Time: 3 Hours **Marks: 80**

N. B.: 1. Question 1 is Compulsory
2. Attempt any three questions out of the remaining five.
3. All questions carry equal marks.
4. Assume suitable data, if required and state it clearly.

1. Attempt any FOUR
   a. Write a short notes on Service Capacity. [5]
   b. Explain the steps of Capacity planning. [5]
   c. Explain Forwards scheduling and backward scheduling. [5]
   d. Write notes on MRP. [5]
   e. Explain the objectives of Line balancing. [5]
   f. Write notes on JIT [5]

2 a. Use largest Candidate rule to work out a solution on a precedence diagram. Assume cycle time is 1 min. find out a. theoretical number of stations. b. Efficiency and balance delay. [10]

No.	ElementDescription	Time(min.)	Mustbe Precedenceby
1	Placeframeonworkholderandclamp	0.2	---
2	Assembleplug,grommettopowercord	0.4	---
3	Assemblebracketstoframe	0.7	1
4	Wirepowercordtomotor	0.1	1,2
5	Wirepowercordtoswitch	0.3	2
6	Assemblemechanismplatetobracket	0.11	3
7	Assemblebladetobracket	0.32	3
8	Assemblemotortobracket	0.6	3,4
9	Alignbladeandattachtomotor	0.27	6,7,8
10	Assembleswitchtomotorbracket	0.38	5,8
11	Attachcover,inspect,andtest	0.5	9,10
12	Placeintotepanforpacking	0.12	11

b. Explain the concept of wastes in JIT Manufacturing. How these wastes are eliminated in JIT Manufacturing? [10]

3. a. Explaindifferent factors influencing Plant Layout. [10]

b. Jobs each of which must be processed on the machine M1, M2, ... M6. The processing times in hrs are given (i) Find the optimal sequence. (ii) Minimum total elapsed time. (iii) Idle times associated with machines.

Jobs	Processing times					
	M_1	M_2	M_3	M_4	M_5	M_6
A	18	8	7	2	10	25
B	17	6	9	6	8	19
C	11	5	8	5	7	15
D	20	4	3	4	8	12

4. a. The Following activities are involved in a XYZ project are given below along with relevant information. Construct the network and find the critical path also find the floats for each activity. [10]

   b. What is aggregate planning? Explain aggregate planning strategies in detail [10]

5. a. Following data refers to the past sales of one product [10]

Year	1982	1983	1984	1985	1986	1987	1988	1989	1990
Sales in ₹ (× 10000)	39	54	62	73	85	100	95	105	120

   Use least square method and estimate sales forecasting of year 1992.

   b. Bring out the difference between PERT and CPM. [10]

6. a. Explain Pillars of Lean Manufacturing in detail. [10]

   b. Explain Production and operations function in detail [10]

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Subject Code : 53371

Question Paper Code Number: 29376

Missing Data in the Question Numer 4a) is given below

4. a. The Following activities are involved in a XYZ project are given below along with relevant information. Construct the network and find the critical path also find the floats for each activity.

Activity	1 – 2	1 – 3	2 – 3	2 – 4	3 – 4	4 – 5
Duration	20	25	10	12	6	10

[10]

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Time: 3 hours **Max. Marks: 80**

Note: 1. Assume suitable data if necessary
2. Figures to the right indicate full marks
3. Question No. 1 is compulsory
4. Solve any **three** out of the remaining **five** questions

Q1.	**Solve any four**	
A	Classify composites based on their fibers and matrix.	**5**
B	Explain plain stress assumption.	**5**
C	Explain failure envelopes.	**5**
D	Define thermal conduction and moisture diffusion.	**5**
E	Explain Pulse Echo method in detail.	**5**
F	Explain the factors which are required to be considered while selecting an appropriate method for repairing a composite structure.	**5**
Q2.		
A	Define viscoelastic properties in detail.	**5**
B	Explain maximum stress failure theory.	**5**
C	Explain laminate in detail.	**10**
Q3.		
A	Elaborate cracks related to laminates.	**5**
B	Define thermal expansion and moisture swelling.	**5**
C	Illustrate Tsai-Wu failure theory.	**10**
Q4.		
A	Elaborate how matrix cracks repaired in composite materials.	**5**
B	Explain ultrasonic through transmission method in detail.	**5**
C	What are the different types of laminates and how are they designated using codes.	**10**
Q5.		
A	List application of composite materials in detail.	**5**
B	Explain the process of damage removal.	**5**
C	Explain radiographic inspection of composites.	**10**
Q 6.		
A	Explain Pultrusion process	**5**
B	Derive Hooke's Law for a two dimensional unidirectional lamina.	**5**
C	Illustrate the different types of generic repair designs.	**10**

Time: 3-hour **Max. Marks: 80**

Note:

1. Question No.1 is compulsory.
2. Attempt any three questions from the remaining.
3. Assume suitable data if required.

Q1. **Solve any four out of five.** **5 Marks each**

a Define adiabatic flame temperature, enthalpy of combustion & enthalpy of reaction.

b Derive an expression for the force exerted by a jet of water on a fixed curved plate in the direction of the jet.

c Write the differences between the mounting and Accessories of the boiler.

d Describe the working of reheating gas turbine plant with the help of a T-S diagram.

e Write a short note on the air vessel with a neat sketch.

Q2. **20 Marks**

a In a Parson reaction turbine, the angles of receiving tips are 35° and of discharging tips, 20°. The blade speed is 100 m/s. Calculate the tangential force, power developed, diagram efficiency, and axial thrust of the turbine if its steam consumption is 1 kg/min. **10 Mark**

b Write a short note on the Francis turbine. **5 Mark**

c Write a short note on the Turbojet engine. **5 Mark**

Q3. **20 Marks**

a The following data refers to a gas turbine plant:
Power developed = 5 MW
Inlet pressure and temperature of air to compressor = 1 bar and 30°C
Pressure ratio of the cycle = 5
Isentropic efficiency of the compressor = 80%
Isentropic efficiency of turbines = 85%
Maximum temperature in the turbines = 550°C
Take for air, Cp = 1.0 kJ/kgK, γ = 1.4 and
for gases, Cp = 1.15 kJ/kgK, γ = 1.33.
If a reheater is used between two turbines at a pressure of 2.24 bar, calculate the following:
(a) Mass flow rate of air,
(b) The overall efficiency,
Neglect the mass of fuel.
10 Mark

b What is specific speed for turbine and centrifugal pump? **5 Mark**

c Write a short note on the Rocket engine. **5 Mark**

Q4. **20 Marks**

a A boiler generates 8 kg of steam per kg of fuel burnt at a pressure of 12 bar from feed water entering at 80°C. The boiler is 75% efficient and its factor of evaporation is 1.15. Calculate
(a) Degree of superheat and temperature of the steam generated,
(b) Calorific value of fuel in k.J/kg,
(c) Equivalent evaporation in kg of steam per kg of fuel.
Take specific heat of superheated steam as 2.3 k.J/kg·K

10 Mark

b Derive the condition for maximum blade efficiency of the impulse turbine.

5 Mark

c What is the Classification of pumps? **5 Mark**

Q5. **20 Marks**

a Determine the air–fuel ratio and the theoretical amount of air required by mass for the complete combustion of a fuel containing 85% of carbon, 8% of hydrogen, 3% of oxygen, 1% of sulfur, and the remaining ash. If 40% of excess air is used, what is the volume of air at 27°C and 1.05 bar pressure? Does this represent per kg of fuel?

10 Mark

b A centrifugal pump has an impeller 0.5 m outer diameter and when running at 600 rpm discharges water at the rate of 8000 liters/minute against a head of 8.5 m. The water enters the impeller without whirl and shock. The inner diameter is 0.25 m, the vanes are set back at the outlet at an angle of 45° and the area of flow which is constant from inlet to outlet of the impeller is 0.06 m^2. Determine (a) the manometric efficiency of the pump, and (b) the vane angle at the inlet.

10 Mark

Q6. **20 Marks**

a Design a Francis turbine runner with the following data: Net head H = 68 m; speed N = 750 rpm; output power P = 330 kW; η_h = 94%; η_o = 85 %; flow ratio ψ = 0.15; breadth ratio n = 0.1; inner diameter of the runner is half of the outer diameter. Also, assume 6% of the circumferential area of the runner to be occupied by the thickness of the vanes. The velocity of flow remains constant throughout and flow is radial at the exit

10 Mark

b Draw a general layout of a hydroelectric power plant using an impulse turbine and define the following:
(a) Gross head, (b) Mechanical Efficiency, (c) Hydraulic efficiency, and
(d) Overall efficiency of the impulse turbine.

5 Mark

c What do you mean by cavitation and its effect on the turbine and pump?

5 Mark

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Time: 3hour **Max Marks: 80**

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N.B. (1) Question No. 1 is compulsory.
(2) Attempt any three questions out of remaining five questions.
(3) Assume suitable data if necessary.
(4) Figures to the right indicate full marks.

Q1. Solve any Four out of Five. 20

a) Illustrate the Cause-and-effect diagram with suitable example.

b) List and describe the dimensions of product quality.

c) What is single sampling plan? Explain with neat sketch.

d) What is Quality Circle? What are the steps involved in quality circle process.

e) Specify the difference between ISO9000 and QS9000.

Q2.

a) What is cost of quality? What are its categories explain in brief. 10

b) What are the reasons for benchmarking and explain the important steps in the process of benchmarking. 10

Q3.

a) Following are the inspection results of magnets for nineteen observations. 10

Week No.	No. of Magnet inspected	No. of defective magnets	Week No.	No. of Magnet inspected	No. of defective magnets
1	724	48	11	736	47
2	763	83	12	739	50
3	748	70	13	723	47
4	748	85	14	748	57
5	724	45	15	770	51
6	727	56	16	756	71
7	726	48	17	719	53
8	719	67	18	757	34
9	759	37	19	760	29
10	745	52			

Calculate the average fraction defective and 3 sigma control limits, construct the control chart and state whether the process is in statistical control.

b) Explain the concept of Taguchi's quality function in detail. Give an example. 10

Q4.

a) Discuss about the four important documents to be prepared for ISO9000 certification. 10

b) Elaborate on the concept of Win-win policy in the context of supplier relationship? 10

Q5. .

a) Describe Deming's philosophy for quality improvement. 10

b) Explain in brief Malcom Baldrige National Quality Award framework and criteria for performance excellence. 10

Q6.

a) Explain how Six Sigma can be used to improve the quality of products and services in the manufacturing and service sectors. 10

b) Explain strategic approach to leadership in TQM. 10

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[Time: 3 **Hours]** **[Marks:80]**

N.B: 1. **Questions No. 1 is Compulsory.**
2. **Attempt any three out of remaining Questions.**
3. **Figures to the right Indicate full marks.**

Q.1 Attempt any Four write short notes on **20**

a) Significance of Environment

b) Global Warming

c) Scope of Environment Management

d) EMS certification

e) Forest Act

f) Eco-system and its types

Q.2 a) Discuss on environmental issues related to Indian context. **10**

b) Discuss on Air [P & CP] Act **10**

Q.3 a) Explain limiting factor and food chain as related to ecosystem. **10**

b) Write a note on each. Ozone layer depletion & Acid rain. **10**

Q.4 a) Discuss on corporate environment responsibity. **10**

b) What is sustainable development? What are the parameter effecting it? **10**

Q.5 a) What is ISO-14000? How does adoption of ISO-14000 practices benefits industries as well Environment. **10**

b) Discuss the functions of government as planning and regulatory agency. **10**

Q.6 a) Discuss the Atomic and Biomedical hazards as related to Global environmental concern. **10**

b) Discuss on Total Quality environmental management. **10**

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(3 Hours) **[Total Marks: 80]**

NB: 1. Question No. 1 is compulsory
2. Solve any three questions from remaining questions
3. Assume suitable data with proper justification if required
4. Use of standard design data book like PSG, Kale and Khandare is permitted.

Q.1) Answer any four 20

(a) Explain the morphology of mechanical system design with neat flow chart.
(b) State the significance of structural formula and structural diagram in the multispeed gear box design.
(c) State the function of different type of piston rings.
(d) State the churning phenomenon and its effect in a centrifugal pump.
(e) Classify and compare wire rope according to twisting direction and according to wire size.

Q.2) For the specification of an EOT Crane,
Application - Class II
Load to be Lifted - 70 KN
Hoisting speed - 5 m/min
Maximum Lift - 10 m
i. Design a 6 X 37 type of rope and find its life. 6
ii. Design hook and check it at most critical cross section. 8
iii. Design rope drum and select suitable motor for hoisting. 6

Q.3.A) Design belt conveyor for following specification
Material to be handled -: Gypsum Stone,
Grain type -: Non standard
Working Capacity -: 125 TPH,
Length of conveyor -: 100 m
Inclination with horizontal -: 10°
Lump size -: 60 mm
i. Determine width and thickness of a conveyor belt 8
ii. Select suitable motor for conveyor. 4
iii. Determine length and diameter of top and bottom idler. 4

Q.3.B) Write a short note on take up arrangement in case of belt conveyor. 4

Q.4.A) The following data are pertaining to a 4-stroke single cylinder, water cooled petrol engine.
Brake power= 7.5 KW
Mass of reciprocating parts = 8 kg.
Length of connecting rod = 310 mm.
Stroke length = 150mm.
Speed = 3000 RPM.
Compression ratio = 5:1
Over speed= 10%
Design the following,
i. Piston and piston pin 8
ii. connecting rod for forged steel having "I" cross section with proportion being depth = 6t and width = 4t, where "t" is thickness of web and flange. 8

Q.4.B) Sketch different types of valves used in internal combustion engine 4

Q.5.A) The following data refers to centrifugal pump for pumping water. 16
Static suction head= 4 m, Length of suction pipe= 8 m,
Static delivery head = 25 m, Delivery pipe length= 30 m,
Discharge = 1500 LPM,

i) Select suitable motor
ii) Determine inlet and tip diameter of an impeller
iii) Determine inlet and exit angle of an impeller
iv) Determine number of blades for an impeller.

Q.5.B) Which shaft is heavily loaded in case of gear pump, Explain. 4

Q.6) Design a layout of 6 speed gear box of milling machine having output speed ranging from 160 to 1000 rpm approximately. Power applied to the gear box is 6 KW at 960 rpm.

i. Choose standard step ratio and construct structural diagram. 8
ii. Construct ray diagram by deciding various reduction ratios. 6
iii. Determine the no of teeth on each gear. 6

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