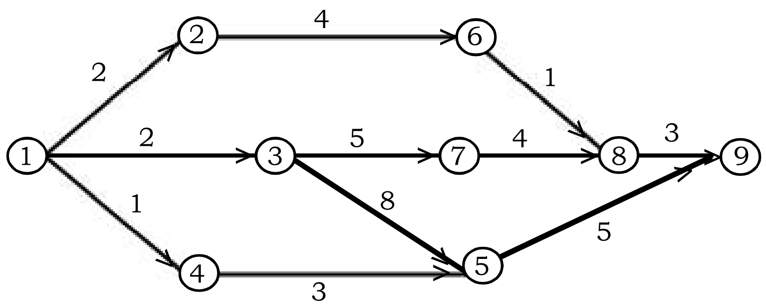
(b) Find the critical path and calculate the total float for each event of the following network diagram. 6



6. (a) There are five jobs each of whcih is to be processed through three machines A, B and C in the order ABC. Processing times in hours are given in the following table 6

Job	A	B	C
1	3	4	7
2	8	5	9
3	7	1	5
4	5	2	6
5	4	3	10

Determine the optimum sequence for the five jobs and the minimum elapsed time. Also find the idle time for the three machines.

(b) The following table lists the jobs of a network with their estimates.

	Duration (in days)		
job (i - j)	Optimistics (t_o)	Most likely (t_m)	Ressimistic (t_p)
1 - 2	3	6	15

4. (a) Solve the game by using matrix method. 6

		B I	II	III
A	1	7	1	7
	2	9	-1	1
	3	5	7	6

(b) Solve the following game by using graphical method. 8

		B I	II	III	IV
A	1	19	6	7	5
	2	7	3	14	6
	3	12	8	18	4
	4	8	7	13	-1

Unit - III

5. (a) Use graphical method to minimise the time needed to process the following jobs on the machines shower below:

Job 1 →	Seegment machines	→	A	B	C	D	E
	Time	→	2	3	4	6	2
Job 2 →	Segment machines	→	C	A	D	E	B
	Time	→	4	5	3	2	6

Also calculate the total time needed to complete both the jobs. 8

8. (a) Using Duhamel's principle solve the following $u_t - u_{xx} = f(x, t)$, $0<x<L$, $0<t<\infty$ with boundary conditions

$u(0, t) = u(L, t) = 0$

and initial conditions

$u(x, 0) = 0$, $0 \le x \le L$ 7

(b) Find the temperature $u(x, t)$ in a bar whose ends $x = 0$, $x = l$ are kept at temperature zero and initial temperature $f(x) = \sin(\pi x/l)$ 7

Unit - V

9. (a) Obtain the solution of 5

$$\frac{\partial^2 u}{\partial r^2} + \frac{1}{r}\frac{\partial u}{\partial r} + \frac{1}{r^2}\frac{\partial^2 u}{\partial \theta^2} = 0$$

(b) Obtain the solution of 7

$\nabla^2 u = 0$, $0 \le x \le a$, $0 \le y \le b$

with boundary conditions

$u(x, b) = u(a, y) = 0$, $u(0, y) = 0$, $u(x, 0) = f(x)$

(c) Prove that if the Dirichlet problem for a bounded region has a solution, then it is unique 2

10. (a) Find the potential function $u(x, y, z)$ in a rectangular has defined by $0 \le x \le a$, $0 \le y \le b$, $0 \le z \le c$, if the potential is zero on all sides and the bottom while $u = f(x, y)$ on the tope of the box. 7

(b) Solve $\nabla^2 u = 0$, $0 \le x \le a$, $0 \le y \le b$ satisfying boundary conditions 7

$u(0, y) = 0$, $u(x, 0) = 0$, $u(x, b) = 0$

$$\frac{\partial u}{\partial x}(a, y) = \mathrm{T}\,\mathrm{Sin}^3\left(\frac{\pi y}{a}\right)$$

★★★

PG Even Semester Examination, May 2025

MATHEMATICS

2nd Semester

Course No. : MAT - 553

(Partial Differential Equations)

Full Marks : 70

Pass Marks : 28

Time : 3 hours

The figures in the margin indicate full marks for the questions

(Answer one question from each unit)

Unit - I

1. (a) Show that $z = ax + \left(\frac{y}{a}\right) + b$ is a complete integral of pq=1. This problem has no singular integral. Find particular solution corresponding to the sub-family b=a. 2+3+4=7

(b) Find a complete integral of the equation $(p^2 + q^2)x = pz$ and integral surface containing C : $x_0 = 0$, $y_0 = s^2$, $z_0 = 2s$ 2+5=7

2. (a) Show that $f = p^2 + q^2 - 1 = 0$ and $g = (p^2+q^2)x - pz = 0$ are compatible and find one-parameter family of common solution. 3+4=7

(b) Apply Jacobi's method to solve $p^2z + q^2 = 4$ 5

(c) Solve $p + q - pq = 0$ 2

(Turn Over)