CBCS SCHEME

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21ME61

Sixth Semester B.E. Degree Examination, June/July 2024
Production and Operations Management

Time: 3 hrs. Max. Marks: 100

Note: ***Answer any FIVE full questions, choosing ONE full question from each module.***

Module-1

1 a. Discuss the three major functional areas of business organizations and describe how they interrelate. **(10 Marks)**

b. List some factors that affect productivity and some ways that productivity can be improved. **(06 Marks)**

c. Calculate the multifactor productivity for an eight-hour day, in which the output is 300units, produced by three workers who use 600kg of material. The workers are paid wages of Rs.50 and material cost is Rs.10 per kg. Overhead is 1.5 times labour cost. **(04 Marks)**

OR

2 a. Describe the following :
i) Decision making characteristics
ii) Break Even Point (BEP). **(10 Marks)**

b. A furniture company produces inexpensive tables and chairs. Each table takes 4 hours of carpentry and 2 hours in the painting department. Each chair requires 3 hours of carpentry and 1 hours in the painting department. During the current production period, 240 hours of carpentry time is available and 100 hours in painting is available. Each table sold yields a profit of Rs.7; each chair produced is sold for a profit of Rs.5. Find the best combination of tables and chairs to manufacture in order to reach maximum profit. Use LPP (Linear programming) method. **(10 Marks)**

Module-2

3 a. Discuss qualitative forecast and its types. **(10 Marks)**

b. Given the following data :

Period	1	2	3	4	5
Number of complaints	60	65	55	58	64

Prepare a forecast for period 6 using each of these approaches :
i) The appropriate naïve approach
ii) A three-period moving average
iii) A weighted average using weights of 0.50(most recent), 0.30 and 0.20
iv) Exponential smoothing with a smoothing constant of 0.40. **(10 Marks)**

OR

4 a. Discuss the sources of idea for new design and services. **(10 Marks)**

b. Explain the 3R's with respect to sustain ability in product design. **(10 Marks)**

Module-3

5 a. Discuss the determinants for effective capacity. **(10 Marks)**

b. A small firm produces and sells automotive items in a five-state area. The firm expects to consolidate assembly of its battery charger line in a single location. Currently operations are in three widely scattered locations. The leading candidate for location will have a monthly fixed cost of Rs.42,000 and variable costs of Rs.3 per charger. Charger sell for Rs.7 each. Prepare a table that shows total profits, fixed costs, variable costs and revenues for monthly volumes of 10,000, 12,000 and 15,000 units. What is the breakeven point? **(10 Marks)**

OR

6 a. Discuss the primary regional factors involved in identifying a region during location decision. **(10 Marks)**

b. Use the information contained in the table shown :

Task	a	b	c	d	e	f	g	h
Immediate predecessor	–	a	–	c	b	d, e	f	g
Task taken, min	0.2	0.2	0.8	0.6	0.3	1	0.4	0.3

Do each of the following :

i) Draw a precedence diagram

ii) Assuming an eight – hour workday, compute the cycle time needed to obtain an output of 400units per day

iii) Determine the minimum number of workstations required

iv) Assign tasks to workstations according to the greatest number of following tasks. Compute the resulting percent idle time and efficiency of the system. **(10 Marks)**

Module-4

7 a. Explain briefly the strategies used in aggregate planning. **(10 Marks)**

b. Company manufacturing several models of bicycles are about to prepare a aggregate plan that will cover six periods. They have assembled the following information :

Period	1	2	3	4	5	6	Total
Forecast	200	200	300	400	500	200	1800

Output : Regular time = Rs.200 per bicycle
Inventory = Rs.100 per bicycle per period an average
Back orders = Rs.50per bicycle per period

The firm wants to evaluate a plan that calls for a steady rate of regular–time output. Prepare an aggregate plan and determine the total cost. Assume a level output rate of 300 units. **(10 Marks)**

OR

8 a. Discuss master scheduling process with the help of a flow chart. **(10 Marks)**

b. A manufacturing plant is in the process of updating its Master Production Schedule (MPS) for its products. The plant produces a product as a produce to stock basis. The table below shown hours the estimates of demand for the product for the next six weeks.

Type of demand	Week					
	1	2	3	4	5	6
Customers (forecasts) and orders	700	1200	700	500	400	1200
Warehouses	100	100	400	500	200	100
Market research	–	50	–	–	10	–
Production Research	10	–	–	–	–	–

The safety stock level, minimum lot sizes and beginning inventory level for the product are :

Minimum lot size	Safety stock	Beginning inventory
2000	500	1500

Prepare a six week detailed MPS for the product and determine the production run periods. **(10 Marks)**

Module-5

9 a. With a flow chart, discuss inputs to and outputs from MRP system. **(10 Marks)**

b. Compute the material requirement plan for an item shown in below. This item has an independent demand and a safety lock of 40 is desired :

Order quantity = 70 Lead time = 4 weeks safety lock = 40	Week											
	1	2	3	4	5	6	7	8	9	10	11	12
Projected requirement	20	20	25	20	20	25	20	20	30	25	25	25
Receipts		70										
Available on hand /65												
Planned order release												

(10 Marks)

OR

10 a. Discuss the concepts of tenders and explain its types. **(10 Marks)**

b. Give a comparison between the two approaches to supply management. **(10 Marks)**

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21ME62

Sixth Semester B.E. Degree Examination, June/July 2024
Heat Transfer

Time: 3 hrs. Max. Marks: 100

Note: **1.** ***Answer any FIVE full questions, choosing ONE full question from each module.***
2. ***Use of HMT data handbook is permitted.***

Module-1

1 a. Explain the modes of Heat Transfer. **(04 Marks)**

b. Derive General 3D heat conduction equation in Cartesian coordinates. **(08 Marks)**

c. An exterior wall of a house may be approximated by a 0.1 m layer of common brick (K = 0.7 W/m°C) followed by a 0.04 m layer of gypsum plaster (K = 0.48 W/m°C). What thickness of loosely packed rock wool insulation (K = 0.065 W/m°C) should be added to reduce the heat loss or (gain) through the wall by 80 percent? **(08 Marks)**

OR

2 a. Derive 2-D Heat conduction equation for Hollow cylinder. **(10 Marks)**

b. A standard cast iron pipe (ID = 50 mm and OD = 55 mm) is insulated with 85 percent magnesium insulation (K = 0.02 W/m°C). Temperature at the interface between the pipe and insulation is 300°C. The allowable heat loss through the pipe is 600 W/m length of pipe and for safety, the temperature of the outside surface of insulation must not exceed 100°C. Determine:

(i) Minimum thickness of insulation required

(ii) The temperature of inside surface of pipe assuming its thermal conductivity 20 W/m°C. **(10 Marks)**

Module-2

3 a. Derive heat dissipation equation for a fin with insulated end. **(10 Marks)**

b. A steel rod (K = 32 W/m°C), 12 mm in diameter and 60 mm long, with an insulated end is to be used as a spine. It is exposed to surroundings with a temperature of 60°C and a heat transfer coefficient of 55 $W/m^{2}°C$. The temperature at the base of the fin is 95°C. Determine:

(i) Fin efficiency

(ii) The temperature at the edge of the spine

(iii) The heat dissipation **(10 Marks)**

OR

4 a. Obtain an expression for Instantaneous and total heat transfer for lumped system analysis of heat conduction. **(12 Marks)**

b. A 50 cm × 50 cm copper slab 6.25 mm thick has a uniform temperature of 300°C. Its temperature is suddenly lowered to 36°C. Calculate the time required for the plate to reach the temperature of 108°C. Take ρ = 9000 kg/m^{3}, c = 0.38 kJ/kg°C, k = 370 W/m°C and h = 90 $W/m^{2}°C$. **(08 Marks)**

Module-3

5 a. Explain: (i) Stefan-Boltzmen law (ii) Wien's displacement law (iii) Radiation shield (iv) Radiosity (v) Black body **(10 Marks)**

b. Consider two large parallel plates one at $t_1 = 727°C$ with emissivity $\varepsilon_1 = 0.8$ and other at $t_2 = 227°C$ with emissivity $\varepsilon_2 = 0.4$. An aluminum radiation shield with an emissivity, $\varepsilon_3 = 0.05$ on both sides is placed between the plates. Calculate the percentage reduction in heat transfer rate between the two plates as a result of the shield. **(10 Marks)**

OR

6 a. Explain how Stefan Boltzman constant is determined using Stefan Boltzman apparatus experimentally. **(10 Marks)**

b. An electric heating system is installed in the ceiling of a room 5 m (length) × 5m (width) × 2.5 m (height). The temperature of the ceiling is 315 K whereas under equilibrium conditions the walls are at 295 K, if the floor is non-sensitive to radiations and the emissivities of the ceiling and wall are 0.75 and 0.65 respectively. Calculate the radiant heat loss from the ceiling to the walls. **(10 Marks)**

Module-4

7 a. Explain briefly with sketches:
(i) Boundary layer thickness (ii) Thermal boundary layer thickness **(08 Marks)**

b. A cylindrical body of 300 mm diameter and 1.6 m height is maintained at a constant temperature is 36.5°C. The surrounding temperature is 13.5°C. Find out the amount of heat to be generated by the body per hour if $\rho = 1.025$ kg/m^3, $C_p = 0.96$ kJ/kg°C, $V = 15.06 \times 10^{-6}$ m^2/s, $K = 0.0892$ kJ/m-h°C and $\beta = \frac{1}{298} K^{-1}$. Assume $Nu = 0.12 (Gr.Pr)^{1/3}$. **(12 Marks)**

OR

8 a. Explain the significance of :
(i) Reynolds number (ii) Prandtl number
(iii) Grashoff number (iv) Stenton number **(10 Marks)**

b. Air at 30°C and at atmospheric pressure flows at a velocity of 2.2 m/s over a plate maintained at 90°C. The length and the width of the plate are 900 mm and 450 mm respectively. Using exact solution calculate the heat transfer rate from:
(i) First half of the plate (ii) Full plate (iii) Next half of the plate
The properties of air at temperature 60°C are $\rho = 1.06$ kg/m^3, $\mu = 7.211$ kg/hm, $V = 18.97 \times 10^6$ m^2/s, $Pr = 0.696$, $k = 0.02894$ W/m°C. **(10 Marks)**

Module-5

9 a. With a neat sketch, explain the different regimes of pool boiling. **(10 Marks)**

b. A vertical plate 350 mm high and 420 mm wide at 40°C is exposed to saturated steam at 1 atm. Calculate the following:
(i) The film thickness at the bottom of plate.
(ii) The maximum velocity at the bottom of plate
(iii) The total heat flux to the plate. **(10 Marks)**

OR

10 a. Derive the expression for LMTD of a parallel flow heat exchanger. **(10 Marks)**

b. Water ($C_p = 4200$ J/kg°C) enters a counter flow double pipe heat exchanger at 38°C flowing at 0.076 kg/s. It is heated by oil ($C_p = 1880$ J/kg°C) flowing at the rate of 0.152 kg/s from an inlet temperature of 116°C. For an area of 1 m^2 and $U = 340$ W/m^2°C. Determine the total heat transfer rate. **(10 Marks)**

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21ME63

Sixth Semester B.E. Degree Examination, June/July 2024
Machine Design

Time: 3 hrs. Max. Marks: 100

Note: 1. *Answer any FIVE full questions, choosing ONE full question from each module.*
2. *Use of data hand book is permitted.*
3. *Missing data if any may be suitably assumed.*

Module-1

1 a. Explain the design procedure with the help of flow chart. **(06 Marks)**

b. Derive Soderberg's equation when a member is subjected to fatigue axial loading. **(06 Marks)**

c. A cantilever beam is C-45 steel is subjected to completely reversed bending load varying from 5F to –F as shown in Fig.Q1(c). Determine the maximum load the member can carry for infinite life. Take $\sigma_y = 353$ MPa and $\sigma_u = 640$ MPa for the material. Assume FoS = 2.

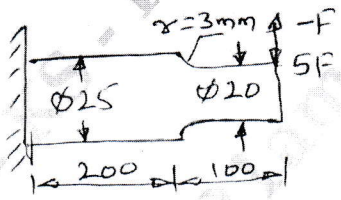

Fig.Q1(c) **(08 Marks)**

OR

2 a. Briefly discuss factors influencing the selection of suitable material for machine element. **(06 Marks)**

b. Explain the following theories of failure:
(i) Maximum normal stress theory
(ii) Maximum shear stress theory
(iii) Distortion energy theory **(06 Marks)**

c. A bar of rectangular cross section is subjected to an axial pull of 500 kN as shown in Fig.Q2(c). Calculate its thickness if the allowable tensile stress in the bar is 200 MPa.

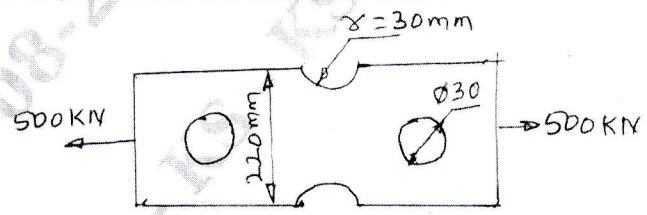

Fig.Q2(c) **(08 Marks)**

Module-2

3 A steel shaft 600 mm long supported between bearings carries a pulley of diameter 400 mm, weighing 400 N and is mounted in the middle of the shaft.

This shaft receives 40 KW at 600 rpm by a flat belt drive, power from the shaft is transmitted through another pulley of diameter 600 mm weighing 600 N overhanging the right bearing by 200 mm. The belt drives on the pulleys are at right angles to each other. Taking ratio of belt tensions as 3. Determine the diameter of the shaft required taking design shear stress as 40 MPa. **(20 Marks)**

OR

4 a. Derive an equation for shear stress due to twisting moment and deflection of helical spring. **(08 Marks)**

b. Design an helical spring for an operating load range from 90 N to 135 N. The deflection for this load range is 7.5 mm. Other data are as follows:
Spring index = 10
Permissible shear stress for the material = 480 MPa
Shear modulus = 80 GPa **(12 Marks)**

Module-3

5 a. Explain the following:
(i) Failure of riveted joints
(ii) Efficiency of riveted joint **(08 Marks)**

b. Determine the required fillet weld size for the bracket shown in Fig.Q5(b).

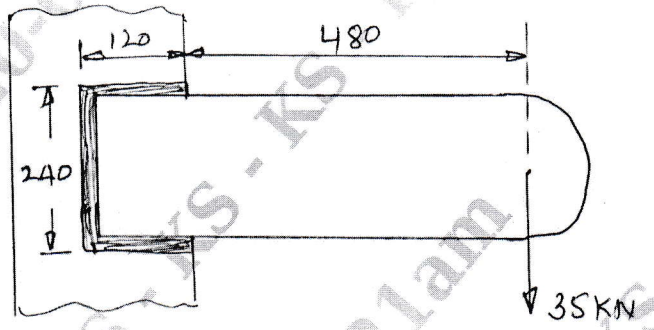

Fig.Q5(b) **(12 Marks)**

OR

6 a. Explain different types of stresses due to various loading on threaded fasteners. **(10 Marks)**

b. A cover plate is bolted on to the flanged end of a pressure vessel through 6 bolts. The inner diameter of the pressure vessel is 200 mm and is subjected to an internal pressure of 10 MPa. Selecting carbon steel C-40 as the material with σ_y = 324.6 MPa for the bolts, determine the size of the bolts also considering the initial tension for the following cases:
(i) Metal to metal joint
(ii) A gasket joint **(10 Marks)**

Module-4

7 Design a pair of spur gear 20° full depth involute to transmit 30 KW of power at 600 rpm of pinion. Number of teeth on pinion is 15. Transmission ratio (gear reduction ratio) is 5. Material of the pinion is cast steel untreated having σ_y as 137.34 MPa. Material of the gear is high grade cast iron having σ_y as 103.005 MPa. Take service factor (C_S) as 1.5. **(20 Marks)**

OR

8 A pair of helical gears for a turbine has a transmission ratio of 10 and the teeth are $14\frac{1}{2}$ involute. The pinion has 25 teeth and rotates at 5000 rpm. Material for both pinion and gear is 0.4% carbon steel heat treated having σ_y as 86.03 MPa. Power to be transmitted at 100 KW. Design the gears completely. Take helix angle $\beta = 20°$. **(20 Marks)**

Module-5

9 a. Design a single plate clutch used in automobile transmission for the following specification: Power to be transmitted = 20 KW, speed = 1500 rpm. Take μ = 0.35, pressure (p) = 1 N/mm^2, yield stress for shaft material = 328.6 MPa. **(08 Marks)**

b. A simple band brake is required to transmit a torque of 980 N-m. The brake drum is 400 mm diameter and coefficient of friction is 0.25. Find the effort required to operate the brake. Also design the band and the lever. Take θ = 270°, a = 680 mm and b = 80 mm. Yield stress (σ_y) for both band and lever = 328.6 MPa.

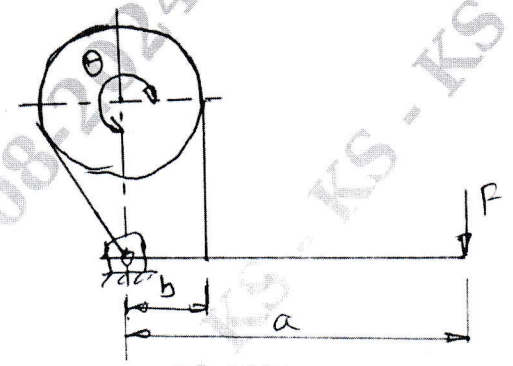

Fig.Q9(b) **(12 Marks)**

OR

10 a. Derive Petroff's equation with usual notations. **(10 Marks)**

b. A lightly loaded journal bearing has a load of 1 kN. The oil used is SAE 60 and mean effective temperature of operation is 40°C. The journal has a diameter of 50 mm and the bearing has a diameter of 50.5 mm. The speed of journal is 15000 rpm. The L/d ratio is limited to 1.2. Determine the coefficient of friction and power loss in friction. **(10 Marks)**

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21ME641

Sixth Semester B.E. Degree Examination, June/July 2024
Supply Chain Management and Introduction to SAP

Time: 3 hrs. Max. Marks: 100

Note: Answer any FIVE full questions, choosing ONE full question from each module.

Module-1

1 a. Explain the evolution of supply chain through the three major revolutions. (10 Marks)
b. Explain the impact of different drivers on the performance of the supply chain. (10 Marks)

OR

2 a. Define outsourcing. What are the advantages and disadvantages of outsourcing? (10 Marks)
b. Explain the factors that must be considered while choosing supplier. (10 Marks)

Module-2

3 a. Define stores management. What are the major functions of the stores? (10 Marks)
b. Explain a few frequently used stores accounting system. (10 Marks)

OR

4 a. Who are the important stake holders in transportation? What are the different modes of transport? (10 Marks)
b. Explain the measures employed to improve operational efficiency of warehouse. (10 Marks)

Module-3

5 a. What are the factors influencing network design decisions? (10 Marks)
b. Explain briefly the decision tree analysis methodology. (10 Marks)

OR

6 a. What is demand planning? Explain the importance of demand planning. (10 Marks)
b. What are the conditions under which revenue management tactics can be effective? (10 Marks)

Module-4

7 a. What are the different stages of supply chain integration? (10 Marks)
b. Explain role of forecasting in a supply chain. Define demand forecasting and its importance. (10 Marks)

OR

8 a. What is supply chain restructuring? How supply chain restructuring different supply chain integration and optimization. (10 Marks)
b. Explain role of IT in supply chain management. What are the future trends in terms of the way IT is going to influence supply chain management? (10 Marks)

Module-5

9 a. Define SAP MM. How can SAP MM benefit business? (10 Marks)
b. Explain the concepts of purchase requisition and request for quation in SAP MM. (10 Marks)

OR

10 a. What is the purpose of purchase information record in SAM MM? (10 Marks)
b. Explain different stages of inventory management process. (10 Marks)

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21ME652

Sixth Semester B.E. Degree Examination, June/July 2024
Renewable Energy Power Plants

Time: 3 hrs. Max. Marks: 100

Note: ***Answer any FIVE full questions, choosing ONE full question from each module.***

Module-1

1 a. Write the difference between renewable energy sources and nonrenewable energy sources. **(06 Marks)**

b. Write the statistics of
Solar power
Wind power
Small hydro power and
Biomass (Bagasse) cogeneration power, cumulative achievements as on May 2024 as per information of ministry of New and renewable energy. **(04 Marks)**

c. Explain need for nonconventional energy sources. **(10 Marks)**

OR

2 a. Writ a short note on Solar radiation at earth's surface. **(04 Marks)**

b. With neat sketch, explain sunshine recorder. **(08 Marks)**

c. With neat sketch, explain pyrheliometer. **(08 Marks**

Module-2

3 a. Define the following terms and draw neat sketch for each definition.
i) Declination Angle
ii) Zenith Angle
iii) Solar altitude Angle
iv) Surface azimuth Angle
v) Hour Angle **(10 Marks)**

b. Determine the number of day light hours in Srinagar on 5th January and 5th July [Latitude = 34°05′]. **(10 Marks)**

OR

4 a. Explain briefly with the help of a line diagram, How the solar energy is stored in a solar pond. **(10 Marks)**

b. With neat sketch, explain solar chimney. **(10 Marks)**

Module-3

5 a. List the six properties of wind energy. **(06 Marks)**

b. Discuss the problems associated with wind power. **(06 Marks)**

c. With neat sketch, Explain horizontal axis wind mill (2-blades only) for electricity generation. **(08 Marks)**

OR

6 a. What are the advantages and disadvantages of Biomass? **(10 Marks)**

b. With a neat sketch, explain construction and working of Janata model gobar gas plant. **(10 Marks)**

Module-4

7 a. Give a detailed classification of hydroelectric plant. **(10 Marks)**

b. The mean monthly discharge at a site is as shown in table (Q7 (b). Draw the hydrograph and flow duration curve.

Month	Discharge m^3/sec	Month	Discharge m^3/Sec
January	200	July	2000
February	450	August	2400
March	600	September	1800
April	1200	October	1200
May	1500	November	800
June	1600	December	400

(10 Marks)

OR

8 a. Explain the fundamental characteristics of tides. **(05 Marks)**

b. List the advantages and disadvantages of wave energy. **(05 Marks)**

c. With neat sketch, explain double basin arrangement of tidal power plant. Also mention the limitation of tidal energy. **(10 Marks)**

Module-5

9 a. With neat sketch, explain principle of conversion of geothermal energy and mention the advantages of geothermal energy over other energy forms energy over other energy forms. **(10 Marks)**

b. List the different kinds of geothermal energy sources and explain in detail any two. **(10 Marks)**

OR

10 a. With a neat schematic diagram, explain Rankine OTEC cycle. Also mention problems associated with OTEC. **(10 Marks)**

b. Write a brief note on geothermal stations in the world. **(05 Marks)**

c. List the disadvantages of geothermal energy. **(05 Marks)**

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