rated braking torque and -1500 rpm.
 - (iii) Calculate the motor speed at the rated torque and $\alpha = 160^\circ$ for the regenerative braking in the second quadrant.
- 4 a) Explain with circuit and waveforms of two quadrant chopper fed separately excited DC motor. [8M]
- b) A 230V, 960 rpm and 200A separately excited dc motor has $R_a=0.02\text{ohm}$. The motor is fed from a chopper which provides both motoring and braking operations. Assume continuous conduction. Calculate duty ratio of chopper for motoring and braking operations at rated torque and 350 rpm. [8M]



- 5 a) Show that variable frequency control of induction motor is more efficient than stator voltage control. [7M]
- b) A 440V, 3 phase, 50 Hz, 6 pole, 945 rpm, delta connected Induction Motor has the following parameters referred to the stator. [9M]
 $R_s = 2\Omega$, $R_r = 2\Omega$, $X_s = 3\Omega$, $X_r = 4\Omega$.
When driving a fan load at rated voltage it runs at rated speed. The motor speed is controlled by stator voltage control. Determine motor terminal voltage, current and torque at 800 RPM.
- 6 a) Explain static Scherbius drive control for speed control of induction motor. Draw speed -torque characteristics. [8M]
- b) Explain with circuit and waveforms for speed control of induction motor by Static rotor resistance. [8M]
- 7 a) Describe the operation of self-controlled Synchronous Motor drives in detail. [8M]
- b) Describe the open-loop and closed loop methods of speed control of a synchronous motor using VSI. [8M]



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PART -A

- 1 a) Explain about fundamental torque equation. [3M]
- b) Describe the rectifier control of dc series motor. [4M]
- c) Draw the block diagram of closed loop operation of chopper controlled dc motor. [4M]
- d) Explain the significance of (V/f) speed control method of an induction motor. [3M]
- e) Draw the circuit diagram for static Scherbius drive [4M]
- f) Compare self-controlled and load-commutated inverter controlled synchronous motor drives. [4M]

PART -B

- 2 a) Explain the different components of basic electrical drive system. [7M]
- b) Explain the four quadrant operation of a motor drive in general. [9M]
- 3 a) Explain the operation of a separately excited dc motor supplied from 3- Φ semi controlled rectifier. [8M]
- b) A 12.2 kW, 230 V, 850 rpm, 56 A dc separately excited motor is controlled by a 3-phase fully-controlled rectifier fed from 460 V, 60 Hz ac supply through a transformer. It has an armature resistance of 0.284 Ω and sufficient inductance to assure continuous conduction for all operating points with torques greater than 20 percent of the rated. The transformer and the source impedance can be neglected.
- (i) A rated dc voltage across the motor at full load is desired. Choose a suitable transformer from the following three available:
- (i) 460/460 V
- (ii) 460/230 V
- (iii) 460/ 180 V
- (ii) Having chosen the transformer find the following:
- (i) The rectifier firing angle for the rated torque and speed.
- (ii) The rectifier firing angle for the rated braking torque and the speed of 600 rpm in the reverse direction.



- 4 a) With circuit and waveforms explain the operation of four quadrant chopper fed separately excited DC motor. [8M]
- b) A 230 V, 500 rpm, 90 A separately excited dc motor having an armature resistance and inductance of 0.115 Ω and 11 mH respectively, is controlled by a class C two-quadrant chopper operating with a source voltage of 230 V and a frequency of 400 Hz. [8M]
- (i) Calculate the motor speed for a motoring operation at $\delta = 0.5$ and half of rated torque.
- (ii) What will be the motor speed when regenerating at $\delta = 0.5$ and rated torque?
- 5 a) Explain speed control of induction motor by AC Voltage Controllers. [7M]
- b) A 3 phase, 4 pole, 50 Hz squirrel cage Induction motor has the following circuit parameters: [9M]
- $r_1 = 0.05\text{ohm}$, $r_2 = 0.09\text{ohm}$, $X_1 + X_2 = 0.55\text{ohm}$.
- The motor is star connected and rated voltage is 400V. It drives a load whose torque is proportional to the speed and is given as $T_1 = 0.05\omega$ N-m. Determine the speed and torque of the motor for a firing angle of 45° of the AC Voltage Controller on a 400V, 50 Hz supply.
- 6 a) Draw the circuit diagram and explain the working of a slip power recovery system using Static Kramer drive for a three phase induction motor. [8M]
- b) Explain with circuit and waveforms for speed control of induction motor by Static rotor resistance method. [8M]
- 7 a) How is the output voltage of a VSI improved by PWM techniques? Explain how you will use this converter for speed control of a synchronous motor. [8M]
- b) Discuss in detail with suitable circuit diagram the principle of operation of self-controlled Synchronous motor drive employing load commutated thyristor inverter. [8M]



III B. Tech II Semester Regular Examinations, April - 2016
INDUSTRIAL ENGINEERING MANAGEMENT

(Mechanical Engineering)

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PART -A

- 1 a) Define Industrial Engineering. [3M]
- b) What are the objectives of plant maintenance? [3M]
- c) Explain the term PMTS. [4M]
- d) State the importance of Quality control. [4M]
- e) What is profit sharing? [4M]
- f) State Fulkerson's rule for numbering the nodes in a network. [4M]

PART -B

- 2 a) Differentiate between production and productivity. [4M]
- b) Explain the contributions of Taylor for scientific management and how it leads to the concept of scientific management. [8M]
- c) State the functions of the management in an organisation. [4M]
- 3 a) What do you mean by optimal design in plant layout? [4M]
- b) Briefly discuss the factors to be considered for the selection of a location for a factory construction. [8M]
- c) Explain the importance of preventive maintenance in production management. [4M]
- 4 a) State the differences between method study and work measurement with their objectives. [8M]
- b) Explain the need and procedure for conducting work sampling study. [8M]
- 5 a) The following table gives the coded measurement obtained from 20 subgroups of 5 each: [8M]

Subgroups No.	Statistics	Subgroups No.	Statistics
1	-1,2,1,0,1	11	0,1,-3,2,1
2	2,0,1,0,1	12	2,1,-1,0,0
3	1,1,0,0,1	13	0,1,-3,2,1
4	2,1,0,-1,0	14	0,0,-1,0,1
5	1,-1,0,0,-1	15	-1,2,1,1,2
6	1,-1,2,0,2	16	1,-1,2,0,2
7	-1,-1,0,-2,1	17	2,1,-1,0,0
8	1,1,2,-1,0	18	2,0,1,0,1
9	2,1,-1,0,0	19	0,1,1,-1,1
10	-2,1,-2,2,1	20	3,-3,1,1,1

- i. Construct the \bar{X} and R charts and plot the points on the chart
- ii. What will be the control limits on \bar{X} and R charts for immediate future?
- iii. Estimate the value of σ .

- b) Explain in detail about the need of ISO quality systems in an industry. [8M]
- 6 a) Why an employee must be rated? State and explain different methods of employee rating. [8M]
b) Discuss the fundamental requirements of good financial wage incentive system. [8M]
- 7 a) What is the need for value analysis of a product? [4M]
b) State the difference between PERT and CPM in project management. [4M]
c) A project has the following time schedule: [8M]

Activity	Time in weeks	Activity	Time in weeks
1 – 2	2	4 – 6	3
1 – 3	2	5 – 8	1
1 – 4	1	6 – 9	5
2 – 5	4	7 – 8	4
3 – 6	8	8 – 9	3
3 – 7	5		

Construct PERT network and compute

- i. T_L and T_E for each event
- ii. Float for each activity
- iii. Critical path and its duration



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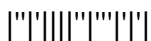
PART -A

- 1 a) Define scientific management. [3M]
- b) Define plant maintenance schedule. Write down the procedure for scheduling plant maintenance. [5M]
- c) Explain the importance of Ergonomics. [4M]
- d) Explain the term TQM. [3M]
- e) What is incentive? How it helps to improve production? [4M]
- f) State the modules of ERP. [3M]

PART -B

- 2 a) State the role of an Industrial Engineer in shop floor. [4M]
- b) Explain the tools that are used in Industrial engineering for solving managerial problems. [8M]
- c) Describe the importance of management in an Organization. [4M]
- 3 a) State the principle of plant layout. [3M]
- b) Explain various types of plant layouts with their relative advantages over other types. [8M]
- c) Explain the different types of maintenance system followed in a continuous process Industry. [5M]
- 4 a) Explain the steps followed in method study of job process. [8M]
- b) What is process Chart? Explain different types of process chart with relevant sketches. [8M]
- 5 a) Construct (\bar{X}) and R-charts for the following information and state whether the process is in control. For each of the following, (\bar{X}) has been computed from a sample of 5 units drawn at an interval of 1 hour from an ongoing manufacturing process. [8M]

S. No.	X ₁ (10 am)	X ₂ (11 am)	X ₃ (12 noon)	X ₄ (1 pm)	X ₅ (2 pm)
1	10.02	10.15	9.85	10.02	9.97
2	9.97	9.98	9.96	9.92	10.05
3	10.08	10.02	10.1	10	10.01
4	9.92	10.12	10.08	10.02	10.05
5	10.02	10.06	10.04	9.95	9.89



- b) Explain six sigma concept. How do you think that this concept would improve the productivity? [8M]
- 6 a) What are the objectives and functions of trade union? [8M]
b) Explain Rowan plan of wage rating. [8M]
- 7 a) Explain the rules of network construction. [8M]
b) In the following table optimistic, most likely and pessimistic times are respectively shown against each connected activity from 1 to 10 in a project. [8M]

Activity	Time	Activity	Time
1 - 2	4 , 8 , 12	2 - 3	1 , 4 , 7
2 - 4	8 , 12, 16	3 - 5	3 , 5 , 7
4 - 5	0 , 0 , 0	4 - 6	3 , 6 , 9
5 - 7	3 , 6 , 9	5 - 8	4 , 8 , 6
6 - 10	4 , 6 , 8	7 - 9	4 , 8 , 12
8 - 9	2 , 5 , 8	9 - 10	4 , 10 , 16

- i. Construct a network.
- ii. Find the critical path and its duration
- iii. The schedule completion time for the project is 48 days. Calculate the probability of finishing the project within the time.



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PART -A

- 1 a) What do you understand from the term production management? [3M]
- b) Differentiate between preventive and breakdown maintenance. [4M]
- c) Explain MTM. [4M]
- d) Define zero defect concept. [4M]
- e) State few non-financial incentives offered to the employees in a manufacturing industry. [4M]
- f) What is critical path in the network diagram? [3M]

PART -B

- 2 a) Explain the scope and application of Industrial Engineering. [4M]
- b) Explain Henri Fayol's principles of management thoughts. [6M]
- c) State the relationship between Management, Administration and Organization. [6M]
- 3 a) How Preventive maintenance is evaluated? [2M]
- b) State the advantages and disadvantages of selecting the plant location in an urban and a rural site. [8M]
- c) Explain the Quantitative techniques for optimal design of layouts. [6M]
- 4 a) What is time study? Describe the steps involved in time study. [8M]
- b) Explain how a high productive design of a work place layout can be made with the concept of Ergonomics motion economy [8M]
- 5 a) Construct control chart \bar{X} - R for the following data on the basis of 12 samples collected from a process, 5 data points are taken every hour. Comment on the state of control, assuming that these are the first data. What will be future control limit? [8M]

1	2	3	4	5	6	7	8	9	10	11	12
42	42	19	36	42	51	60	18	15	69	64	61
65	45	24	54	51	74	60	20	30	109	90	78
75	68	80	69	57	75	72	27	39	113	93	94
78	72	81	77	59	78	95	42	62	118	109	109
87	90	81	84	78	132	138	60	84	153	112	136

- b) What is Quality circle? How the implementation of Quality circle enhance the Production? [8M]



- 6 a) Explain the functions of personnel management. [8M]
 b) State the need and types of Job-evaluation. [8M]
- 7 a) Explain the concept of supply chain management and the parameters that influence the supply chain design. [8M]
 b) The table given below shows the activity details for a construction project, with the time estimates of each activity in days. [8M]

Activity	Time estimate		
	Optimistic	Most likely	Pessimistic
1 – 2	2	5	8
2 – 3	8	11	20
3 – 4	0	0	0
2 – 4	4	7	16
2 – 5	4	9	20
4 – 6	7	10	13
5 – 6	3	7	17
3 – 7	3	5	13
6 – 7	2	3	10
7 – 8	2	4	6

- i. Construct the network
- ii. Find the critical path and the project duration
- iii. Determine the probability of completion of project in 40 days.



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PART -A

- 1 a) How Industrial Engineering plays an important role in an industry? [3M]
b) List the major factors that govern the plant location for an automotive and auto component manufacturing industry. [4M]
c) What is Therbligs? [4M]
d) Define SQC. [3M]
e) State the difference between merit rating and job evaluation. [4M]
f) What is the significance of crashing in network technique? [4M]

PART -B

- 2 a) Define Productivity. What are the different kinds of productivity measures? [6M]
b) Explain briefly about Douglas McGregor theory X and theory Y on motivation and management with the assumptions. [6M]
c) Differentiate between production management and Industrial engineering. [4M]
- 3 a) To increase the productivity, what type of maintenance must be carried out in the shop floor? State its importance. [4M]
b) Discuss Product type of layout. State the advantage and disadvantage of product type of layout over process type of layout. [8M]
c) Explain the steps involved in designing a plant layout [4M]
- 4 a) Explain how micro-motion study is performed. [8M]
b) Describe briefly the different technique of rating used in connection with work study of an operator's performance in a labor intensive industry. [8M]
- 5 a) The following data (two subgroup of size 4), is from two different machines which are supposed to be alike. Plot the necessary chart to show whether their product would support this assumption. If they don't, does this prove the machines are not essentially alike? [8M]



Machine 1			Machine 2		
Subgroup	Average	Range	Subgroup	Average	Range
1	2.77	0.06	1	2.53	0.12
2	2.70	0.29	2	2.67	0.30
3	2.78	0.19	3	2.66	0.17
4	2.67	0.12	4	2.57	0.25
5	2.75	0.34	5	2.60	0.24
6	2.77	0.23	6	2.60	0.05
7	2.75	0.17	7	2.70	0.30
8	2.73	0.06	8	2.56	0.04
9	2.76	0.23	9	2.70	0.19
10	2.63	0.20	10	2.67	0.08
11	2.73	0.17	11	2.60	0.11
12	2.74	0.28	12	2.63	0.14
13	2.73	0.26	13	2.71	0.24
14	2.72	0.13	14	2.63	0.31
15	2.73	0.13	15	2.75	0.17

- b) Describe the key steps involved in the process of getting registered to ISO 9000 certification. [8M]
- 6 a) Why is it important to manage human resource in an organization? Discuss. [8M]
 b) Explain any one type of wage incentive plan that you think will improve the productivity of a continuous production industry. [8M]
- 7 a) What is enterprise resource planning? [3M]
 b) In what ways an organization is benefited by the implementation of ERP. [5M]
 c) The following data gives the information about duration and cost of various activities in a project network [8M]

Activity	Normal duration (weeks)	Normal cost (in Rs.)	Crash duration (weeks)	Crash cost (in Rs.)
1 – 2	4	4000	2	12000
2 – 3	5	3000	2	7500
2 – 4	7	3600	5	6000
3 – 4	4	5000	2	10000

The project overhead costs are Rs.2000 per week. Find the optimum duration and cost associated with it. Also, draw the least cost network.



Code No: R32026

R10

Set No. 1

III B.Tech II Semester Supplementary Examinations, April - 2016

MANAGEMENT SCIENCE

(Common to ECE, CSE, CHEM, EIE, BME, IT)

Time: 3 hours

Max. Marks: 75

**Answer any FIVE Questions
All Questions carry equal marks**

- 1 a) Explain the importance of Principle of Authority and Responsibility.
b) What is virtual organization?
- 2 a) What do you mean by purchase? State its important objectives.
b) Discuss the importance of the marketing strategies.
- 3 a) Define HRM in an organization.
b) Explain the management practice and importance of JIT.
- 4 a) Discuss the role of the business communication.
b) Define the importance of the report writing in business letters.
- 5 a) Explain the formulation and implementation of the strategic management.
b) Discuss the basic concept of the MIS.
- 6 a) What is wage? Explain the importance of the business management in daily life.
b) Describe the HRD in an organization.
- 7 a) Write something about Maximum inventory and Minimum inventory which a firm has to follow.
b) Explain the Importance of the Enterprise Resource planning (ERP) in management.
- 8 a) Explain the Importance of the TQM in organization.
b) Explain the importance of the control charts in an origination.



Code No: R32036

R10

Set No. 1

III B.Tech II Semester Supplementary Examinations, April - 2015
INDUSTRIAL ENGINEERING & MANAGEMENT
(Mechanical Engineering)

Time: 3 hours

Max. Marks: 75

Answer any FIVE Questions
All Questions carry equal marks

- 1 a) Define the terms industrial engineering and productivity.
b) Explain the quantitative tools of IE and productivity measurement.
- 2 a) Explain the effect of group layout on production industry.
b) Plant location is a recurring problem involving business survival. Evaluate the statement.
- 3 Define ergonomics. Differentiate between static and dynamic ergonomics. Describe the ergonomic considerations in design of any system.
- 4 a) Explain SQC with advantages, limitations and applications.
b) What is the importance of quality control? Explain.
- 5 Critically evaluate different methods of merit rating.
- 6 a) Explain the concept of zero defects.
b) What is the prominence of ISO quality system?
- 7 Explain the various types of values. Discuss each of these citing suitable examples.
- 8 You are given the following data:

Activity	Logical Sequence	Time (days)		
		Optimistic time (to)	Most likely time (tm)	Pessimistic time (tp)
A	--	4	8	10
B	--	8	12	18
C	A	6	10	12
D	C	6	8	12
E	B	10	14	18

Draw a network diagram and determine the following:

- a) Expected task time and their variance,
- b) Earliest and latest expected time to reach each node,
- c) Critical path and
- d) Probability of completing the project in 48 days.

