23ISU208 / 23RMU207 / 23BLU207

PSG COLLEGE OF ARTS & SCIENCE
(AUTONOMOUS)

BBA DEGREE EXAMINATION DECEMBER 2025
(Second Semester)

Common to Branches – **BUSINESS ADMINISTRATION(INFORMATION SYSTEM)/ BUSINESS ADMINISTRATION(RETAIL MANAGEMENT) / BUSINESS ADMINISTRATION(LOGISTICS)**

APPLIED OPERATION RESEARCH

Time: Three Hours Maximum: 75 Marks

SECTION-A (10 Marks)

Answer **ALL** questions

ALL questions carry **EQUAL** marks (10 × 1 = 10)

Module No.	Question No.	Question	K Level	CO
1	1	Simplex problem is infeasible when a) All the variables in entering column are negative b) Variables in the basis are negative c) Artificial variable is present in basis d) Pivotal value is negative	K1	CO1
	2	Which of the following statements is correct ? a) Every LP problem has at least one optimal solution. b) Every LP problem has a unique solution. c) If an LP problem has two optimal solutions, then it has infinitely many solutions. d) If a feasible region is unbounded then LP problem has no solution	K2	CO1
2	3	The column, which is introduced in the matrix to balance the rim requirements, is known as a) Key column b) Idle column c) Slack column d)Dummy Column	K1	CO2
	4	The assignment matrix is always a a) Rectangular matrix b) Square matrix c) Identity matrix d) None of the above	K2	CO2
3	5	A two-person zero-sum game means that the a) the sum of losses to one player is equal to the sum of gains to other b) the sum of losses to one player is not equal to the sum of gains to other c) no any player gains or losses d) none of these	K1	CO3
	6	Customer behavior in which the customer moves from one the queue to another in a multiple channel situation is a) Balking b) Reneging c) Jockeying d) Alternating	K2	CO3
4	7	Group replacement policy is most suitable for a) Trucks b) Infant machines c) Street light bulbs d) New cars	K1	CO4
	8	Which cost of the following is irrelevant to replacement analysis? a) Purchase cost of the machine b) Operating cost of the machine c) Maintenance cost of the machine d) Machine hour rate of the machine	K2	CO4
5	9	In PERT,the span of time between optimistic and pessimistic time estimate of an activity is_____ a) 3σ b) 6σ c)10σ d) 12σ	K1	CO5
	10	CPM was developed in which country? a) China b) Japan c) Russia d) USA	K2	CO5

SECTION - B (35 Marks)

Answer **ALL** questions

ALL questions carry **EQUAL** Marks (5 x 7 = 35)

Module No.	Question No.	Question	K Level	CO
1	11.a.	List out the scope of Operations Research?	K1	CO1
		(OR)		
	11.b.	Write the uses of Operations Research?		
2	12.a.	Write the procedure of least cost method ?	K1	CO2
		(OR)		
	12.b.	Mention the difference between Transportation Problem and Assignment Problem?		
3	13.a.	Solve the game whose pay-off matrix is given below	K3	CO3

-2	0	0	5	3
3	2	1	2	2
-4	-3	0	-2	6
5	3	-4	2	-6

(OR)

Cont...

<table>
<tr><td>3</td><td>13.b.</td><td>AT.V. mechanic finds that the time spent on his jobs has an exponential distribution with mean 30 minutes, if he repairs sets in the order in which they come in. If the arrival of sets is approximately Poisson with an average rate of 10 per eight-hour day, what is the inechanic's expected idle time each day? How many jobs are ahead of the average set just brought in?</td><td>K3</td><td>CO3</td></tr>
<tr><td rowspan="3">4</td><td>14.a.</td><td>A company has six jobs, A to F. All the jobs have to go through two machine MI and MII. The time required for the jobs on each machine in hours is given below. Find the optimum sequence that minimizes the total elapsed time.
<table>
<tr><td>job</td><td>A</td><td>B</td><td>C</td><td>D</td><td>E</td><td>F</td></tr>
<tr><td>M-I</td><td>1</td><td>4</td><td>6</td><td>3</td><td>5</td><td>2</td></tr>
<tr><td>M-II</td><td>3</td><td>6</td><td>8</td><td>8</td><td>1</td><td>5</td></tr>
</table></td><td rowspan="3">K3</td><td rowspan="3">CO4</td></tr>
<tr><td colspan="2">(OR)</td></tr>
<tr><td>14.b.</td><td>A Machine cost Rs.10,000.its operating cost and resale values are given below.
<table>
<tr><td>year</td><td>1</td><td>2</td><td>3</td><td>4</td><td>5</td><td>6</td></tr>
<tr><td>cost</td><td>1000</td><td>1200</td><td>1400</td><td>1700</td><td>2000</td><td>2500</td></tr>
<tr><td>Resale</td><td>6000</td><td>4000</td><td>3200</td><td>2600</td><td>2500</td><td>2400</td></tr>
</table>
Determine at what time it should be replaced?</td></tr>
<tr><td rowspan="3">5</td><td>15.a.</td><td>Construct a network for each of the projects whose activities and their precedence relationship are given below.
<table>
<tr><td>Activity</td><td>A</td><td>B</td><td>C</td><td>D</td><td>E</td><td>F</td></tr>
<tr><td>Predecessor</td><td>-</td><td>-</td><td>-</td><td>A</td><td>B</td><td>B</td></tr>
</table>
<table>
<tr><td>G</td><td>H</td><td>I</td><td>J</td><td>K</td></tr>
<tr><td>C</td><td>D</td><td>E</td><td>H,I</td><td>F,G</td></tr>
</table></td><td rowspan="3">K2</td><td rowspan="3">CO5</td></tr>
<tr><td colspan="2">(OR)</td></tr>
<tr><td>15.b.</td><td>A,B and C can start simultaneously
A<D,I;B<G,F;D<G,F;C<E;E<H,K;F<H,K;G,H<J</td></tr>
</table>

SECTION -C (30 Marks)

Answer **ANY THREE** questions

ALL questions carry **EQUAL** Marks (3 x 10 = 30)

<table>
<tr><th>Module No.</th><th>Question No.</th><th>Question</th><th>K Level</th><th>CO</th></tr>
<tr><td>1</td><td>16</td><td>Maximize: $Z=3x+4y$
Subject to $2x+5y\leq 60$, $4x+2y\leq 40$, $x,>0$.
Solve by Graphical Method (i)Plotthegraph (ii)Obtaintheoptimalsolution</td><td>K3</td><td>CO1</td></tr>
<tr><td>2</td><td>17</td><td>A Company has 5 jobs to be done on five machines.any job can be done on any machine.the cost of doing the jobs on different machines are given below.assign the jobs for different machines so as to minimize the total cost.
<table>
<tr><td>Jobs</td><td colspan="5">Machines</td></tr>
<tr><td></td><td>A</td><td>B</td><td>C</td><td>D</td><td>E</td></tr>
<tr><td>1</td><td>13</td><td>8</td><td>16</td><td>18</td><td>19</td></tr>
<tr><td>2</td><td>9</td><td>15</td><td>24</td><td>9</td><td>12</td></tr>
<tr><td>3</td><td>12</td><td>9</td><td>4</td><td>4</td><td>4</td></tr>
<tr><td>4</td><td>6</td><td>12</td><td>10</td><td>8</td><td>13</td></tr>
<tr><td>5</td><td>15</td><td>17</td><td>18</td><td>12</td><td>20</td></tr>
</table></td><td>K3</td><td>CO2</td></tr>
<tr><td>3</td><td>18</td><td>A petrol station has two pumps. The service time follows the exponential distribution with mean four minutes and cars arrive for service in a Poisson process at the rate of 10 cars per hour. Find the probability that a customer has to wait for service. What proportion of time do the pumps remain idle?</td><td>K3</td><td>CO3</td></tr>
<tr><td>4</td><td>19</td><td>The probability P_n of failure just before age n is shown below.if individual replacement costs Rs.12.50 and group replacement costs Rs.3 per item.Find the optimal replacement policy.
<table>
<tr><td>n</td><td>1</td><td>2</td><td>3</td><td>4</td><td>5</td></tr>
<tr><td>P_n</td><td>0.1</td><td>0.2</td><td>0.25</td><td>0.3</td><td>0.15</td></tr>
</table></td><td>K3</td><td>CO4</td></tr>
<tr><td>5</td><td>20</td><td>A small maintenance project consists of the following jobs,whose precedence relationship are given below.
<table>
<tr><td>Job</td><td>1-2</td><td>1-3</td><td>2-3</td><td>2-5</td><td>3-4</td><td>3-6</td></tr>
<tr><td>Duration</td><td>15</td><td>15</td><td>3</td><td>5</td><td>8</td><td>12</td></tr>
<tr><td>Job</td><td>4-5</td><td>4-6</td><td>5-6</td><td>6-7</td><td></td><td></td></tr>
<tr><td>Duration</td><td>1</td><td>14</td><td>3</td><td>14</td><td></td><td></td></tr>
</table>
(i).Draw an arrow diagram representing the project.
(ii).find the total float for each activity.
(iii).find the critical path and the total project duration.</td><td>K4</td><td>CO5</td></tr>
</table>

Z-Z-Z END