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(AUTONOMOUS)
(Affiliated to the University of Madras and Re-accredited with 'A+' Grade by NAAC)
Chromepet, Chennai - 600 044.
B.Com. - END SEMESTER EXAMINATIONS - NOV'2024
SEMESTER - III
**23UCOCT3007 - Business Statistics and Operations Research-II**

Total Duration : 2 Hrs.30 Mins. Total Marks : 60

## Section B

Answer any **SIX** questions $(6 \times 5 = 30$ Marks)

1. A problem in statistics is given to five students A, B, C, D and E. Their chances of solving it are $\frac{1}{2}, \frac{1}{3}, \frac{1}{4}, \frac{1}{5}$and $\frac{1}{6}$. What is the probability that the problem will be solved?

2. From the following table: Fit a straight-line trend by the method of least squares.

| Year | Production |
|---|---|
| 2009 | 12 |
| 2010 | 10 |
| 2011 | 14 |
| 2012 | 11 |
| 2013 | 13 |
| 2014 | 15 |
| 2015 | 16 |

3. Given the restrictions
   x $\geq$ 0, y $= \geq$ 0
   2x+ y $\leq$ 20
   X + 2y $\leq$ 20
   Indicate the feasible region on a graph and maximum the function x + 3y

4. A project is as follows,

| Activity | Duration | Preceding activity |
|---|---|---|
| A | 4 | - |
| B | 9 | - |
| C | 3 | A |
| D | 8 | B |
| E | 7 | B |
| F | 2 | D |
| G | 5 | F |

   Construct the network and find the project and the critical path duration.

**Contd...**

5. Find the coefficient of skewness from the date given below:

| **Size** | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
|---|---|---|---|---|---|---|---|---|
| **Frequency** | 7 | 10 | 14 | 35 | 102 | 136 | 43 | 8 |

6. Compute the average seasonal movement for the following series:

| **Year** | **Quarterly production** | | | |
|---|---|---|---|---|
| | **I** | **II** | **III** | **IV** |
| 2011 | 3.5 | 3.9 | 3.4 | 3.6 |
| 2012 | 3.5 | 4.1 | 3.7 | 4.0 |
| 2013 | 3.5 | 3.9 | 3.7 | 4.2 |
| 2014 | 4.0 | 4.6 | 3.8 | 4.5 |
| 2015 | 4.1 | 4.4 | 4.2 | 4.5 |

7. A manufacturer makes two products P1 and P2 using two machines M1 and M2. Product P1 requires 2 hours on machine M1 and 6 hours on machine M2. Product P2 requires 5 hours on machine M1 and no time on machine M2. There are 16 hours of time per day available on machine M1 and 30 hours on M2. Profit margin from P1 and P2 are Rs.2 and Rs.10 per unit, respectively. What should be the daily production mix to optimize profit?

8. A project has the following activity duration and resource requirements.

| **Activity** | **Preceding activities** | **Duration (days)** | **Manpower required (No. of persons)** |
|---|---|---|---|
| A | - | 6 | 3 |
| B | - | 3 | 2 |
| C | - | 2 | 2 |
| D | C | 2 | 1 |
| E | B | 1 | 2 |
| F | D | 1 | 1 |

(i) Find the critical path and the project duration.
(ii) Find the maximum number of persons required for the project.

## Section C

Answer any **THREE** questions $(3 \times 10 = 30$ Marks)

9. A bag contains 30 balls numbered from 1 to 30. One ball is drawn at random. Find the probability that the number of the ball drawn will be a multiple of (a) 5 or 7 and (b) 3 or 7.

**Contd...**

10. Calculate Bowley's measures of skewness from the following data:

| **Payment of commission (Rs.)** | **No. of salesmen** |
|---|---|
| 1000-1200 | 4 |
| 1200-1400 | 10 |
| 1400-1600 | 16 |
| 1600-1800 | 29 |
| 1800-2000 | 52 |
| 2000-2200 | 80 |
| 2200-2400 | 32 |
| 2400-2600 | 23 |
| 2600-2800 | 17 |
| 2800-3000 | 7 |

11. Calculate trend value from the following data using the method of least square:

| **Year** | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 |
|---|---|---|---|---|---|---|
| **Production** | 7 | 9 | 12 | 15 | 18 | 23 |

12. Minimise z = 4x1 + x2 subject to
    $3x_1 + 4x_2 \geq 20$
    $-x_1 - 5x_2 \leq -15$
    $X_1, x_2 \geq 0$

13. Consider the following project whose activities along with PERT time estimate, the optimistic time (a), most likely time (m) and the pessimistic time (b) and given as follows

| **Activity** | **a(days)** | **m(days)** | **b(days)** |
|---|---|---|---|
| 1 -2 | 12 | 14 | 21 |
| 1 -3 | 7 | 10 | 16 |
| 3 – 5 | 4 | 6 | 10 |
| 3 – 4 | 36 | 40 | 60 |
| 4 – 6 | 12 | 15 | 24 |
| 5 – 6 | 6 | 8 | 12 |
| 6 – 7 | 9 | 12 | 18 |
| 6 – 8 | 6 | 10 | 15 |
| 7 – 8 | 4 | 5 | 7 |
| 8 - 9 | 8 | 10 | 14 |

Construct the network diagram and find the critical path. Determine the project completion time and its variance.

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