Automobile Engineering

(QUESTION BANK)

UNIT-I

1. Discuss about the fuel supply system in S.I. engine.
2. Explain about the different types of air filters.

3. Explain about the formation of spray in C.I. engine.

4. Discuss about the chassis and body components in automobile.

5. Explain how a four wheel drive mechanism offers better power transmission in a automobile.

6. Explain with a simple schematic diagram, working of a four wheel drive automobile.

7. Describe in detail about the multipoint fuel injection for S.I. engines.

8. Write about oil pumps and engine service?

9. Write about splash and pressure lubrication systems?

10.Explain how the power can be transmitted in front wheel drive by using a neat diagram?

11. Sketch a chassis of any four wheelers and mark various parts on it. Explain the functions of various components of automobile.

12. How can turbo-charging improve performance of an engine?

UNIT-II

1. What do you mean by the term “Ignition”? How is it related with “combustion”?
2. Sketch and explain different types of Ignition systems used in automotive engines.

3. Why lubrication system is essential in a automobile, explain working of pressurized lubrication system.

4. Explain in detail about the liquid cooling system with a diagram.

5. Discuss about the bendix drive mechanism.

6. Explain why engines should not be sub-cooled.
7. Explain about horn, wiper, fuel gauge and engine temperature indicator?

UNIT-III

1. What are the pollution standards for automobile?

2. Discuss different energy alternatives with their merits and demerits.

3. What are the advantages of using hydrogen as fuel?
4. What are the merits and demerits of biomass?

5. Explain about central locking and electric windows?

6. Write about thermal and catalytic converters?

7. Explain the use of alternative fuels for emission control?

8. Explain the mechanism of pollutants formation?

9. Explain briefly the methods available to control emissions from a automobile.

10. Explain with relevant sketches, working of electric windows in a automobile.

11. Explain Compensated voltage control with the help of a diagram.

12. Name the various electrical components used in an automobile & give their functions?

UNIT-IV

1. Explain with a simple sketch, working of centrifugal type of clutch and why free play should be provided for clutch.

2. Draw and explain with a simple sketch, working of a constant mesh gear box.

3. Describe in detail about single plate clutch with a neat diagram.

4. Explain about the differential rear axle with neat sketch.

5. What are the functions of universal joint and Propeller shaft?

6. Discuss the working principles of i) Torque tube drive. ii) Hotchkiss drive.

7. Explain about sliding mesh and synchro mesh gear boxes with neat diagrams?

8. Explain about magnetic clutch and fluid fly wheel in detail?

9. Write about functions of a propeller shaft and Hotch – Kiss drive?

UNIT-V

1. Explain with a simple sketch, working of worm and ball bearing nut steering mechanism.

2. What are the functions of steering system, explain with relevant sketch Ackerman steering mechanism.

3. Explain with a schematic diagram, working of rigid axle front wheel suspension system.

4. Discuss about the Davis steering mechanism in the automobiles.

5. Describe about the mechanical brake system.

6. Explain the Davis Steering Mechanism? Write its relative merits?

7. Explain about steering geometry in detail?

8. Sketch the arrangement of pneumatic braking system used in automobiles and explain?

9. Explain about the types of steering gears?

10. Describe the cam and roller type of Steering Gear with neat diagram?

B.Tech IV Year I Sem

CAD/CAM

Important Questions

UNIT-I

1. Define the term product life cycle also compare and contrast between the product cycle in a conventional manufacturing environment?
2. Explain the benefits of CAD?
3. What is rendering and explain it effects?
4. Explain three dimensional transformations with an example?
5. Explain the Z buffer algorithm for hidden surface removal?
6. What is display unit? Discuss screen buffer and scanning related to CAD system?
7. Explain the concept of various co ordinate systems required for geometric display systems. Give an example?
8. Discuss the concept of obtaining a rotation about an arbitrary point in XY plane?
9. Briefly discuss various input devices for the graphics and state their functions?
10. Briefly explain the working of refresh display and DVST?
11. What is aliasing? Describe different methods of carrying anti-aliasing?
12. What are the various types of co ordinate systems used to input store?
13. What is data base structure? Explain the popular database model with an example?
14. What is meant by product life cycle? Briefly describe with a neat sketch.
15. Briefly describe the types of storage devices used in computers.
16. A triangle lamina has corners P, Q, R the coordinates of the points are (20, 20), (40, 25), (30, 40) respectively. The lamina is rotated about P through 300^0 in clockwise direction. Obtain the transformation matrix and calculate the new coordinates of the triangle.

UNIT-II

1. What are the requirements of geometric modeling?
2. Describe with the help of neat sketches the major surface entities provided by the CAD/CAM systems.
3. Explain the importance of vertex, edge and face table in the boundary representation of solid modeling?
4. Explain the constructive solid geometry for the representation of solids?
5. Explain the importance of clipping? Give the details of method used for line clipping?
6. What are the primitive elements in CAD? Give the classification of geometric modeling systems based on their capabilities?
7. What are the differences and applications of coons and Bezier surfaces?
8. Explain various facilities that are useful for geometric entities in CAD drafting system?
9. Explain extrude and loft commands in CAD software package?
10. How do you classify the various modeling systems on the basis of their capabilities?
11. Describe with the help of neat sketches the major surface entities provided by the CAD CAM systems?
12. What is importance of layers in drafting? Explain with an example?
13. Describe the Euler-Poincare formula for boundary representation of solid modeling with an example?
14. A cubic Bezier curve is defined by the control points as (20, 20), (60, 80), (120,100) and (150, 30). Find the equation of the curve and its midpoint.
15. What is the Bezier surface? Discuss the properties of Bezier surface.
16. What are the various types of display control commands? Explain windowing and panning with a neat sketch.
17. What is the importance of layers in drafting? Explain with an example.

UNIT-III

1. Briefly discuss the following NC motion control system of point to point, straight cur and contouring?
2. Enumerate the advantages of computer assisted part programming when compared to manual part programming?
3. With a block diagram explain main features of CNC machine tools with feed back?
4. Differentiate between manual part programming and computer aided part programming in CNC machines?
5. Discuss the salient features of machining centers?
6. Under what circumstances the adaptive control machining system is used? Discuss briefly?
7. What is meant by a machining centre? Discuss the features of a CNC turning centre with a neat diagram.
8. The component to be machined is shown in figure. Write a program using canned cycles to drill all the holes shown in figure.

UNIT-IV

1. Explain the MICLASS coding system with an example?
2. Explain the part design and manufacturing attributes giving examples?
3. Define part family in GT? Explain one method of parts coding system?
4. Explain the guide lines and benefits of implementing GT?
5. Discuss the benefits of group technology?
6. What are the part families? What are the methods used for grouping of parts?
7. Develop the Optiz form code with justification for the component shown in figure.

8. What is generative process planning? Explain?
9. What is meant by CAPP? Compare and contrast retrieval and generative CAPP systems.

UNIT-V

1. Explain the benefits of applications and advantages of CAQC with CAD CAM systems?
2. Explain the application of machine vision in computer aided inspection?
3. With a block diagram explain the computerized elements of CIM system?
4. Discuss the principle of material handling. Name and describe the five types of material handling devices?
5. Define computer aided quality control? Explain how it is implemented?
6. What are the types of CMM? State the applications?
7. With a CIM circle diagram explain communication network the system?
8. State the advantages of CIM in manufacturing industry?
9. What are the functions of machine vision? Describe the procedure of machine vision?
10. With the help of schematic diagram explain the measurement system based on scanning laser beam system explain its applications in CAQC systems?
11. Describe different types of material handling systems used in CIM briefly?
12. Discuss the role of computer networks in CIM?
13. Discuss various types of contact inspection methods with neat diagram.
14. Discuss the various principles of material handling systems.
15. What is meant by CIM? Illustrate the importance of CIM in modern manufacturing systems.

UNIT – I

1 a) Define measurement and explain its significance in our day to day life.

b) What are the different sources of errors in measuring instrument? Suggest and explain the methods for elimination or minimization of the errors.

2 Explain the dynamic performance characteristics of measuring instruments.

4 Explain the various elements of generalized system with a neat sketch.

5 What is meant by statistical analysis of random errors? Explain the terms involved in it.

6 With the help of a suitable example, explain the functional description of various elements of a generalized measuring system.

7 a) Classify measuring instruments.

b) What are the desired, modifying and interfering inputs for ameasurement system? Give examples for each of thesequantities. What is the influence of these on the final output?

8 Explain the dynamic response instruments to step, ramp and sinusoidal inputs.

9 a) Differentiate between accuracy and precision.

10 a) Distinguish between direct and indirect methods of measurement with suitable examples.

b) Discuss propagation of uncertainties in measurement systems.

11 Discuss the following transducers with respect to their construction, working and characteristics:

a) Piezo-electric

b) Capacitance

Ionization

c) b) A platinum resistance thermometer has a resistance **f 140.5**

12 Explain the calibration procedure for inductive transducer.

a) Explain the working principle,c nstructin characteristics of Linear Variable Differential Transf mer(LVDT).

13 Ω and 100.0 Ω at 100° and 0° respectively. If its resistance becomes 305.3 Ω when it is in contact with a h t gas,

14 determine the temperature of gas. Take the temperature coefficient of platinum as 0.0039°C -1.

a) List electrical transducers for measurement of linear and angular displacement.

b) Explain the construction and working of a photo-electric transducer.

15 Design a measurement system for displacement measurement using LDR (Light dependent resistor) as sensor.

UNIT-II

1 Explain the principle of working of a pyrometer. With the helpof a neat sketch, explain a pyrometer and state its advantages of the same.

a) Explain the temperature measurement by thermocouples.

2 b) Explain the temperature measurement by resistance comprehension thermometers.

3 Explain the use of thermocouples for the measurement of average temperature of a room.

a) Distinguish between R D and Thermistors.

b) State the laws of thermocouples. How are the laws useful in

4 construction of thermocouple thermometers?

5 a) Differentiate between rare metal thermocouples and base metal thermocouples.

b) Why protection is needed for a sensing element?

6 With the help of line diagrams, explain the construction, working and advantages of thermal conductivity gauges.

7 With the help of a suitable diagram, explain the construction, working and principle features of bourdon tube pressure gauge.

8 a) Explain the working principle of diaphragm gauge with a neat diagram.

b) State the advantages and disadvantages of diaphragm gauge.

9 a) Explain the working principle of manometers for pressuremeasurement.

b) List out various types of manometers used for pressure measurement and discuss their specific characteristics.

10 How do you measure the pressure with the helpof U-tub emanometer and micro- manometer?

a) What is the basic principle in thermal conductivity gauge?

11 Explain the working principle of thermal couple type conductivity gauge.

b) A Mcleod gauge having V = 200 cm^3 and a capillary diameterof 2 mm is used to measure the gas pressure. What will be the pressure of the gas corresponding to a capillary of 4 cm?

12 Explain the construction and working principle of Ionization pressure gauge.

a) Explain absolute, gauge and vacuum pressure

b) Explain with the help of suitable sketches, the

13 diffe ence between a Bellow gauge and a diaphragm gauge f r pressure measurement.

14 Describe the construction, theory and applicati ns f different types of Diaphragm pressure gauges.

15 Explain the construction, working principle and features of Pirani thermal conductivity gauge.
16. Describe the construction of bubbler level indicator.

UNIT – III

1 What is the principle of working of a magnetic flow meter?

2 What are its advantages over other types of flow meters?

3 Explain the use of rotameter for flow measurement.

4 a) Explain the working principle of ultrasonic flow meter.

b) Explain the construction and working principle of turbine

5 Comprehension flow meter with a neat sketch. State its advantages and limitations. With the help of a neat diagram, explain the construction, working and special features of Laser Doppler anemometer.

6 a) Enumerate the principle of operation, construction details, advantages and limitations of rotameter.

b)List out the advantages and dis-advantages of indirect method level measurement.

7 Describe in detail with neat sketches:

a) Hook level indicator

b) Turbine flow meter

c) Cryogenic fuel method

8 Explain in detail with neat sketches:

a) Bubbler level indicator

b) Ultrasonic level method

c) Capacitive level method

9 Distinguish between the direct and indirect modes of level measurement. Discuss in brief about the methods.

10 Explain the principle of operation of Hot wire anemometer

11 List the various equipments for measurement of flow. Discuss each one of them in brief

12 Explain the construction, working and applications vibrometer.

13 What is the working principle of stroboscope? Explain working and applications.

14 Explain the construction and working principle of A.C tachometer with a neat diagram. State its advantage limitations.

15 Explain the angular velocity measurement by :

a) AC tachometer

b) Stroboscope

c) Photoelectric tachometer

16 Explain the working principle of seismic instruments. With the

help of suitable diagrams, explain the construction, working and application of vibrometer.

17 a) What is meant by tachometer?

b) With neat sketch, explain the working principle f rev counter and tachoscope tachometers.

18 Describe the functioning of a stroboscope and describe and explain how speed of a rotating shaft can be measured using a single pattern and multi - pattern disc.

19 Explain the working principle of non -contact type of electrical transducers

20 Name the different mechanical tachometers. Sketch and explain the working of centrifugal tachometer.

21 Explain the measurement of vibration by Reed Vibrometer.

UNIT – IV

1 Explain the use of electrical strain gages for bending strains.

2 Explain the use of resistance strain gauges for the measurement of bending and compressive strains.

3 How are the electrical strain gauges classified? Explain their characteristics.

4 Define gauge factor. Explain the factors on which gauge factor depends.

5 Derive an equation of a gauge factor.

6 Four strain gauges are mounted on a test specimen of steel subjected to a tensile load. Show the arrangement of gauges on

the test specimen and also in the bridge

7 A 200 Ω strain gauge is bonded to a steel bar which is subjected to a tensile load. Cross-sectional area of the bar is 0.8 x 10-4 m2

and E = 200 GN/m^2. Determine the gauge factor of the gauge.

8 a) What is the temperature compensation with respect to strain gauges?

b) Explain how an unbonded strain gauge is used to measure strain.

c) List the essential characteristics required for the backing material of a bonded strain gauge.

9 a) Describe the salient features of a semi-conductor type strain gauge.

b) Explain the two-arm and four-arm conditions used for strain measurements.

10 a) If a strain gauges has a low gauge factor, what does it indicate?

b) Name the various typesof strain gauges for different applications.

c) Distinguish between bonded and unbonded type of resistance strain gauges.

11 Give the classification of dynamometers. Explain how

dynamometers can be used to measure the forces acting in different directions in a machine tool.

12 a) Explain the working of dew point meter.

b) Explain the working principle of torsion meter.

13 a) List out various types of psychrometers. Explain any one of them with a neat sketch.

b) Explain the working principle of strain gauge t rsi n meter with a neat diagram.

14 What is a load cell? How do you measure force with the help a load cell? Name the applications of load cells.

15 Explain the working of a sling psychrometer.

16 a) What are the driving dynamometers? Explain any one of them

b) With the help of a neat sketch, explain the working principle of a mechanical humidity sensing

absorption hygrometer.

17 a) How absolute humidity is measured?

b) How is dew point temperature measured?

18 How does a mechanical load cell work? Explain the principle of measuring shaft torque using strain gauge torsion meter.

a) What is a psychrometer? Where does It find applications?

b) Explain clearly the difference between absorption, transmission and driving type of dynamometers.

19 Discuss in brief:

a) Elastic force meters

b) Moisture content of gases

UNIT – V

1 Explain the advantages of open loop control.

2 Discuss about speed control systems.

3 Differentiate between open and closed loop control systems.

4 What is a servomechanism? Describe thefeatures of a servomechanism.

5 What is a block diagram? Explain the steps involved in the preparation of block diagrams.

a) What are the requirements of a control system?

6 b) Describe the operation of a driver driving an automobile on the road and identify the components, input and output of the human system.

Suggest a simple control system which automatically turns on a

7 room lamp at dusk and turn it off in day light. Draw the

schematics and block diagram of the suggested control system.

8 What are the basic elements of a control system? Explain.

9 Describe a control system to fill a tank with water after it is emptied through an output at the bottom. This system

automatically stops the inflow of water when the tank is filled. Draw the clock diagram of the system.

10 Explain the concept of control in engineering. List several control devices with which you are familiar and describe any two of them.

QUESTION BANK

OPERATIONS RESEARCH

IV B.TECH SEM-I

DEPARTMENT OF MECHANICAL ENGINEERING

MALLA REDDY COLLEGE OF ENGINEERING AND TECHNOLOGY

MALLA REDDY COLLEGE OF ENGINEERING & TECHNOLOGY

Department Of Mechanical Engineering

B.Tech IVth Year 1 Semester

Operations Research

MODEL PAPER 1

PART A (25 Marks)

1. a. Write the scope of Operations research (2M)
   b. Write the Applications of Operations Research (3M)
   c. Write the different Types in Transportation problem (2M)
   d. Define the following i)Alternative optimum solution
   ii)unbounded solution
   iii)Slack variable (3M)
   e. Discuss the practical application of assignment problem (2M)
   f. Discuss the steps of Hungarian method (3M)
   g. What is dynamic programming (2M)
   h. What is Kendall Notation .Give the classification of queuing system based on Kendall Notation (3M)
   i. Define inventory (2M)
   j. Find the value of the game (3M)

6	9
8	4

PART B (50 Marks)

2. a) Let us consider a company making single product. The estimated demand for the product for the next four months are 1000,800,1200,900 respectively. The company has a regular time capacity of 800 per month and an overtime capacity of 200 per month. The cost of regular time production is Rs.20 per unit and the cost of overtime production is Rs.25 per unit. The company can carry inventory to the next month and the holding cost is Rs.3/unit/month the demand has to be met every month. Formulate a linear programming problem for the above situation.

   b) What are applications of OR

OR

3. Solve the following LPP by Big-M penalty method
   Minimize $Z = 5x_1 + 3x_2$
   S.T $2x_1 + 4x_2 \geq 12, 2x_1 + 2x_2 = 10, 5x_1 + 2x_2 \leq 10$
   and $x_1, x_2 \geq 0$

4. A company has factories at F_1, F_2 and F_3 that supply products to ware houses at W_1, W_2 and W_3

.The weekly capacities of the factories are 200,160 and 90 units. The weekly warehouse requirements are 180,120 and 150/units respectively. The unit shipping costs in rupees are as follows find the optimal solution

	W1	W2	W3	supply
F1	16	20	12	200
F2	14	8	18	160
F3	26	24	16	90
Demand	180	120	150	

OR

5. Different machines can do any of the five required jobs with different profits ring from each assignment as shown in adjusting table. Find out maximum profit possible through optimal assignment

.

Jobs	Machines				
	A	B	C	D	E
1	30	37	40	28	40
2	40	24	27	21	36
3	40	32	33	30	35
4	25	38	40	36	36
5	29	62	41	34	39

6. Solve the following sequence problem given optimal solution when passing is not allowed

Machines	Jobs				
	A	B	C	D	E
M1	11	13	9	16	17
M2	4	3	5	2	6
M3	6	7	5	8	4
M4	15	8	13	9	11

OR

7. Machine A costs of Rs:80,000. Annually operating cost are Rs:2,000 for the first years and they increase by Rs:15,000 every years (for example in the fourth year the operating cost are Rs:47,000) .Determine the least age at which to replace the machine. If the optional replacement policy is followed (a)What will be the average yearly cost of operating and owing the machine (Assume that the reset value of the machine is zero when replaced, and that future costs are not discounted

b)Another machine B cost Rs:1,00,000.Annual operating cost for the first year is Rs:4,000 and they increase by Rs:7,000 every year .The following firm has a ma(chine of type A which is one year old. Should the firm replace it with B and if so when?

(c)Suppose the firm is just ready to replace the M/c A with another M/c of the same type, just the the firm gets an information that the M/c B will become available in a year .What should firm do?

8. Obtain the optimal strategies for both pensions and the value of the game for two persons zero sum game whose payoff matrix is as follows.

		player-B	
		B1	B2
Player-A	A1	1	-3
	A2	3	5
	A3	-1	6
	A4	4	1
	A5	2	2
	A6	-5	0

OR

9. The production department of a companyrequired 3,600kg If raw material for manufacturing a particular item per year. It has been estimated that the cost of placing an order is Rs.36 and the cost of carrying inventory is 25% for the investment in the inventories, the price is Rs.10/kg. help the purchase manager to determine and ordering policy for raw material, determine optimal lot size

10. Customers arrive at box office windows being manned by a single individual according to a poisson input process with a mean rate of 20/hr. the time required to same a customer has an exponential distribution with a mean of 90 sec. Find the average waiting time of customers. Also determine the average number of customers in the system and average queue length

OR

11. a)What is simulation? Discuss application of simulation? b)Minimize $z=y_1^2+y_2^2+y_3^2$

subjected to $y_1+y_2+y_3=10$ and $y1, y_2, y_{3\geq 0}$ solve using Bellman's principle

MALLA REDDY COLLEGE OF ENGINEERING & TECHNOLOGY

Department Of Mechanical Engineering

B.Tech 4th Year 1 Sem

Operations Research

MODEL PAPER 2

PART A **(25 Marks)**

1. a. Define Operations research (2M)
   b. Write the industrial Applications of Operations Research (3M)
   c. Write the different Types in Transportation problem (2M)
   d. Write algorithm for Northwest corner method (3M)
   e. Discuss the practical application of assignment problem (2M)
   f. Discuss the steps of Hungarian method (3M)
   g. What is difference between balanced and unbalanced problems in the Assignment problems (2M)
   h. What is Kendall Notation .Give the classification of queuing system based on Kendall Notation (3M)
   i. Define inventory (2M)
   j. Find the value of the game (3M)

6	**2**	**4**
2	**3**	**3**
5	**2**	**6**

PART B **(50 Marks)**

2.a) Solve the following LP problem using graphical method

Maximize Z == $-x_1+2x_2$

Subjected to $x_1-x_2 \leq -1$

$-0.5x1-x2 \leq 2$ $x_1, x_2 \geq 0$

b) Explain the advantages of OR

OR

3 a.) Explain what is meant by degeneracy in LPP? How can this be solved?

b.) Solve the following LP problem by two phase method. Maximize Z = $5x_1+3x_2$

subjected to $3x_1+2x_2 \geq 3$

$x_1+4x_2 \geq 4$

$x_1+x_2 \leq 5$

$x_1+x_2 \geq 0$

4. a) Solve the following assignment problem to minimize the total time of the

Operator

Jobs					
Operator	1	2	3	4	5
1	6	2	5	2	6
2	2	5	8	7	7
3	7	8	6	9	8
4	6	2	3	4	5
5	9	3	8	9	7
6	4	7	4	6	8

b) Write the Mathematical representation of an assignment model?

OR

5. a). Briefly explain about the assignment problems in OR and applications of assignment in OR?

b) What do you understand by degeneracy in a transportation problem?

6. A book binder has one printing press, one binding machine and manuscripts of 7 different books The time required for performing printing and binding operations for different books are shown below

Book	1	2	3	4	5	6	7
Printing time (hr)	20	90	80	20	120	15	65
Binding time(hrs)	25	60	75	30	90	35	50

Decide the optimum sequence of processing of books binder to minimize the total time required to bring out all the books

OR

7. Six jobs are to be processed on three machines A, B, C with the order of processing jobs as BCA

Job	U	V	W	X	Y	Z
Proc,time on machine A	12	10	9	14	7	9
Proc,time on machine B	7	6	6	5	4	4
Proc,time on machine C	6	5	6	4	2	4

The suggested sequence is Y-W-Z-V-U-X. Find out the elapsed time for the sequence suggested. Is it optimal? If it is not optimal, then find out the optimal sequence and the minimum total elapsed time associated with it.

8. Define group replacement policy.

b) A computer contains 10000 resistors. When any resistor fails, it is replaced the cost of replacing a resistor individually is Rs.1 only. If all the resistors are replaced at the same time, cost per resistor would be reduced to 35 paisa. The % of surviving resistors say S(t) at the end of month t and the P(t) the probability of failure during

The month t is.

t	0	1	2	3	4	5	6
S(t)	100	97	90	70	30	15	0
P(t)	-	0.03	0.07	0.2	0.4	0.15	0.15

What is the optimal replacement policy?

OR

9. a)Explain the terms
i) Maxmin criteria and Minimax criteria ii) Strategies: Pure and mixed strategies.
b) Solve the following game graphically

	Player B		
Player A	B_1	B_2	B_3
A_1	1	3	11
A_2	8	5	2

10. Customers arrive at box office windows being manned by a single individual according to a poisson input process with a mean rate of 20/hr. the time required to save a customer has an exponential distribution with a mean of 90 sec. Find the average waiting time of the customers. Also determine the average number of customers in the system and average queue length

OR

11 a) State and explain the Bellman's principle of optimality.

b) Solve the LPP by dynamic programming approach Maximize z = 4x1 + 14x2

such that 2x 1 + 7x2 ≤ 21
7x1 + 2x2 ≤ 21 x1, x2 ≥ 0

MALLA REDDY COLLEGE OF ENGINEERING & TECHNOLOGY
Department Of Mechanical Engineering
B.Tech 4th Year 1 Sem
Operations Research

MODEL PAPER 3

PART A (25 MARKS)

1. a. Define Operations research (2M)
   b. Write the assumptions in Linear programming (3M)
   c. Write the formula for EOQ for the purchase model without shortages (2M)
   d. Write algorithm for Least Cost Cell method (3M)
   e. Discuss the practical application of assignment problem (2M)
   f. Discuss the steps of Hungarian method (3M)
   g.What is dominance property (2M)
   h.Distinguish between breakdown maintenance and preventive maintenance (3M)
   i. Define dynamic programming (2M)
   j. Find the value of the game (3M)

6	**2**	**4**
2	**3**	**3**
5	**2**	**6**

PART B (50 Marks)

2. Solve the following LPP problem by Two phase method Max $Z=2x_1+3x_2+5x_3$

S.T $3x_1+10x_2+5x_3\leq 15$

$33x_1-10x_2+9x_3\leq 33$

$x_1+2x_2+3x_3\geq 4$

$x_1, x_2, x_3\geq 0$

OR

3.a) Define the LPP. Give an example

b) Solve the following LPP using graphical method and verify by Simplex method

Maximize $Z=10x_1+8x_2$

S.T $x_1+2x_2\leq 1000$

$x_1\leq 300$

$x_2\leq 500$ and $x_1, x_2, \geq 0$

4. a) Give the mathematical formulation of Transportation problem

b) Use Vogel's approximate method to obtain an initial basic feasible solution of a transportation problem and find the optimal solution

Warehouse / Factory	W	X	Y	Z	Supply
A	11	13	17	14	250
B	16	18	14	10	300
C	21	24	13	10	400
Demand	200	225	275	250	

OR

5. Six jobs go first on machine A, then on machine B and last on a machine C. The order of completion of jobs have no significance. The following table gives machine time for the six jobs and the three machines. Find the sequence of jobs that minimizes elapsed time to complete the jobs.

Jobs	Processing Time		
	Machine A	Machine B	Machine C
1	8	3	8
2	3	4	7
3	7	5	6
4	2	2	9
5	5	1	10
6	1	6	9

6. The data collected in running a Machine the cost of which is Rs: 60,000 are

Resale value	1	2	3	4	5
Resale value (R	42,000	30,000	20,400	14,400	9,650
Cost of Spares (	4,000	4,270	4,880	5,700	6,800
Cost of Labor	14,000	16,000	18,000	21,000	25,00

Find the time when the machine should be replaced?

OR

7. Find the most economic batch quantity of a product on machine if the production rate of the item on the machine is 300 pieces per day and the demand is uniform at the rate of 150 pieces/day. The set up Cost is Rs.300 per batch and the cost of holding one item in inventory is Rs.0.81/per day. How will the batch quantity vary if the machine production n rate was infinite?

8. a)Explain the terms i)Rectangular games ii) type of Strategies

b) Solve the following game graphically where pay off matrix for player A has been prepared

1	5	-7	4	2
2	4	9	-3	1

OR

9. A dealer supplies you the following information with regards to a product that he deals in annual demand =10,000 units, ordering cost Rs.10/order. Price Rs.20/unit. Inventory carrying cost is 20% of the value of inventory per year. The dealer is considering the possibility of allowing some back orders to occur. He has estimated that the annual cost of back ordering will be 25% of the value of inventory

    a. What should be the optimum no of units he should buy in 1 lot?
    b. What qty of the product should be allowed to be back ordered
    c. What would be the max qty of inventory at any time of year
    d. Would you recommend to allow backordering? If so what would be the annual cost saving by adopting the policy of back ordering.

10. a) Explain how the queues are classified and give their notations
    b) In a bank, cheques are cashed at a single "teller" counter. Customers arrive at the counter in a Poisson manner at an average rate of 30 customers/hr. The teller takes on an average 1.5 minutes to cash a cheque. The service time has been shown to be exponentially distributed.
    i) Calculate the percentage of time the teller is busy
    ii) Calculate the average time a customer is expected to wait.

OR

11. Use dynamic programming to solve the following
    LPP Max $z= 3x_1+5x_2$

    Subjected to $x_1 \leq 4$.

    $X_2 \leq 6$,

    $3x_1+2x_2 \leq 18$,

    $x1, x2 \geq 0$

MALLA REDDY COLLEGE OF ENGINEERING & TECHNOLOGY
Department Of Mechanical Engineering
B.Tech 4th Year 1 Sem
Operations Research

MODEL PAPER 4

PART A **(25 Marks)**

1. a. Define Operations research (2M)
   b. What is simulation and what is the need of simulation (3M)
   c. What is surplus variable (2M)
   d. Write algorithm for Northwest corner method (3M)
   e. Discuss the practical application of Transportation problem (2M)
   f. Discuss the steps of Hungarian method (3M)
   g. What is difference between balanced and unbalanced problems in the Assignment problems (2M)
   h. Define the following i)balking
      ii)Reneging
      iii)dynamic programming (3M)
   i. Define strategy (2M)
   j. Find the value of the game (3M)

1	-1	3	-1	5
-2	2	-2	4	-2

PART B **(50 Marks)**

2. a)Write the applications and scope of OR

   b) Use Big-M method solve the following

   Max $Z=6x_1+4x_2$

   Subjected to $2x_1+3x_2\leq 30$, $3x_1+2x_2\leq 24$, $x_1+x_2\geq 3$, $x_1, x2 \geq 0$

OR

3. Solve the following LPP by Two phase method Max $z =2x_1+3x_2+5x_3$

   subjected to $3x_1+10x_2+5x_3\leq 15$

   $33x_1-10x_2+9x_3\leq 33$

   $x_1+2x_2+3x_3\geq 4$

   $x_1,x_2, x_3 \geq 0$

4.a) What do you understand by degeneracy in a transportation problem?

b) Obtain initial solution in the following transportation problem by using VAM and LCM

Source	D1	D2	D3	D4	D5	Availability
S1	5	3	8	6	6	1100
S2	4	5	7	6	7	900
S3	8	4	4	6	6	700
Requirement	800	400	500	400	600	

OR

5. Different machines can do any of the five required jobs with different profits resulting from each assignment as shown in the adjusting table. Find out maximum profit possible through optimal assignment.

Jobs	Machines				
	A	B	C	D	E
1	30	37	40	28	40
2	40	24	27	21	36
3	40	32	33	30	35
4	25	38	40	36	36
5	29	62	41	34	39

6. A salesman has to visit five cities A,B,C,D,E. The intercity distances are tabulated below

	A	B	C	D	E
A	-	12	24	25	15
B	6	-	16	18	7
C	10	11	-	18	12
D	14	17	22	-	16
E	12	13	23	25	-

Find the shortest route covering all the cities.

OR

7.a) Explain the terminology of sequencing techniques in operations research?

b) Solve the following sequence problem, given an optimal solution when passing is not allowed

Machines	Jobs				
	A	B	C	D	E
M1	11	13	9	16	17
M2	4	3	5	2	6
M3	6	7	5	8	4
M4	15	8	13	9	11

8.a) Purchase manager places order each time for a lot of 500 no of particular item from the available data the following results are obtained, inventory carrying 40%, ordering cost order Rs.600, cost per unit Rs.50 annual demand 1000 find out the loser to the organization due to his policy

b) What are inventory models? Enumerate various types of inventory models and describe them briefly

OR

9. a)What are characteristics of a game?

b) Reduce the following Game by dominance and the fid the game value

PlayerA					
		I	II	III	IV
	I	3	2	4	0
	II	3	4	2	4
	III	4	2	4	0
	IV	0	4	0	8

10. A bakery keeps stock of a popular brand of cake. Previous experience show the daily demand pattern for the item with associated probabilities as given

Daily damand (number)	0	10	20	30	40	50
Probability	0.01	0.20	0.15	0.50	0.12	0.02

use the following sequence of random numbers to simulate the demand for next 10 days Random numbers: 25,39,65,76,12,05,73,89,19,49 Also estimate the daily average demand for the cakes on the basis of the

OR

11. Solve using dynamic programming

Max $z= 50x_1+100x_2$

S.T $2x_1+3x_2\leq 48$

$x_1+3x_2\leq 42$

MALLA REDDY COLLEGE OF ENGINEERING & TECHNOLOGY
Department Of Mechanical Engineering
B.Tech 4th Year 1 Sem
Operations Research

MODEL PAPER 5

PART A **(25 Marks)**

1. a. Define scope of Operations research (2M)
   b. Write the advantages of simulation (3M)
   c. What is artificial variable (2M)
   d. Write algorithm for LCM method (3M)
   e. Discuss the practical application of Transportation problem (2M)
   f. Write any three applications of Bellman's principle of optimality (3M)
   g. What is difference between balanced and unbalanced problems in the Assignment problems (2M)
   h. Write the applications of Travelling salesman problem (3M)
   i. Define pure strategy (2M)
   j. Discuss the steps of Hungarian method (3M)

PART B **(50 Marks)**

2. a) A firm produces three types of biscuits A,B,C it packs them in arrangement of two sizes 1 and 11. The size 1 contains 20 biscuits of type A, 50 of type B and 10 of type C. the size 11 contains 10 biscuits of type A, 80 of type B and 60 of type C. A buyer intends to buy at least 120 biscuits of type A, 740 of type B and 240 of type C. Determine the least number of packets he should buy. Write the dual LP problem and interrupt your answer

   b) Solve the following LPP using graphical method and verify by Simplex method

   Maximize $Z=10x_1+8x_2$

   S.T $x_1+2x_2\leq 1000$

   $x_1\leq 300$

   $x_2\leq 500$ and $x_1, x_2 \geq 0$

OR

3. a) Explain what is meant by degeneracy in LPP? How can this be solved? b)Solve the following LP problem by graphically

   Maximize $Z=2x_1+x_2$

   S.T $x_1+2x_2\leq 10$, $x_1+x_2\leq 6, x_1-x_2\leq 2, x_1-2x_2\leq 1$ $x_1, x_2 \geq 0$

4. a) State the assignment problem mathematically.

   b) For the assignment table, find the assignment of salesmen to districts that will result

in maximum sales

Districts / Sales people	A	B	C	D	E
1	32	38	40	28	40
2	40	24	28	21	36
3	41	27	33	30	37
4	22	38	41	36	36
5	29	33	40	35	39

OR

5. a) What do you understand by degeneracy in a transportation problem?

b)A company has three plants at locations A.B.C which supply to Warehouse located at D,E,F,G and H. Monthly plant capacities are 800,500, and 900 respectively. Monthly warehouse requirements are 400,500,400 and 800units.Unit Transportation cost in rupees is

	D	E	F	G	H
A	5	8	6	6	3
B	4	7	7	6	5
C	8	4	6	6	4

Determine the optimum distribution for the company in order to minimize total transportation cost by NWCR

6. a) State Group of replacement policy

b) The following failure rates have been observed for a certain type of light bulbs

End of week	Probability of failure date
1	0.05
2	0.13
3	0.25
4	0.43
5	0.68
6	0.88
7	0.96
8	1.00

The cost of replacing an individual failed bulb is Rs.1.25.the decision is made to replace all bulbs simultaneously at fixed intervals and also to replace individual bulbs as they fall in service. If the cost of group replacement is 30 paise per bulb, what is the best interval between group replacements? At what group replacement price per bulb would a policy of strictly individual replacement become preferable to the adopted policy?

OR

7. a) A firm is considering the replacement of a machine, whose cost price is Rs.12,200 and its shop value is Rs.200. From experience the running (maintenance and operating) costs are found to be as follows.

Year	1	2	3	4	5	6	7	8
Ruuning cost	200	500	800	1200	1800	2500	3200	4000

When should the machine be replaced?

b) Explain two person zero sum game and n person game?

8. The demand for a purchased item 1000 units per month and shortages are allowed. If the unit cost is Rs. 1.50 per unit, the cost of making one purchase is Rs.600,the holding cost for one unit is Rs.2 per year and one shortage isRs.10 per year. Determine

i)The optimum purchase quantity

ii)The number of orders per year

iii)The optimal total yearly cost

OR

9. a)Obtain the optimal strategies for both pensions and the value of the game for two persons zero sum game whose payoff matrix is as follows.

		player-B	
		B1	B2
Player-A	A1	1	-3
	A2	3	5
	A3	-1	6
	A4	4	1
	A5	2	2
	A6	-5	0

b) Explain pay of matrix and types of strategy in game theory?

10. a) Define simulation why simulation uses. Give one application area when this technique is used in practice

b) Use dynamic programming to solve the following

LPP Max $z= 3x_1+5x_2$

Subjected to $x_1 \leq 4$.

$X_2 \leq 6$,

$3x_1+2x_2 \leq 18$,

$x1, x2 \geq 0$

OR

11. a)What are the applications of the dynamic programming?.Explain Bellman's principle of optimality.

b)Using dynamic programming approach solve the below problem

Maximize $z = 8x_1 + 7x_2$

S.T $2x_1 + x_2 \leq 8, 5x_2 + 2x_2 \leq 15, x_1, x_2 \geq 0$

POWER PLANT ENGINEERING

UNIT – 1: THERMAL POWER PLANTS

1. Draw a general lay out of a thermal power plant and explain the working of different circuits.
2. What factors are considered for selecting a site for a big thermal power plant?
3. How much coal, cooling water and combustion air are required for a thermal power station of 500 MW capacity per hour.
4. How much ash and SO2 are produced per day from a plant of Koradi size if Indian low grade coal is used.
5. What is the importance of thermal power plant in the national power grid?
6. What is meant by overfeed and underfeed principles of coal firing? Which is preferred for high volatile coal and why.
7. What are the advantages of burning the fuels in pulverized form?
8. Why ash and dust handling problem is more difficult than coal handling problems.
9. What are different ash handling systems? Discuss the relative merits and demerits.
10. How the ash produced carries the importance in the selection of thermal power plant site
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19 What are different ash handling systems? Discuss the relative merits and demerits.
20. How the ash produced carries the importance in the selection of thermal power plant site.

UNIT – 2: HYDROELECTRIC POWER PLANTS

1. What are the different factors to be considered while selecting the site for hydroelectric power plant?
2. How the hydroelectric power plants are classified.
3. How the most economical capacity of hydroelectric power plant is decided.
4. What do you understand by run-off river power plant and how its performance is increased by introducing a pondage in the plant?
5. Explain in detail about pump storage plant.
6. Draw a neat diagram of storage type hydroelectric power plant and describe the function of each component used in the plant.
7. Mention the advantages and disadvantages of hydroelectric power plants compared with thermal power plants.
8. Why the combined operation of hydro and thermal plants is more economical than individual operation of the plant.
9. What do you understand by pump storage plant and what are the advantages and limitations of this plant.
10. What are the specific advantages of storage reservoir type power plant? How they differ from other types of hydro power plant?

UNIT – 3: NUCLEAR POWER PLANTS

1. Why uranium oxide is preferred over uranium as fuel.
2. Why cladding is necessary. What are the requirements of a good cladding material?
3. What properties are required for a good coolant? Which gases are used as coolant?
4. What are the desirable properties of a good moderator? Compare H2O, D2O and C as moderators.
5. What are the desirable properties of control rod materials? Compare the merits and demerits of different control rod materials.
6. Why shielding of a reactor is necessary. What do you understand by thermal shielding?
7. Compare the properties of stainless steel and zirconium for use as reactor fuel element cladding.
8. How induced radioactivity affects the cost of shielding.
9. Considering the problem of induced radioactivity which coolant among water and sodium is more desirable and why.
10. Discuss the advantages and disadvantages of Lithium, Bismuth and sodium as coolants for nuclear reactors.

UNIT – 4: GAS AND DIESEL POWER PLANTS

1. What are the main advantages of a combined cycle system in the present power picture of the world?
2. Draw the line diagrams of repowering system using steam turbine only and boiler only. Discuss the merits and demerits also.
3. What is the gasification of coal and explain in detail.
4. What are the merits and demerits of using air or O2 in a gasification plant when the gasification plant is integrated with closed cycle?
5. What do you understand by PFBC, Explain in detail?
6. Draw the line diagrams of two different PFBC systems which are commonly used and discuss their merits and demerits.
7. What are the main difficulties faced in developing the combined cycles with PFBC.
8. Why and when organic fluid is preferred over water in the bottoming cycle. What are its advantages?
9. Discuss the part behavior of combined cycle plant and compare with conventional gas turbine plant of the same capacity.
10. What future developments are expected in combined cycle plants?

UNIT – 5: NON-CONVENTIONAL POWER GENERATION

1. What are the non-conventional sources of energy and why are they seriously thought throughout the world.
2. What are the different sources of geothermal energy?
3. Discuss the different systems used for generating the power using geo-thermal energy.
4. What are the specific environmental effects if the geothermal source of energy is used for power generation?
5. What factors are considered for selecting a suitable site for tidal power plants?
6. Differentiate with neat sketches the difference between single basin and double basin systems.
7. List out the advantages of tidal power plants over the conventional hydel power plants.
8. What are the basic requirements for locating a wind power plant? What factors affect them?
9. What methods are used to overcome the fluctuating power generation of a wind mill?
10. Explain the working of a fuel cell and list out its advantages over other non-conventional systems of power generation.

ROBOTICS QUESTION BANK

UNIT-I

1) Discuss the following types of automation
   i) Fixed automation
   ii) Flexible automation
2) Draw and explain the four basic configurations of robot.
3) Explain the different joints used in robots with neat sketch.
4) What are the various factors in gripper's selection and design?
5) What is meant by position and orientation of robot?
6) Explain RPY representation of orientation.
7) Define manipulator
8) Define robot and discuss the advantages and disadvantages
9) What is industrial automation? What are its types?
10) Discuss the gripper design considerations in robotics

Unit-II

1) Explain the importance of homogeneous transformations
2) For the vector v=25i+10j+20k perform translation by distance of a 8 in the x direction, 5 in the y direction and 0 in the z direction.
3) Draw any two euler angle systems and show rotation and angles
4) Give euler angles representation for the RPY system and drive the rotation matrix.
5) Explain about the following
   Homogeneous coordinates and homogeneous transformations
6) For the point 3i+7j+5k perform the following operation translates 6 units along y then rotate 30^0 about x
7) Explain the homogeneous transformation matrix

8) Explain DH notations
9) Define dh parameters
10) Write the importance of euler angle representation

Unit-III

1) Write short note on inverse kinematic model
2) Explain forward kinematic model
3) Differentiate forward and inverse kinematic model
4) Write short note on DH convention
5) Write short note on inverse transforms
6) Explain co-ordinate frame assignment of DH representation
7) Discuss about direct and inverse kinematics
8) Define and illustrate the link and joint parameters. Explain their uses
9) Derive the kinematic equation for the elbow manipulator with coordinate frame assignment.
10) Derive the kinematic equation for the SCARA robot giving coordinate frame diagram and the kinematic parameters

Unit-IV

1) Find the manipulator jacobian j(q) for the two axis planer articulated robot.
2) Compute the jacobian J11 for the three linked spherical manipulator.
3) Find the total differential transformation caused by small rotation about three axes of dx=0.1, dy=0.05 and dz=0.02 rad.
4) What is jacobian of a robot system?
5) Derive the jacobian matrix for the two link planer manipulator.
6) Explain Newton Euler formulation of a robotic system.
7) Explain the following briefly as applied to robot arm dynamics analysis
   i) Kinetic energy
   ii) Potential energy

iii) Joint velocities

8) Derive the dynamic equation of motion for a single link manipulator given the mass and length of the link.
9) Derive the dynamic equation of motion of a revolute prismatic (RP) robot arm manipulator.
10) Enumerate trajectory generation of polynomial type.

Unit-V

1) Compare the features of most commercially electrical actuators in robots.
2) Explain the following hydraulic actuators with neat sketch
   i) Robot actuators
   ii) Linear actuators
3) Explain the various touch sensors with neat sketch.
4) What are the considerations of robot in material handling?
5) What are the applications of robot in industry?
6) Explain spray painting by robots.
7) Explain the function of robots in assembly and inspection.
8) Explain automation in inspection.
9) Explain various assembly systems configuration.
10) Explain applications of robot in machine loading and unloading.