8E4049

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8E4049

B. Tech. VIII Sem. (Main / Back) Exam., April, 2015
Mechanical Engineering
8ME1 Renewable Energy Technology

Time: 3 Hours **Maximum Marks: 80**

Min. Passing Marks: 24

Instructions to Candidates:

*Attempt any **five questions**, selecting **one question** from **each unit**. All questions carry **equal** marks. Schematic diagrams must be shown wherever necessary. Any data you feel missing suitably be assumed and stated clearly.*

Units of quantities used/calculated must be stated clearly.

Use of following supporting material is permitted during examination. (Mentioned in form No. 205)

1. NIL 2. NIL

UNIT – I

Q.1 (a) Classify Renewable and Non-Renewable sources of energy and discuss why Renewable Energy Technologies are gaining momentum in the current Energy scenario. [8]

(b) Explain the construction and working of a Solar Flat Plate collector with neat diagrams. [8]

OR

Q.1 (a) Explain the working principle of a Solar Still. Discuss its various types and its major application areas. [8]

(b) Discuss in brief the various photovoltaic applications. [8]

UNIT – II

Q.2 Classify Wind Energy Conversion Systems (WECS) with its characteristics and applications. [16]

OR

Q.2 (a) What do you understand by Betz limit? Derive the expression for the same. [8]

(b) Describe the various factors influencing wind. How is wind shear and turbulence related to the selection of WECS? [8]

UNIT – III

Q.3 (a) What do you understand by Ocean Energy? What are its resources and routes? [8]

(b) What is the principle of energy conversion through OTEC system? Explain open cycle OTEC system. [8]

OR

Q.3 (a) What do you mean by Ocean Wave Energy Conversion. Describe one of the methods of power generation through ocean wave. [8]

(b) Explain with neat diagram the closed cycle OTEC system [8]

UNIT – IV

Q.4 Write short notes on: [4×4=16]

(a) Nuclear fission and fusion

(b) MHD

(c) Geothermal Energy

(d) Biomass

OR

Q.4 What are the various considerations for site selection of a Geothermal Power Plant? Explain the working of a geothermal power plant with neat sketches. [16]

UNIT – V

Q.5 (a) Describe the basic design of a fuel cell. What are the electrochemical principles and thermodynamics involved in the working of fuel cell? [8]

(b) List the various types of fuel cells and describe any one of them. [8]

OR

Q.5 (a) What are the various hydrogen production methods? Explain one of these methods. [12]

(b) Discuss the challenges involved in the production of hydrogen. [4]

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8E4050

B. Tech. VIII Sem. (Main/Back) Exam., April, 2015
Mechanical Engineering
8ME2 Operations Management

Time: 3 Hours **Maximum Marks: 80**

Min. Passing Marks: 24

Instructions to Candidates:

*Attempt any **five questions,** selecting **one question** from **each unit.** All questions carry **equal** marks. Schematic diagrams must be shown wherever necessary. Any data you feel missing suitably be assumed and stated clearly.*

Units of quantities used/calculated must be stated clearly.

Use of following supporting material is permitted during examination.

1. NIL 2.NIL

UNIT – I

Q.1 (a) Explain what is meant by the term service revolution? Name five service industries and explain in brief their service types. [6]

(b) A large health maintenance organization (HMO) was created as a result of a corporate merger two years ago. Cindy Belle, the operation manager, needs to develop a staffing plan for the legal department. She wants to use the two years of historical law suit data given below to forecast the number of law suits filed against the company for one month ahead. [10]

Month	No of Lawsuits	Month	No of Lawsuits	Month	No of Lawsuits
1	16	9	51	17	63
2	25	10	56	18	57
3	16	11	67	19	48
4	24	12	45	20	55
5	38	13	53	21	61
6	46	14	61	22	51
7	54	15	55	23	56
8	52	16	69	24	53

(i) Develop moving average forecasts for the past 10 months (months 15 – 24) for AP = 2, 4, 6 & 8 months.

(ii) Which AP results in the lowest mean absolute forecasting error? Which AP would you recommend? Why?

(iii) Using your recommended AP, forecast the number of lawsuits expected for next month (month 25)

OR

Q.1 (a) Define and describe the concept of a product life cycle for each stage of the product life cycle. Give an example of a product that is in that stage. [6]

(b) A toy company buys large quantities of plastic pellets for use in the manufacture of its products. Production manager Josh Kang wants to develop a forecasting

system for plastic pellet prices. The price per pound of plastic pellets has varied as shown: [10]

Month	Plastic pellets price/pound	Month	Plastic pellets price / pound
1	$0.39	9	$0.35
2	0.41	10	0.38
3	0.45	11	0.39
4	0.44	12	0.43
5	0.40	13	0.37
6	0.41	14	0.38
7	0.38	15	0.36
8	0.36	16	0.39

(i) Use exponential smoothing to forecast monthly plastic pellet prices. Compute what the forecasts would have been for all the months of historical data for $\alpha = 0.1$, $\alpha = 0.3$ and $\alpha = 0.5$ if the assumed forecast for all α's in the first month is $0.39.

(ii) Which alpha value results in the least mean absolute deviation for months 7 – 16?

(iii) Use the best alpha value for part (ii) to compute the forecasted plastic pellets price for month 17.

UNIT – II

Q.2 Discuss different types of Production systems with -

(a) Examples & figure (layouts) [6]

(b) Triveni steels (P) Ltd is planning to start a new factory for manufacturing steel utensils. It is considering three location options, namely Bokaro, Jamshedpur and Bhilai. The fixed costs at the three locations have been estimated at Rs 8.15 million, Rs 7.377 million and Rs 7.903 million, respectively. The variable costs at the three locations are estimated at Rs 500 per unit, Rs 580 per unit and Rs 490 per unit respectively. The factory will have an annual production capacity of 10,000 steel utensils and in the initial years it will operate at 75% efficiency. Find the best location option which has the lowest total cost of production. [10]

OR

Q.2 (a) Name three ways that firms can reduce long – range capacity. Name five ways that firms can expand long – range capacity. [6]

(b) A manufacturing needs to add more production capacity. Two alternatives are now being studied - automated and manual. The information below is important to this decision. [10]

	Automated Process	Manual Process
Annual fixed cost	$ 545,000	$ 123,000
variable cost per product	$ 15.66	$ 17.69
Estimated annual production		
(in no to products): Year 1	120,0000	120,000
Year 5	150,000	150,000
Year 10	220,000	220,000

(i) Which alternative would be the least cost alternative in year 1, 5 & 10?

(ii) How much would the variable cost per unit have to be in year 5 for the automated alternative to justify the additional annual fixed cost of the automated alternative over the manual alternative?

UNIT – III

Q.3 (a) What is materials requirement planning (MRP)? What are the in puts and out puts required by the MRP processing logic? [6]

(b) The central terminal at the Quick Cargo Air Freight company receives air freight from aircraft arriving from all over the United States and redistributes it to aircraft for shipment to all U.S. destinations. The company guarantees overnight shipment of all parcels, so enough personnel must be available to process all cargo as it arrives. The company now has 24 employees working in the terminal. The forecasted demand for ware house workers for the next seven months is 24, 26, 30, 28, 28, 24 & 24. It costs $2,000 to hire and $ 3,500 to lay off each worker. If over time is used to supply labour beyond the present work force straight time capacity, it will cost the equivalent of $2,600 more for each additional worker needed. Should the company use a level capacity with over time or a matching demand plan for the next six months? [10]

OR

Q.3 List the advantages and disadvantages of these traditional aggregate plans: [16]

(a) Matching demand

(b) Level capacity with inventory

(c) Level capacity with back log.

(d) Level capacity with subcontracting.

(e) Level capacity with part time workers.

Give suitable examples.

UNIT – IV

Q.4 Describe how customer – as – participant service operations are planned, controlled analyzed, scheduled and managed. [16]

OR

Q.4 (a) What are routing, dispatching, prioritization and expediting? Explain. [6]

(b) Table 1 gives the processing time (in hours) of seven jobs to be processed on three machines MI, M2 and M3 in the order M1, M2, M3. Sequence the jobs using Johnson's method and find the overall processing time. Find also the waiting times of the jobs and the idle times of the three machines. [10]

Table

Job	M1	M2	M3
A	7	6	10
B	10	3	9
C	11	1	15
D	14	2	13
E	21	5	18
F	17	4	11
G	8	1	9

UNIT – V

Q.5 (a) How is the producer's model of inventory different from the retailer's model? Derive an expressive for the EOQ in the producer's model. [6]

(b) If the annual demand for a product is 350,000 units, then the annual carrying cost rate is 25% of the cost of the unit. The product costs $ 14.75 per unit to purchase, and each time the product is ordered the related ordering cost is $ 53.00. [10]

(i) What is the EOQ?

(ii) What is the Total annual Storing Cost (TSC) at the EOQ?

(iii) How much would the TSC increase if the order quantity must be 2500 units because of a standard shipping container size?

OR

Q.5 (a) Why is the ABC classification of items done? How is the ABC distribution curve (Pareto Curve) drawn? [6]

(b) Zen Bicycles Ltd sources 3,000 seat covers for its bicycles from an outside supplier. The operating cost is Rs. 10 per order and the carrying cost is Rs. 6 per unit per year. The company has 300 working days per year. Find the - [10]

(i) EOQ

(ii) The number of orders per year

(iii) Total inventory cost

(iv) No of inventory cycles in a year, and

(v) The duration of an inventory cycle.

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B. Tech. VIII Sem. (Main/Back) Exam., April, 2015

Mechanical Engineering

8ME3 Gas Turbine & Gas Power Plant

Time: 3 Hours **Maximum Marks: 80**

Min. Passing Marks: 24

Instructions to Candidates:

*Attempt any **five questions**, selecting **one question** from **each unit**. All questions carry **equal** marks. Schematic diagrams must be shown wherever necessary. Any data you feel missing suitably be assumed and stated clearly.*

Units of quantities used/calculated must be stated clearly.

Use of following supporting material is permitted during examination. (Mentioned in form No.205)

1. Gas Table 2. Steam table

UNIT – I

Q.1 (a) Give classification of gas Turbine? Explain open & closed cycle arrangement with suitable diagram. [6]

(b) What are the assumptions in Ideal gas turbine cycle? Derive an expression of efficiency for intercooled cycle with heat exchange & reheat. Also explain its Performance Curves. [10]

OR

Q.1 (a) Compute the Indicated mean effective pressure and efficiency of a Joule cycle, if the temperature at the end of combustion is 200K and the temp. & pressure before compression is 350K & 1 bar. The pr. ratio is 1.3. Assume Cp = 1.005 KJ/KgK. [6]

(b) Draw schematic diagram of a simple cycle with reheat & heat exchange. Draw P-V & T-S diagram also. Derive expression for specific work output & efficiency of cycle. Explain variation of parameter with pressure ratio. [10]

UNIT – II

Q.2 (a) Define polytrophic efficiency. Derive suitable expression for polytrophic efficiency and bring out the relation between the Polytrophic efficiency & Isentropic efficiency. [8]

(b) In a gas Turbine Plant air enters the compressor at 1 bar and 7°C. It is compressed to 4 bar with an Isentropic efficiency of 82%. The maximum temperature at inlet to turbine is 800°C. the Isentropic efficiency of turbine 85% the calorific value of fuel is 43.1 MJ/Kg. the heat losses are 15% of calorific value. Calculate following - [8]

(i) Compressor Work

(ii) Heat Supplied

(iii) Turbine Work

(iv) Net Work

(v) Thermal efficiency

(vi) Air/fuel ratio

(vii) Specific fuel consumption in Kg/KWh

(viii) Ratio of compressor to turbine work.

OR

Q.2 (a) Explain the losses incurred in practical gas turbine cycles. [6]

(b) Explain following - [4]

(i) Compressor & Turbine Efficiency

(ii) Heat exchanger effectiveness.

(iii) Effect of varying mass flow & specific heat.

(c) A gas turbine operates at a pressure ratio of 7 and maximum temperature is limited to 1000K. The Isentropic efficiency of compressor is 85% & turbine is 90%. If air enters the compressor at a temp. of 288K, calculate the specific work output & efficiency of plant. Compare these values with those achieved by Ideal Joule cycle. If the unit under actual condition is required to produce power output of 750KW, determine necessary mass flow rate. $C_p = 1.005$ [6]

UNIT – III

Q.3 (a) Give classification of Gas Turbine engine. Explain working of turbojet engine with suitable diagram. Describe P-V & T-S diagram. Also describe performance curves. [8]

(b) A jet propelled plane consuming at the rate of 18.2 Kg/s is to fly at Mach number 0.6 at the altitude of 4500m (Pa = 0.55 bar, Ta = 255K). The diffuser which has pressure coefficient 0.9, decreases the flow to negligible velocity. The compressor pr. ratio is 5 and maximum temperature in the combustion chamber is 1273K. After expanding in the turbine, gas continues to expand in the nozzle to pr. of 0.69 bar. The isentropic efficiencies of compressor, turbine & nozzle are 81%, 85% & 91.5% respectively. Heating value 45870 kJ/Kg, Cp = 1.005 kJ/kgK, Cpg = 1.147 kJ/kgK, $\gamma_{air} = 1.4$, $\gamma_{gas} = 1.33$. Calculate- [8]

(i) Power input to compressor

(ii) Power output to compressor

(iii) Full lair ratio

(iv) Thrust provided by engine

(v) Thrust power developed.

OR

Q.3 (a) What is meant by Thrust? Derive expression for thrust equation for general propulsive system. [5]

(b) Briefly describe various efficiencies of components of Turbojet Engine. [5]

(c) Air enters a Turbojet engine at a rate of 12×10^4 Kg/h at 15°C & 1.03 bar and compressed adiabatically to 182°C and four times the pressure. Product of combustion enters the turbine at 815°C & leave at 650°C to enter the nozzle. Calculate Isentropic efficiency of compressor, power required to derive the compressor, exit speed of gases & thrust developed when flying at 800Km/h. Assume compressor & turbine efficiency same & nozzle efficiency 90% [6]

UNIT – IV

Q.4 Briefly Describe- [4x4=16]

(i) Postulations of Combustion Mechanism

(ii) Process of Combustion

(iii) Factors affecting the combustion chamber performance

(iv) Combustion Intensity & efficiency.

OR

Q.4 (a) Explain various practical problems in the operation of combustion chamber. [8]

(b) How do you differentiate between impulse & reaction Turbine? In a single stage impulse turbine the nozzle discharges the fluid on to the blades at an angle of 65° to the axial direction and the fluid leaves the blades with absolute velocity of 300 m/s at the angle of 30° to the axial direction. If the blades have equal inlet and outlet angles and these is no axial thrust, estimate the blade angle, power produced per kg/s of fluid & blade efficiency. [8]

UNIT – V

Q.5 Write Short note on - [4x4=16]

(i) Thrust augmentation method

(ii) Free piston engine with suitable diagram

(iii) Gas Turbine blading & fuels.

(iv) Performance parameter for Gas Turbine power plant with curves.

OR

Q.5 (a) Draw layout of steam power plant. What are the factors to be considered while selecting the site for plant? [10]

(b) Write short note on Gas Turbine materials. [6]

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B. Tech. VIII Sem. (Main/Back) Exam., April, 2015

Mechanical Engineering

8ME4.1 Reliability and Maintenance Engineering

Time: 3 Hours **Maximum Marks: 80**

Min. Passing Marks: 24

Instructions to Candidates:

*Attempt any **five questions,** selecting **one question** from **each unit.** All questions carry **equal** marks. Schematic diagrams must be shown wherever necessary. Any data you feel missing suitably be assumed and stated clearly.*

Units of quantities used/calculated must be stated clearly.

Use of following supporting material is permitted during examination.

1. NIL 2.NIL

UNIT – I

Q.1 (a) Highlight various causes of equipment breakdown and elaborate possible ways to overcome. [8]

(b) Discuss economies of maintenance function for productive system. [8]

OR

Q.1 Compare -

(a) Breakdown maintenance and Time-based maintenance. [8]

(b) Age replacement and Periodic replacement policy. [8]

UNIT – II

Q.2 (a) Justify the significance of Non-destructive testing with-respect-to conventional testing methods. [8]

(b) Explain oil analysis and radiographic testing methods. [8]

OR

Q.2 Suppose you are in-charge of maintenance department in XYZ manufacturing firm. Your boss asked you to submit report on maintenance policy that the firm should adopt and follow. Write the report, it should include everything like mission, vision, objective, methodology etc. [16]

UNIT – III

Q.3 (a) The reliability of a cutting assembly is given by - [8]

$$R(t) = \begin{cases} (t - \frac{t}{to}), & 0 \leq t \leq to \\ 0, & t \geq to \end{cases}$$

Determine -

(i) The failure rate

(ii) Does failure rate increase or decrease with time

(iii) Determine the MTTF

(b) A linear hazard function $\lambda(t) = 5 \times 10^{-6} t$, where 't' is measured in operating hours. If the reliability of 0.98 is desired, what is the design life? [8]

OR

Q.3 (a) A particular machine has a constant failure rate of $\lambda = 0.02$ hrs. [8]

(i) What is the probability that it will fail within first 10 hours

(ii) Suppose that the machine has successfully operated for 100 hrs, what is the probability that it will fail during the next 10 hours of operation.

(b) A device has a decreasing failure rate characterized by two parameter Weibull distribution with a wear out linear hazard function [8]

$$\lambda(t)=\frac{2}{1000}\left(\frac{t}{1000}\right)=2\times10^{-6}t$$

The shape parameter β =2 and scale parameter, θ = 1000. The device is required to have a design life reliability of 0.99. Determine the design life and MTTF.

UNIT – IV

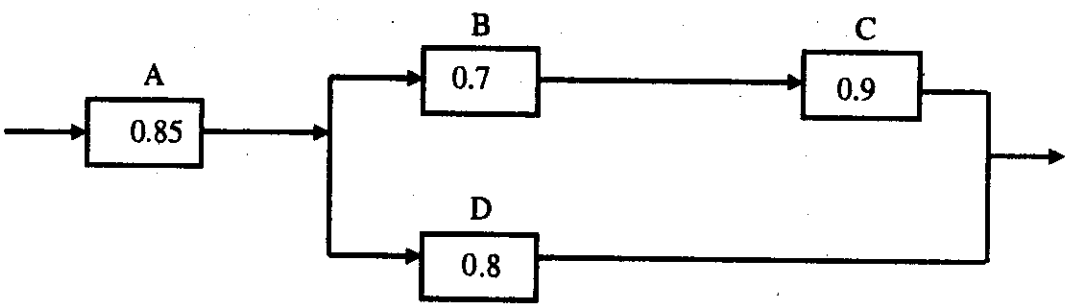
Q.4 (a) A system is composed of 10 components connected in series. Each component has an exponential time to failure distribution with a constant failure rate of 0.5 per 4000 hours. Compute the reliability of the system for 2000 hours of operation and find MTTF. [8]

(b) (i) Elaborate various configurations of system reliability. [4]

(ii) What do you mean by redundancy? Explain with an example. [4]

OR

Q.4 (a) Calculate the system reliability for units connected as shown below: [8]



(b) (i) Explain the concept and use of pareto analysis [4]

(ii) How reliability of a product could be enhanced? [4]

UNIT – V

Q.5 As an engineer of NST manufacturing firm, prepare a detailed report to be submitted to boss of the firm regarding your plan for spare part management (including objectives, features, methodology etc.) that aid in smooth working of firm. [16]

OR

Q.5 (a) (i) Compare ABC analysis and XYZ analysis. [4]

(ii) Give example of VED analysis [4]

(b) Ten items are kept in the inventory. The details regarding the number of items used per annum and price per unit are given below. Classify the items into A, B and C class. [8]

Item No.	Annual Usage	Price
101	200	40.00
102	100	360.00
103	2000	0.20
104	400	20.00
105	6000	0.04
106	1200	0.80
107	120	100.00
108	2000	0.70
109	1000	1.00
110	80	400.00

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