Class: XII Session: 2020-21

Subject: Mathematics

Practice Question Paper 5
(Theory)

Time Allowed: 3 Hours **Maximum Marks: 80**

General Instructions:

1. This question paper contains two **parts A and B**. Each part is compulsory. Part A carries **24** marks and Part B Carries **56** marks
2. **Part-A** has Objective Type Questions and **Part-B** has Descriptive Type Questions.
3. Both Part A and Part B have choices.

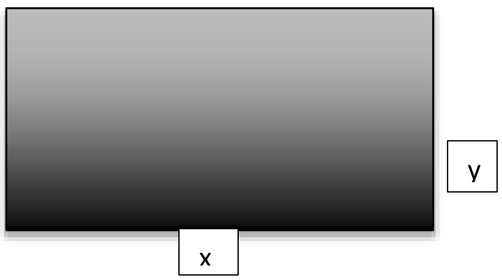
Part-A:

1. It consists of two sections- **I and II**
2. Section **I** comprises of 16 very short answer type questions.
3. Section **II** contains **2** case studies. Each case study comprise of 4 case-based MCQs.

Part –B:

1. It consists of three sections- **III, IV and V.**
2. Section **III** comprises of 10 questions of **2 marks** each.
3. Section **IV** comprises of 7 question of **3 marks** each.
4. Section **V** comprises of 3 questions of **5 marks** each.
5. Internal choice is provided in **3** questions of Section –III, **2** questions of Section- IV and **3** questions of Section-V. You have to attempt only one of the alternatives in all such questions

Sr. No.	Part-A	Marks
	Section I **All questions are compulsory. In case of internal choices attempt any one.**	
1.	If A is a square matrix of 3 order and |A|=5, then find the value of |2A| **OR** If A = $\begin{bmatrix} 5 & x \\ y & 0 \end{bmatrix}$ and A= A', what will be the relation between x and y.	1
2.	An equivalence relation R in A is divided into equivalence classes A1, A2, A3. What is the value of A1UA2UA3 and A1∩A2∩A3.	1
3.	If matrix A = $\begin{bmatrix} 0 & a & -3 \\ 2 & 0 & -1 \\ b & 1 & 0 \end{bmatrix}$ is skew symmetric, find the value of a and b. **OR** If A = $\begin{bmatrix} \alpha & \beta \\ \gamma & -\alpha \end{bmatrix}$ is such that A^2 = I. Find the realtion between α, β, γ.	1
4.	What is the property of relation if each element of A is related to itself?	1
5.	Check if relation R in the set R of real numbers defined as R = {(a,b) : a<b} is symmetric.	1
6.	Suppose P and Q are two different matrices of order 3×n and n×p, then what will be the order of P×Q?	1
7.	Evaluate $\int x^2 e^{x^3} dx$ **OR** Find the value of $\int_0^{\pi/2} cos\ x\ e^{sin\ x}\ dx$	1
8.	A card is picked at random from a pack of 52 cards. Given that picked card is queen, find the probability to be spade.	1
9.	A die is thrown once. Let A be the event that number obtained is greater than 3. Let B be the event that number obtained is less than 5. Find the value of P(AUB).	1

10.	Find the vector equation of line which passes through point (3,4,5) and is parallel to vector $2\hat{\imath}+2\hat{\jmath}-3\hat{k}$. **OR** Find the distance of a point P (a,b,c) from x axis.	1
11.	Find the order and degree of differential equation $x^2\left[\frac{d^2y}{dx^2}\right]=\left[1+\left(\frac{dy}{dx}\right)^2\right]^4$	1
12.	A line makes an angle α, β, γ with x axis, y axis and z axis. Find the value of cos 2α + cos 2β + cos 2γ.	1
13.	If line $\frac{x-1}{2}=\frac{y+3}{1}=\frac{z-5}{-1}$ is parallel to plane px+3y-z+5=0. Find the value of p.	1
14.	Evaluate $\int_{-\pi/2}^{\pi/2} x^2 \sin x\, dx$ **OR** $\int_2^8 \frac{\sqrt{10-x}}{\sqrt{x}+\sqrt{10-x}}dx$	1
15.	Find the area bounded by curve y=x^2, the x axis and lines x=-1 and x=1. **OR** Find the area region bounded by curve x= y^2, y axis, line y=3 and y=4.	1
16.	For what value of n will the following line be a homogenous differential equations $\frac{dy}{dx}=\frac{x^3-y^n}{x^2y+xy^2}$ **OR** Find the integrating factor of differential equation $\frac{dy}{dx}(x\ logx)+y=2\ logx$	1
	SECTION – II **Case study based MCQ's (There are 2 quetions of case studies with 5 MCQ's each, all are compulsory)**	
17.	A rectangle of perimeter 36 cm is rolled out to form cylinder of volume as large as possible. Based on this information, answer the following: 	

	(i)	If x and y represent the length and breadth of rectangular region, then relation between variable is: a) X= 18-y b) Y=18-x c) 2y=18-2x d) 2x=36-y	1
	(ii)	Volume of formed cylinder V expressed as function of x is: a) V(x) = π$x^3(x-18)$ b) V(x) = π$(18x^2-18)$ c) V(x) = π$(18x^2-x^3$ d) V(x) = π$(18x^3-x^2)$	1
	(iii)	The dimensions of rectangle for maximum volume should be: a) X=12, y=6 b) X=10, y=8 c) X=8, y=2 d) X=11, y=7	1
	(iv)	Maximum volume of cylinder: a) 846π cm^3 b) 864π cm^3 c) 684π cm^3 d) 866π cm^3	1
	(v)	The value of $\frac{d^2v}{dx^2}$ at maximum point is (a)-36π (b)-63 π (c) 36π (d) 63 π	1
18.	There are 3 urns containing 2 white and 3 black balls, 3 white and 2 black balls and 4 white and 1 black balls respectively. There is an equal probability of each urn being chosen. A ball is drawn at random from the chosen urn and it is found to be white. There are 3 urns U1, U_2, U_3 E_1 – an event where ball is chosen from U_1 E_2- an event where ball is chosen from U_2 E_3- an event where ball is chosen from U_3 E- an event where white ball is drawn Based on this information, answer the following:		

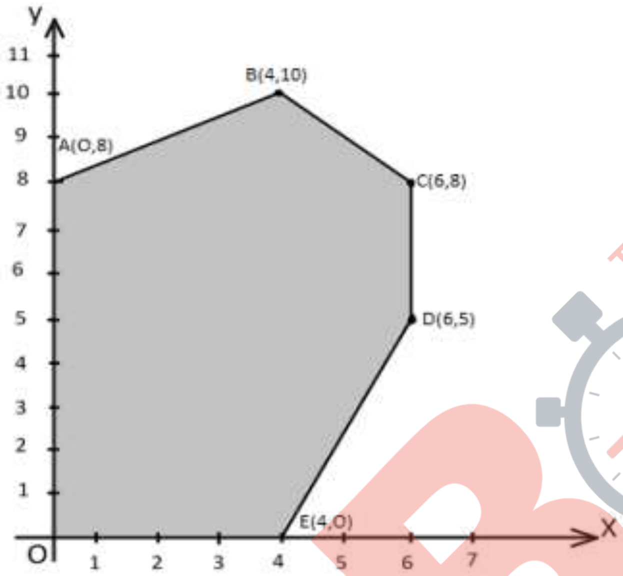
	i)	What is the value of P(U_1)? a) 2/3 b) 3/3 c) 1/3 d) 3/2	1
	ii)	Calculate P(E_2) a) 2/3 b) 1/3 c) 2/5 d) 4/5	1
	iii)	The value of P(E/E_1) and P(E/E_3) will be? a) 4/5, 2/5 b) 2/5, 3/5 c) 3/5, 4/5 d) 2/5, 4/5	1
	iv)	Find the probability that ball drawn was from second urn? a) 1/3 b) 4/5 c) 3/15 d) 3/5	1
	v)	What is the value of P(E_2).P(E/ E_2)?	1
		PART B **SECTION III**	
19.		Express $tan^{-1}\left(\frac{cosx}{1-sinx}\right)$: $\frac{-3\pi}{2} < x < \frac{\pi}{2}$ in simplest form	2
20.		Find a matrix A such that 2A-3B+5C=0 where B= $\begin{bmatrix} -2 & 2 & 0 \\ 3 & 1 & 4 \end{bmatrix}$ And C = $\begin{bmatrix} 2 & 0 & -2 \\ 7 & 1 & 6 \end{bmatrix}$ OR Solve for x and y x$\begin{bmatrix} 2 \\ 1 \end{bmatrix}$+y$\begin{bmatrix} 3 \\ 5 \end{bmatrix}$+$\begin{bmatrix} -8 \\ 11 \end{bmatrix}$=0	2
21.		If function f is defined as: f(x)= $f(x) = \begin{cases} \frac{x^2-9}{x-3}, & x \neq 3 \\ k, & x = 3 \end{cases}$ is continuous at x=3. Find k	2
22.	Find the equation of tangent and normal to the curve $16x^2 + 9y^2 = 145$ at (2,3)		2

23.	Evaluate $\int \frac{\cos 2x+2\,sin^2x}{cos^2x}dx$ OR $\int_0^a \frac{dx}{1+4x^2}=\frac{\pi}{8}$ Find the value of a	2
24.	Find the area bounded by a parabola $y^2 = x$ and straight line 2y=x	2
25.	Find the particular solution of the diffrential equation $\frac{dy}{dx} + 2y\; tanx = sinx$ at y=0 and x= π/3	2
26.	Using vector show P(2,-1,3), Q(3,-5,1) and R(-1,11,9) are collinear	2
27.	Find the vector equation of plane that passes through the point (1,0,0) and contains the line $\vec{r}$-λ$\hat{j}$	2
28.	Given E, F are events such that P(E)=0.8 , P(F)=0.7 , P(E∩F)=0.6. Find P($\bar{E}/\bar{F}$) OR If P(A∩ B)=$\frac{7}{10}$, P(B)= $\frac{17}{20}$ find P $\left(\frac{A}{B}\right)$	2
	SECTION IV **7 questions of 3 marks each**	
29.	Show that function f in A = R – {2/3} defined as function f(x)=$\frac{4x+3}{6x-4}$. is one-one and onto.	3
30.	Prove that curve x=y^2 and xy=k cut at right angles if $8k^2 = 1$ OR Differentiate $\tan^{-1}\sqrt{\frac{1-cosx}{1+cosx}}$, $-\frac{\pi}{4}$<x<$\frac{\pi}{4}$	3
31.	Using integration, find the area of region in the first quadrant enclosed by x axis, the line y=x and circle $x^2 + y^2 = 32$	3
32.	Find the interval in which the function f(x)=$\frac{x^4}{4} - x^3 - 5x^2 + 24x + 2$ is: a) Strictly increasing b) Strictly decreasing	3

33.	Solve $\int \frac{2\cos x+1}{(1-\sin x)(1+\sin^2 x)}dx$ OR $If\ \int \frac{dx}{(x+2)(x^2+1)}$=alog$\|1+x^2\|$+btan$^{-1}x$+$\frac{1}{5}log\|x+2\|$+C Find the values of a and b	3
34.	Solve the differential equation x dy - y dx = $\sqrt{x^2+y^2}$dx	3
35.	If $\log(x^2+y^2) = 2\tan^{-1}\left(\frac{y}{x}\right)$, show that $\frac{dy}{dx} = \frac{x+y}{x-y}$	3
	SECTION V **3 questions of 5 marks each**	
36	Evaluate the product AB where A=$\begin{bmatrix}1 & -1 & 0\\2 & 3 & 4\\0 & 1 & 2\end{bmatrix}$ B=$\begin{bmatrix}2 & 2 & -4\\-4 & 2 & -4\\2 & -1 & 5\end{bmatrix}$. Hence, solve the system of linear equation: x-y=3 2x+3y+4z=17 Y+2z=7 OR Solve the following system of equations $\begin{bmatrix}3 & 0 & 3\\2 & 1 & 0\\4 & 0 & 2\end{bmatrix}\begin{bmatrix}x\\y\\z\end{bmatrix}=\begin{bmatrix}8\\1\\4\end{bmatrix}+\begin{bmatrix}2y\\z\\3y\end{bmatrix}$	5
37	*Maximize* $Z = 15x + 10y$ *Subject to* $3x+2y \leq 80$ $2x+3y \leq 70$ $x,\ y \geq 0$ OR Find the coordinates of foot of perpendicular drawn from origin to the plane 3y+4z-6=0	5
38	Find the Cartesian equation of plane passing through points (2,2,-1), (3,4,2), (7,0,6). Also find the vector equation of a plane passing through (4,3,1) and parallel to the plane obtained above.	5

OR

The corner points of the feasible region determined by the system of linear constraints are as shown below:



Answer each of the following:

(i) Let $Z = 3x - 4y$ be the objective function. Find the maximum and minimum value of Z and also the corresponding points at which the maximum and minimum value occurs.

(ii) Let $Z = px + qy$, where $p, q > o$ be the objective function. Find the condition on p and q so that the maximum value of Z occurs at $B(4,10)$ *and* $C(6,8)$. Also mention the number of optimal solutions in this case.