

--	--	--	--	--	--	--	--	--	--

Eighth Semester B.E. Degree Examination, Aug./Sept.2020
Operations Management

Time: 3 hrs.

Max. Marks:100

Note: Answer any FIVE full questions, selecting at least TWO full questions from each part.

PART – A

- 1 a. Define productivity. Explain the factors affecting productivity. (08 Marks)
 b. Distinguish between manufacturing and service organization. (06 Marks)
 c. Explain in brief, the functions of operations management. (06 Marks)

- 2 a. Explain the steps in Decision Making process. (06 Marks)
 b. The values of a pay-off table are:

	New bridge	No new bridge
A	1	10
B	2	10
C	4	6

- Determine the choice to make under maximin and Laplace strategies. (07 Marks)
 c. Solve the following L.P.P. by graphical method:

$$\text{Maximize } 3x_1 + 5x_2$$

$$\text{Subject to } x_1 + 2x_2 \leq 2000$$

$$x_1 + x_2 \leq 1500$$

$$x_2 \leq 600$$

$$x_1, x_2 \geq 0$$

(07 Marks)

- 3 a. Classify forecasting methods and explain Delphi Technique. (05 Marks)
 b. A firm use simple exponential smoothing with $\alpha = 0.1$ to forecast demand. The forecast for the week of February 1 was 500 units, whereas actual demand turned out to be 450 units.
 i) Forecast the demand for the week of February 8
 ii) Assume that the actual demand during the week of February 8 turned out to be 505 units. Forecast the demand for the week of February 15. Continue on forecasting through March 15, assuming that subsequent demands were actually 516, 488, 467, 554 and 510 units. (07 Marks)

- c. The general manager of a building materials production plant feels that the demand for plasterboard shipments may be related to the number of construction permits issued in the country during the previous quarter. The manager has collected the data shown in the accompanying table. Determine the regression line. Find the forecast for plasterboard shipments when the number of construction permits is 30. (08 Marks)

Construction permits	15	9	40	20	25	25	15	35
Plasterboard shipments	6	4	16	6	13	9	10	16

- 4 a. Define plant layout. Explain product or line layout. (05 Marks)
 b. Explain the factors to be considered while selecting location for the factory/industry. (07 Marks)
 c. A metals processing firm wishes to install enough automatic moulders to produce 2,50,000 good castings per year. The moulding operation takes 1.5 minutes per casting, but its output is typically about 3% defective. How many moulders will be required if each one is available for 2000 hours (of capacity) per year? (08 Marks)

PART – B

- 5 a. Define aggregate planning and master scheduling. Explain the pure strategies used for aggregate planning in brief. (08 Marks)
- b. The supply, demand, cost and inventory data for a company, which has a constant workforce, is given below:

Period	Demand forecast (units)	Supply capacity (units)		
		RT	OT	SC
1	100	60	18	1000
2	50	50	15	1000
3	70	60	18	1000
4	80	65	20	1000

Initial Inventory = 20 units

Final Inventory = 25 units

Regulator time (RT) cost/unit = Rs.100

(Labour = 50% of the cost)

Overtime (OT) cost/unit = Rs.125

Subcontracting (SC) cost/unit = Rs.130

Carrying cost/unit-period = Rs.2

Using transportation model format, allocate production capacity to satisfy demand at minimum cost. (12 Marks)

- 6 a. Explain the reasons for holding inventory. (05 Marks)
- b. Derive EOQ for the lot size with uniform rate of demand and instantaneous demand. Write the assumptions. (07 Marks)
- c. Find the optimum order quantity for a product for which the price break are as follows:

Quantity	Purchase cost (per units) Rs.
$0 \leq Q_1 < 100$	20
$100 \leq Q_2 < 200$	18
$200 \leq Q_3$	16

The monthly demand for the product is 400 units. The storage cost is 20% of the unit cost of the product and the cost of ordering is Rs.25 per month. (08 Marks)

- 7 a. Define MRP, CRP and BOM. (06 Marks)
- b. A Bill of Materials (BOM) is desired for a bracket (2100) that is made up of a base (A10), two springs (B11), and four clamps (C20). The base is assembled from one clamp (C20) and two housing (D21). Each clamp has one handle (E30) and each housing has two bearings (F31) and one shaft (G32). Design a product structure tree that indicates level coding information. (06 Marks)
- c. Complete the material requirements plan for item X shown below. Note that this item has an independent demand that necessitates that a safety stock of 40 units be maintained.

Order quantity = 70 Lead Time = 4 week Safety stock = 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										
On hand at the end of period 65												
Planned order release												

(08 Marks)

- 8 a. Explain procurement process in detail. (06 Marks)
- b. Define tender and explain types of tenders. (04 Marks)
- c. Drasco is a medium sized manufacturer of oil field pumps. The firm has developed a new model of its high-pressure, secondary recovery purge pump with improved performance. Manager of process engineering is trying to decide whether Drasco should make or buy the electronically controlled input valve for new pump. He had developed the following estimates.

	Make process A	Make process B	Buy
Annual volume (in units)	10,000	10,000	10,000
Fixed cost/year (Rs)	1,00,000	3,00,000	-
Variable cost/unit	Rs.75	Rs.70	Rs.80

- i) Should Drasco make the valve using process A, make the valve using process B or buy the valve?
- ii) At what annual volume, should Drasco switch from buying to making the valve using process A?
- iii) At what annual volume should Drasco switch from process A to process B? (10 Marks)

* * * * *

--	--	--	--	--	--	--	--	--	--

Eighth Semester B.E. Degree Examination, Aug./Sept. 2020
Control Engineering

Time: 3 hrs.

Max. Marks:100

Note: Answer FIVE full questions, selecting at least TWO questions from each part.

PART - A

1. a. Write the difference between open loop and closed loop control system and give one example for each. (06 Marks)
 b. What are the requirements of an ideal control system? (06 Marks)
 c. With block diagram, explain proportional plus integral plus differential (PID) controller and state its characteristics. (08 Marks)

2. a. Derive the transfer function of an armature DC motor. The field current is maintained constant during operation. Assume the armature coil has a back emf. $e_b = K_b \frac{d\theta}{dt}$ and coil current produces torque $T = K_m \tau_a$ on the rotor, K_b and K_m are the back emf constant and motor torque constant respectively. (10 Marks)
 b. Obtain the differential equation for the mechanical system shown in Fig. Q2 (b) and draw the equivalent mechanical system. Also draw the analogous electrical network based on:
 (i) Force - Voltage analogy (ii) Force-Current Analogy. (10 Marks)

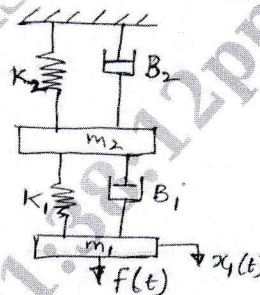


Fig. Q2 (b)

3. a. Reduce the block diagram shown in Fig. Q3 (a) and obtain transfer function $\frac{C(s)}{R(s)}$. (10 Marks)

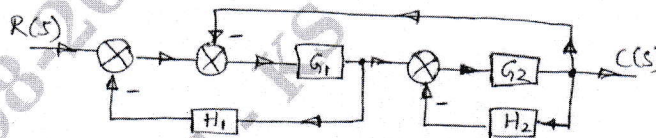


Fig. Q3 (a)

- b. Using Mason's Gain formula find the transfer function of signal flow graph shown in Fig. Q3 (b). (10 Marks)

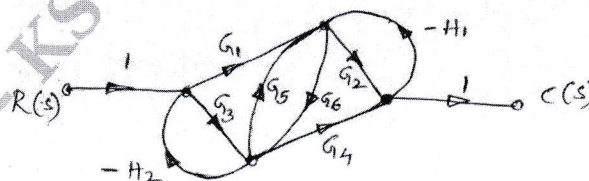


Fig. Q3 (b)

Important Note : 1. On completing your answers, compulsorily draw diagonal cross lines on the remaining blank pages.
 2. Any revealing of identification, appeal to evaluator and /or equations written eg, 42+8 = 50, will be treated as malpractice.

- 4 a. Obtain an expression for time response of the first order system subjected to unit step input. (08 Marks)
- b. A unity feedback system is characterized by an open loop transfer function $G(s)H(s) = \frac{K}{s(s+10)}$. Determine the system gain K, so that the system will have a damping ratio of 0.5. For this value of K, find peak time, settling time and peak overshoot for a unit step input. (08 Marks)
- c. Examine the stability of system whose characteristic equation is $s^4 + 2s^3 + 3s^2 + 8s + 2 = 0$ using R-H criteria. (04 Marks)

PART - B

- 5 a. Sketch polar plot for the transfer function $G(s)H(s) = \frac{12}{s(s+1)(s+2)}$. (08 Marks)
- b. Obtain Nyquist diagram for the system shown in Fig. Q5 (b) and ascertain its stability. (12 Marks)

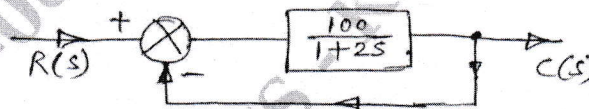


Fig. Q5 (b)

- 6 Sketch the Bode plot for a unity feed back system whose open loop transfer function is given by,

$$G(s)H(s) = \frac{10}{s(1+s)(1+0.02s)}$$

From the Bode plot, determine

- (i) Gain and phase cross over frequencies
- (ii) Gain and phase margins
- (iii) Comment on the stability of the closed loop system. (20 Marks)

- 7 Sketch the root locus for a negative feedback system whose open loop transfer function is given by,

$$G(s)H(s) = \frac{K}{s(s+3)(s^2+3s+4.5)}$$

Comment on the stability of the system. (20 Marks)

- 8 a. Write notes on: (i) Lead compensator (ii) Lag compensator. (14 Marks)
- b. Verify whether the following system is observable or not.

$$\begin{Bmatrix} \dot{x}_1 \\ \dot{x}_2 \end{Bmatrix} = \begin{bmatrix} -5 & 4 \\ -6 & 5 \end{bmatrix} \begin{Bmatrix} x_1 \\ x_2 \end{Bmatrix} + \begin{Bmatrix} 1 \\ 1 \end{Bmatrix} u \text{ and } y = \begin{bmatrix} -2 & 3 \end{bmatrix} x$$

(06 Marks)

USN

--	--	--	--	--	--	--	--	--	--

10ME831

Eighth Semester B.E. Degree Examination, Aug./Sept.2020
Tribology

Time: 3 hrs.

Max. Marks:100

Note:1. Answer any FIVE full questions, selecting atleast TWO questions from each part.
2. Use of Design Data Handbook is permitted.

PART – A

- 1
 - a. Explain with neat sketch, working principle of full Journal bearing, Fixed shoe bearing and Pivoted shoe bearing. (06 Marks)
 - b. Explain with neat sketch working of Flowers Viscometer. (06 Marks)
 - c. Derive an expression for rate of flow between Parallel Stationary Planes. (08 Marks)

- 2
 - a. Explain with neat sketches, mechanism of Pressure development in an oil film. (08 Marks)
 - b. A lightly loaded Journal bearing has following specification – Diameter of Journal – 50mm, Bearing length = 80mm , Diametrical clearance ratio = 0.002 , Radial load = 750 N , Viscosity of lubricant = 10 cp , Speed = 4000 rpm. Determine i) Frictional torque on Journal ii) Co-efficient of friction iii) Power loss. (06 Marks)
 - c. A full Journal has following specification : Shaft diameter = 60mm , Bearing length = 80mm , Radial load = 1KN , Diameter clearance = 0.1mm , Oil used – SAE 60 at 60⁰C , Coefficient of friction = 0.042. Determine i) Speed of Journal ii) Power loss (06 Marks)

- 3
 - a. Explain the significance of Somerfield number. (06 Marks)
 - b. The following data refers to a full Journal bearing : Journal diameter = 30mm , Bearing length = 60mm , Journal speed = 2000 rpm , Radial clearance = 0.02mm , Inlet pressure = 0.3MPa , Oil hole location = 300⁰ , Oil viscosity = 20 cp , Attitude = 0.8. Plot the pressure distribution diagram around the Journal, if distribution is not satisfactory, what alterations are to be made. (14 Marks)

- 4
 - a. Plot the pressure distribution curve for a plane slider bearing having following specifications. Bearing length in the direction of flow = 75mm , Bearing width = 100mm , Velocity of moving surface = 1.5m/sec , Viscosity of oil = 0.02 Pa – sec , Maximum and Minimum film thickness = 0.005mm and 0.002mm. Locate the point of maximum pressure on the curve and calculate load carrying capacity. (08 Marks)
 - b. A slide bearing with rectangular pivoted shoe has the following specifications : Length of shoe = 75mm , Width of shoe = 112.5mm , Velocity of moving member = 2m/sec , Expected mean temperature of the oil film = 75⁰C , Permissible minimum oil film thickness = 0.0225mm , Lubricating oil = SAE 40. Determine i) Load carrying capacity of the bearing under the given condition. ii) Power loss in the bearing consider inclination of the bearing surface corresponds to maximum load capacity, neglect the effect of end flow from the bearing. (08 Marks)

PART – B

- 5
 - a. Explain the Thermal equilibrium of self contained bearing s and bearings lubricated under pressure. (08 Marks)

- b. A full Journal bearing has following specifications load on the Journal = 3.65 kN , Length of the bearing = 25mm , Diameter of the Journal = 25mm , Diametrial clearance ratio = 0.0016 , Viscosity at operating temperature = 0.024 Pa – sec , Speed = 1800 rpm. Considering end leakage, determine i) Minimum film thickness ii) Power loss iii) Weather artificial cooling is required. (12 Marks)
- 6 a. Derive an expression for load carrying capacity of Hydrostatic bearing. (10 Marks)
b. A hydrostatic bearing for a turbine has following specifications : Diameter of shaft = 150mm , Diameter of pocket = 100mm , Vertical thrust on the bearing = 70 KN , Shaft speed = 1000 rpm , Viscosity of lubricant under operating condition = 0.025 Pa – sec , Desirable oil film thickness = 0.125mm. Determine i) Rate of oil flow through the bearing ii) Power loss due to viscous friction iii) Coefficient of friction. (10 Marks)
- 7 a. Explain any five desirable properties of bearing material. (10 Marks)
b. Explain Composition and Application of any five bearing alloys. (10 Marks)
- 8 a. Explain with a neat sketch, Abrasive and Adhesive wear mechanisms. (06 Marks)
b. Explain Wear of Ceramic materials. (06 Marks)
c. Explain Tribological measures with neat sketches. (08 Marks)

USN

--	--	--	--	--	--	--	--	--	--

10ME844

Eighth Semester B.E. Degree Examination, Aug./Sept.2020
Automotive Engineering

Time: 3 hrs.

Max. Marks:100

Note: Answer any FIVE full questions, selecting at least TWO questions from each part.

PART - A

- 1 a. Explain with sketch various methods of cylinder arrangements used in multicylinder engines. (08 Marks)
- b. What are the various methods of engine cooling? Explain with sketch the thermosyphon system of cooling. (06 Marks)
- c. What are the functions of piston rings? Explain briefly. (06 Marks)
- 2 a. What is meant by carburetion? What are the functions of carburetor? (06 Marks)
- b. What are the main components of a Fuel Supply System? Explain any two in both SI and CI engines. (08 Marks)
- c. Draw a neat sketch of mechanical fuel pump and explain its working. (06 Marks)
- 3 a. What is the necessity of super-charging? Explain briefly. (06 Marks)
- b. Explain the different types of super-chargers. (08 Marks)
- c. Compare Mechanical Super Charging and Turbo-Charging. (06 Marks)
- 4 a. Explain with a neat sketch, working of a battery ignition system. (08 Marks)
- b. What are the advantages of using an electronic ignition system? (06 Marks)
- c. Compare battery and magneto ignition system. (06 Marks)

PART - B

- 5 a. Explain principles of automotive transmission. (06 Marks)
- b. Explain the working principle of clutch and with neat sketch, explain centrifugal clutch. (08 Marks)
- c. Determine the dimensions of a clutch plate developing 40 K Watts at 4000 rpm. The inner diameter of the clutch plate is 0.6 times its outer diameter and it is to be ensured that even after a loss of 30% of the engine torque developed due to clutch facing wear, it should not slip. The pressure intensity should not exceed 75 kPa. Take $\mu = 0.3$. (06 Marks)
- 6 a. Explain with neat sketch: (i) Hotchkiss drive (ii) Torque tube drive (08 Marks)
- b. Explain the working of power steering with a sketch. What are the advantages and disadvantages over manual steering? (06 Marks)
- c. Write a short note on different types of Chasis Frame. (06 Marks)
- 7 a. What are the requirements of good suspension system? (06 Marks)
- b. What are the merits and demerits of hydraulic brakes over mechanical brakes? (06 Marks)
- c. Sketch and explain the two types of dual braking system. (08 Marks)
- 8 a. By what methods the emissions of pollutants in automotives can be reduced? Explain briefly. (06 Marks)
- b. Write a note on alternative fuels for automotive engines. (04 Marks)
- c. Explain emissions standard which are followed in India. (05 Marks)
- d. Explain the working of Automotive Exhaust Gas Recirculation System EGR). (05 Marks)

Important Note : 1. On completing your answers, compulsorily draw diagonal cross lines on the remaining blank pages.
 2. Any revealing of identification, appeal to evaluator and /or equations written eg. 42+8 = 50, will be treated as malpractice.