

on machine II and 3 hours on machine III, while each unit of product C requires 2 hours on each of the three machines. The contribution margin of the three product is Rs. 30, Rs. 40 and Rs. 35 per unit respectively. The machine hours available on the three machines are 90, 54, and 93 respectively.

- i. Formulate the above as a linear programming problem (LPP) and solve for maximum profit, using simplex method. **7 Marks**
- ii. What is the shadow price for Machine A? Interpret. **3 Marks**
- iii. Write the dual to the LPP. **2 Marks**

Q6. Write short notes on any two:

6X2 =12 Marks

- a) Type I and Type II errors in Hypothesis Testing
- b) Steps of Hypothesis Testing
- c) Explain various types of averages
- d) Differentiate between Symmetrical and Asymmetrical Distribution

-End-

P.T.O.

Total No. of Pages 04

FIRST SEMESTER

Roll No.

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**SUPPLEMENTARY EXAMINATION
MGT-15 DECISION SCIENCES**

FEB 2019

Max. Marks: 60

Time: 3:00 Hours

Note: Attempt FIVE questions in all. Q1 is compulsory. Show all calculations clearly. Assume suitable missing data, if any.

- Q1. You are required to write True/False, choose correct option(s) or solve or fill in the blanks. Each of parts i to viii is of 1 mark. Parts ix and x are of 2 marks each. **12 Marks**
- i. The mean and variance of a Poisson probability distribution function are same. (True/False)
 - ii. If $P(A) = 0.2$, $P(B) = 0.8$, $P(A | B) = 0.6$, find $P(A \cup B)$.
 - iii. The total area under the curve for Normal distribution is equal to ----.
 - iv. A random variable which follows t distribution can take values in the range ----
 - v. If X is normally distributed with mean 20 and standard deviation 4 then the value of $P(X < 20) =$ ----
 - vi. A major constraint in the use of assignment problem is that number of jobs must equal number of machines. (True/False)
 - vii. If a distribution is abnormally tall and peaked, then it can be said that the distribution is:
 - a. Leptokurtic
 - b. Kurtosis
 - c. Platykurtic
 - d. Mesokurtic
 - viii. The mean of a distribution is 14 and the standard deviation is 5. What is the value of the coefficient of variation?
 - a. 60.4%
 - b. 48.3%
 - c. 35.7%
 - d. 27.8%
 - ix. The probability that a builder will win a contract from company A is 0.40, and the probability that it will win a contract from company B is 0.30. The builder has 0.10 chance of winning the contracts from both companies A and B. What is the probability that the builder will win at least one of these two prospective contracts?

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- x. The mean wage of 100 labourers working in a factory is Rs.38. The factory runs two shifts with 60 workers in morning shift and 40 workers in evening shift. The mean wage of 60 labourers working in the morning shift is Rs. 40. Find the mean wage of 40 labourers working in evening shift.

Q2. [i] The observed data based on a 'Hotel Guest Satisfaction Survey' is as follows:

Choose Hotel Again?	HOTEL		
	A	B	Total
Yes	163	154	317
No	64	108	172
Total	227	262	489

Test the hypothesis that population proportion of guests who would return to Hotel A equals the population proportion of guests who would return to Hotel B. (Given: Critical value of Chi-Square Distribution at 5% level of significance with 1, 2 and 4 degrees of freedom are respectively 3.841, 5.991 and 9.488)

6 Marks

[ii] An MBA student randomly sampled four recent graduates in each of Finance, Marketing and HR Management and asked each of them to report the number of job offers. Can we conclude at 5% significance level that there are differences in the number of job offers between the three MBA majors? Formulate null and alternate hypothesis suitably before performing the analysis. Assume conditions of normality of populations with similar variance.

Finance: 3, 1, 4, 1

Marketing: 1, 5, 3, 4

HR Management: 8, 5, 4, 6

[Given: Tabulated F (.05, 2,9) = 4.26; Tabulated F (.05, 3,15) = 3.29] 6 Marks

Q3. [i] Suppose that 100 tires made by a certain manufacturer lasted on the average 21,819 miles. Suppose population standard Deviation is 1295 miles, test the null hypothesis $\mu = 22,000$ miles against the alternative hypothesis $\mu < 22,000$ miles at the .05 level of significance.

[Given: Tabulated Z (.05) = -1.645; Tabulated Z (.025) = -1.96]

5 Marks

[ii] Obtain the regression equation from the following data to estimate the blood pressure when age of the person is 50 years.

Age (years)	56	42	72	39	63	47	52	49	40	42	68	60
Blood pressure	127	112	140	118	129	116	130	125	115	120	135	133

Interpret the value of regression coefficient. Also find coefficient of correlation and interpret. [4 +1+2=7 Marks]

Q4. (i) A company plans to assign five salesmen to five districts in which it operates. Estimates of sales revenue in thousands of rupees for each salesman in different districts are given in the following table. What should be the placement of the salesmen if the objective is to maximize the sales revenue?

Salesman ↓	Revenue (thousand rupees) Districts				
	I	II	III	IV	V
A	40	46	48	36	48
B	48	32	36	29	44
C	49	35	41	38	45
D	30	46	49	44	44
E	37	41	48	43	47

6 Marks

(ii) A firm has manufacturing plants at places A, B, C with daily output of 500, 300 and 200 units respectively. It has warehouses at places P, Q, R, S with daily requirements of 180, 150, 350 and 320 units respectively. Per unit shipping charges on different routes are given below. The firm wants to send the output from various plants to warehouses involving minimum transportation cost. How should it route the product. Solve the transportation problem by using Vogel's Approximation Method. 6 Marks

From	To →	P	Q	R	S
	A		12	10	12
B		7	11	8	14
C		6	16	11	7

Q5. A firm uses three machines in the manufacturing of three products. Each unit of product A requires 3 hours on machine I, 2 hours on machine II and one hour on machine III. Each unit of product B requires 4 hours on machine I, one hour