Applied Mathematics (Code-241) (XII)
Marking Scheme (set-4)

(1 Marks for each correct Answer)

Q.N.	Answer	Q.N.	Answer	Q.N.	Answer	Q.N.	Answer
1	B	6	B	11	C	16	B
2	B	7	D	12	C	17	C
3	D	8	B	13	C	18	A
4	C	9	D	14	A	19	A
5	A	10	A	15	D	20	A

Q.No.	Solution	Marks
21	Given R= 500, P = 10,000 and $i = \frac{r}{200}$ $P = \frac{R}{i}$ $i = \frac{R}{P} = \frac{500}{10000} = \frac{1}{20}$ $\frac{r}{200} = \frac{1}{20}$ r = 10 % per annum	(1) (1)
22	$= [1 \ -1 \ -1 \ 1]$, $A^2 = [2 \ -2 \ -2 \ 2]$ K = 2 OR $f(A) = A^2 - 4A + 7$ $A^2 = [1 \ 12 \ -4 \ 1]$ $f(A) = [0 \ 0 \ 0 \ 0]$	(1) (1) or (1) (1)
23	np+npq =1.8 and n=5 Getting p =0.2 ,q= 0.8 Probability for 2 successes =P(2)= $10(0.2)^2(0.8)^3 = 0.2048$	½ ½ (1)
24	Given $t_1 = 3\ hr, t_2 = 6\ hr$, y = 2 km / h	

$x = \frac{y\,(t_1 + t_2)}{(t_2 - t_1)}$ (1)

X = 6 km / h (1) (1)

Hence speed of man in still water = 6 km / h

OR

Ramesh runs 5 m in 3 seconds (1)

Time taken to run 200 m = $\frac{3}{5} \times 200$ (1)

= 120 second

25

$$v_f = 216000, v_i = 200000$$

Nominal Rate = $\frac{v_f - v_i}{v_i} \times 100$ (1)

= $\frac{16000}{200000} \times 100$ (1)

= 8 %

26

2006 - 63 (½ marks for each part)

2007-60.5

2008 – 56.25

2009- 53.5

2010- 53.5

2011- 52.5

OR

Year (t)	Y	X= $t_i - 2017$	xi^2	xy
2015	9	-2	4	-18
2016	18	-1	1	-18
2017	21	0	0	0
2018	29	1	1	29
2019	38	2	4	76
	115		10	69

$$a = \frac{\sum y}{n} = \frac{115}{5} = 23$$

And $b = \frac{\sum xy}{\sum x^2} = 69/10$ = 6.9

$y_t = a + b\,x$, $y_t = 23 + 6.9\,x$

Draw the graph

27	Quantity of milk after n operation = $40(1-\frac{4}{40})^3$ = 29.16	(2) (1)
28	$\int \frac{x^2}{(x-1)(x-2)(x-3)} \, dx$ = $\int \left(\frac{\frac{1}{2}}{x-1} + \frac{-4}{x-2} + \frac{\frac{9}{2}}{x-3} \right) dx$ $= \frac{1}{2} \, log \, x - 4 \, log \, log \, x + \frac{9}{2} \, log \, x$ + C OR $-\int_{-2}^{-1}(x^3 - x)dx + \int_{-1}^{0}(x^3 - x)dx - \int_{0}^{1}(x^3 - x)dx$ **for integration** **=11/4**	(2) (1) OR (1) (1) **(1)**
29	$t = \frac{\bar{x} - \mu}{\frac{s}{\sqrt{n}}}$ = 2.24 Degree of freedom =20-10=19 and $t_{0.05}$ = 1.729 null hypothesis is rejected since t – statistics more than the tabulated value	(1) (1) (1)
30	Cost of house = 4500000 Down payment = 500000 Balance amount = 40,00000 So, P = 40,00000 , $i = \frac{6}{12 \, x100} = 0.005 n = 25 \, x \, 12 = 300$	(1) (1)

	EMI = $\frac{p\ x\ i\ x(1+i)^n}{(1+i)^n-1}$ = $\frac{4000000\ x\ 0.005\ \ (1.005)^{300}}{(1.005)^{300}-1}$ = 25772, **Hence EMI = 25772.**	(1)
31	$= \frac{R\ (\ (1+i\ )^n - 1\ )}{i}$here $i = \frac{5}{200} = 0.025$ $R = \frac{A\ X\ i}{(1+i\ )^n - 1}$ R = 39148	(1) (2)
32	Probability of defective buckets = 0.05 n = 100 $m = np = 5$ Let X = number of defective buckets in a sample of 100 $p(X = r\ ) = \frac{e^{-m} m^r}{r!}$, r= 0,1,2,3,------ (i) P(No of defective buckets) = p(r=0) = $\frac{e^{-5} 5^0}{0!}$ = e^{-5} = 0.0067 (ii) P(At most one defective buckets) = P(r=0,1) = $\frac{e^{-5} 5^0}{0!}$ + $\frac{e^{-5} 5^1}{1!}$ = 0.0067 + 0.0335 = 0.0402 OR	(1) (2) (2)

	X=scores of students, μ=45, σ=5, $Z = \frac{X-\mu}{\sigma}$= (X- 45)/ 5 (i) When X =45, Z=0 P (X>45)=P(Z>0) =0.5 ⇒50% students scored more than the mean score ((ii) When X =30, Z=−3 and when X =50, Z=1 P (30<X<50)=P(-3<Z<1)=P(-3< Z≤1) = P(−3<Z≤0)+ P(0≤Z<1) = P(0≤Z<3) + P(0≤Z<1) = 0.4987 +0.3413= 0.84 ⇒84% students scored more than the mean score	(1) (2) (2)
33	Let $x$be the number of guests for the booking Clearly, x>100to avail discount Profit P = $\lfloor 4800 - \frac{200(x-100)}{10} \rfloor x = 6800x - 20\,x^2$ $$\frac{dp}{dx} = 6800 - 40\,x$$ $\frac{dp}{dx}$ = 0 , get x= 170 (1) $\frac{d^2p}{d^2x} = -40 < 0$ (1)	(1) (1)

	A booking for 170 guests will maximise the profit of the company And, Profit= P = $\lfloor 4800 - \frac{200(x-100)}{10} \rfloor x$, put x= 170 we get Profit = ₹5,78,000 OR P(x)= R(x)–C(x) = 5x–(100+ 0.025x^2) ⇒P'(x)=5 –0.05x P'(x)= 0 ⇒x=100 AsP''(x)=–0.05<0,∀x ∴ Manufacturing 100 dolls will maximise the profit of the company And, P(x)= 5x–(100+ 0.025x^2) Put x= 100 we get total Profit=₹1,50,000	(1) (1) (1) (1) (1) (1)
34	cost of new machine =65000 Net amount required at the end of 25 year = 62500 R= $\frac{i\,s}{(1+i)^n - 1}$, R = $\frac{0.035 X\, 62500}{(1.035)^{25} - 1} = 1604.68$ Thus rs . 1604.68 are set aside each year out of the profits.	(1) (1) (2) (1)
35	Here D = −1 , D1 = -11 D2= -92 D3= -53	(1) (1) (1) (1)

	By Cramer's rule $x = \frac{D1}{D} = \frac{-11}{-1} = 11,\ y = \frac{D2}{D} = \frac{-92}{-1} = 92\ z = \frac{D3}{D} = \frac{-53}{-1} = 53$	(1)
36	(1) Pipe C empties 1 tank in 12 hr. = $\frac{2}{5}$ *the* tank in $\frac{2}{5}\ x12 = \frac{24}{5}\ hr\ = 4\ \frac{4}{5}\ hr$ (2) Part of tank filled in 1 hour = $\frac{1}{6} + \frac{1}{8} - \frac{1}{12} = \frac{5}{24}$ = time taken to fill tank completely $= \frac{24}{5}\ hr. = 4\ \frac{4}{5}\ hr.$ (3) At 5 am, Let the tank be completely filled in 't' hours ⇒pipe A is opened for 't' hours pipe B is opened for 't−3' hours And, pipe C is opened for 't−4' hours ⇒In one hour, part of tank filled by pipe A = $\frac{t}{6}$ part of tank filled by pipe B = $\frac{t-3}{8}$ And part of tank filled by pipe C = $\frac{t-4}{12}$ Hence $\frac{t}{6} + \frac{t-3}{8} - \frac{t-4}{12} = 1$, $t = 5$ Total time to fill the tank -= 5 hrs. OR 6 am, pipe C is opened to empty ½ filled tank Time to empty = $\frac{24}{5}$hours Time for cleaning = 1 hour Part of tank filled by pipes A and B in 1 Hour = $\frac{1}{6} + \frac{1}{8} = \frac{7}{24}$ Part of tank filled by pipes A and B in 1 hour=1/15+1/12 +1/20 =3/20 th tank ⇒time taken to fill the tank completely = $\frac{24}{7}$hours Total time taken in the process	(1) (1) (2)

	$= \frac{24}{5} + 1 + \frac{24}{5} \quad = \frac{323}{35}\ hrs \qquad = 9\frac{8}{35}\ hrs$	
37	equation of AD 2x + y = 50 Equation of BC x+2y= 40 (1) the co-ordinates of points B and C B (20,10) and C (0,20) OR the Constraints for the LPP. 2x+y <=50, X+2y<=40, x>=0,y>=0.	 (1) (1) (2) (1) (1) (2)