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PRE-BOARD PRACTICE EXAM MAX.MARKS:80

CLASS:XII SUB:MATHEMATICS TIME:3 HRS

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 comprises of 5 case-based MCQs. An examinee is to attempt*** **any 4 out of 5 MCQs.**

Part – B :

1. ***It consists of three sections*****-III, IV and V.**

2. ***Section*** **III** ***comprises of 10 questions of*** **2 marks** ***each.***

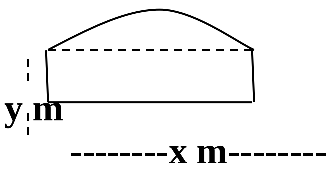
3. ***Section*** **IV** ***comprises of 7 questions of*** **3 marks** ***each.***

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 alternatives in all such questions.***

S.no	PART- A	MARKS
	SECTION-1 **All questions are compulsory. In case of internal choices attempt any one.**	
1	**Check whether the function f:R→ $R\ defined\ as\ f(x) = [x]$ is one-one or not , where [x]denotes the greatest integer less than or equal to x** **OR** **Find the maximum number of equivalence relations on the set A = {1,2,3}**	1 1
2	**Let A=[1,2,3,…,n} and B={a,b} then write the number of surjections from A to B.**	
3	**For the set A={1,2,3}, define a relation R in on the set A as R= {(1,1),(2,2),(3,3),(1,3)} , write the ordered pair to be added to R to make it the smallest equivalence relation.** **OR** **Let R be the equivalence relation in the set A={0,1,2,3,4,5} given by R={(a,b):2 divides (a-b)} ,then write equivalence class [0].**	1 1

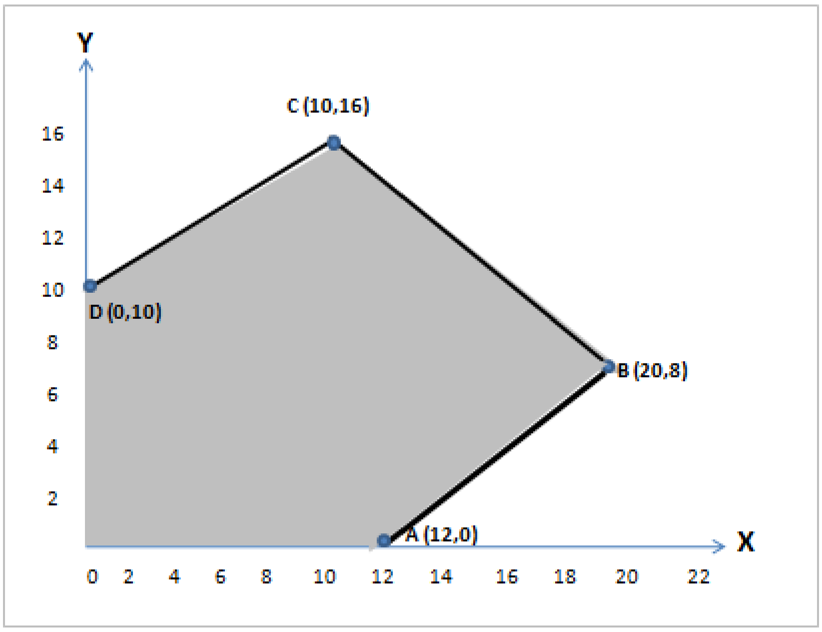
4	**If the matrix A= $[a_{ij}]_{2x2}$ where $a_{ij}=\begin{cases}2, if\ i \neq j \\ 0, if\ i = j\end{cases}$ then write matrix A.**	1
5	**Solve for x, [x 1]$\begin{bmatrix}1 & 0 \\ -2 & 0\end{bmatrix}$ = O** **OR** **A is a square matrix of order 3 , such that $\lvert adjA \rvert$ =64, then find $\lvert A \rvert$.**	1 1
6	**If A and B are symmetric matrices of the same order then verify that ($AB^T - BA^T$) is symmetric or skew-symmetric matrix.**	1
7	**Find $\int \frac{dx}{\sqrt{9-25x^2}}$** **OR** **Evaluate $\int_0^1 \frac{\tan^{-1} x}{1+x^2}$ dx.**	1 1
8	**Find the area of the region bounded by y=x+1 and the lines x=2 and x=3.**	1
9	**Find the order and degree of the differential equation.$(\frac{d^2 y}{dx^2})^2 + (\frac{dy}{dx})^2 = x \sin (\frac{dy}{dx})$** **OR** **Write the general solution of the differential equation $\frac{dy}{dx} = e^{x+y}$**	1
10	**If $\vec{a}$ and $\vec{b}$ are two vectors such that $\vec{a}.\vec{b} = 6, \lvert\vec{a}\rvert = 3, \lvert\vec{b}\rvert = 4, then\ find\ the\ projection\ of\ \vec{a}$ on $\vec{b}$.**	1
11	**Find the area of a parallelogram whose adjacent sides are $3\hat{\imath}$ and $-2\hat{\jmath}$**	1
12	**If $(2\hat{\imath}+6\hat{\jmath}+27\hat{k})x(\hat{\imath} + p\hat{\jmath} + q\hat{k}) = \vec{0}$,then find the values of p and q.**	1
13	**A line makes equal angles with co-ordinate axis. Find the direction cosines of this line.**	1
14	**Find the sum of the intercepts cut off by the plane 2x+y-z =5 on the co-ordinate axes.**	1
15	**Probabilities of solving a specific problem independently by A and B are 1/2 and 1/3 respectively. If both try to solve the problem independently, what is the probability that the problem**	1

	is solved?	
16	Let A and B be two events .If P(A) =0.2, P(B)= 0.4, and P(AUB)= 0.6 then find P(A/B).	1
	SECTION-II Both case study based questions are compulsory. Attempt any 4 sub parts from each question 17 and 18. Each question carries 1 mark.	
17	A carpenter designs a window in the form of a rectangle surmounted by a semicircle. The total perimeter of the window is 10m. Based on the above information answer the following. 	
I	The perimeter of window in terms of x and y is a)2 x +2 y+Πx/2 b)x+2y + Πx/2 c)2x +y + Πx/2 d)x +2y + Πx	1
II	The value of y in terms of Π and x: a) $10 - (\frac{\pi+2}{4})$ x b) $5 - (\frac{\pi+2}{2})$ x c) $5 - (\frac{\pi+2}{4})$ x d) None of these	1
III	Area of the window through which light enters is: a)$xy + \frac{\pi}{2}(x/2)^2$ b) $xy + \pi(\frac{x}{2})^2$ c) $xy + \frac{\pi}{2}(x)^2$ d) $2xy + \frac{\pi}{2}(x/2)^2$	1
IV	For maximum light , x should be : a) $\frac{10}{\pi+4}$ b) $\frac{10}{\pi+2}$ c) $\frac{20}{\pi+4}$ d)) $\frac{20}{\pi+2}$	1
V	For maximum light , the height of the window is : a) $\frac{20}{\pi+4}$ b) $\frac{10}{\pi+4}$ c) $\frac{30}{\pi+4}$ d) None of these.	1
18	A doctor is to visit a patient. From past experience, it is known	

	that the probabilities that he will come by train , bus, scooter or car respectively are (3/10), (1/5), (1/10) and (2/5). The probabilities that he will be late are (1/4), (1/3) and (1/12), if he comes by train, bus and scooter respectively, but if he comes by car, he will not be late. **Based on the above information answer the following.**	
I	**The probability that the doctor is late , given that he comes by train is :** **a) 1/3 b) 1/4 c) 1/12 d) 0**	**1**
II	**The probability that the doctor is late , given that he comes by car is :** **a) 1/4 b) 1/3 c) 1/12 d) 0**	**1**
III	**The total probability of coming late is :** **a) 1/20 b) 1/10 c) 3/20 d) 7/20**	**1**
IV	**When the doctor comes , he is not late, he comes by** **a) Train b) car c) bus d) Scooter**	**1**
V	**When the doctor comes , he is late, the probability that he has come by Scooter:** **a) 1/3 b) 1/12 c) 1/5 d) 1/18**	**1**
	PART-B	
	SECTION-III	
19	**Evaluate** $\tan(\sin^{-1}\frac{3}{5} + \cot^{-1}\frac{3}{2})$ **OR** **Simplify** $\tan^{-1}\left[\sqrt{\frac{1-\cos x}{1+\cos x}}\right]$ **, x<Π**	**2** **2**
20	**If A=** $\begin{bmatrix} 2 & -3 \\ 3 & 4 \end{bmatrix}$ **then show that** A^2 **- 6A+ 17I=O. Hence find** A^{-1}	**2**
21	**Find the area of the region bounded by** $y^2 = 4x$ **and the line x=3**	**2**
22	**Find the value of k , if the function f(x)=** $\begin{cases} \frac{k\cos x}{\pi - 2x}, & if\, x \neq \frac{\Pi}{2} \\ 3, & if\ x = \Pi/2 \end{cases}$	**2**

	is continuous at x= Π/2.	
23	**Find the slope of the tangent to the curve y= x^3 -3x +2 at the point , whose x-coordinate is 3.**	2
24	**Find $\int \frac{3+3\cos x}{x+\sin x}$ dx** **OR** **Evaluate $\int_0^1 x(1-x)^n$ dx.**	2 2
25	**Solve the differential equation $\frac{dy}{dx}$ = 1-x+y-xy**	2
26	**Find a vector of magnitude 5 units and parallel to the resultant of $\vec{a}$ = $2\hat{i}+3\hat{j}-3\hat{k}$ and $\vec{b}$ = $\hat{i}-2\hat{j}+3\hat{k}$.**	2
27	**Find the vector equation of plane which is at a distance of 7 units from the origin and normal to the plane is $3\hat{i}+5\hat{j}-6\hat{k}$**	2
28	**A coin is biased so that the head is three times as likely to occur as tail. If the coin is tossed twice , find the probability distribution of number of tails.**	2
	SECTION-IV	
29	**Show that the relation R in the set A={(a,b):a,b∈Z, $\|a-b\|$ is divisible by 3 } is an equivalence relation.**	3
30	**If y= $(\cos x)^x + \sin^{-1}\sqrt{x}$ find $\frac{dy}{d.x}$.**	3
31	**If y= $e^{a\cos^{-1}x}$, -1 ≤ x ≤ 1, show that $(1-x^2)y_2 - xy_1 - a^2y = 0$** **OR** **If x= a sec t, y= b tan t find $\frac{d^2y}{dx^2}$ at t = Π/6.**	3
32	**Find the intervals in which the function f(x) = sin x + cos x , x ε(0, Π/2) is strictly increasing or decreasing.**	3
33	**Evaluate $\int_0^{\frac{\pi}{4}} \log(1+\tan x)\,dx$.**	3
34	**Find the area of the region in the first quadrant enclosed by X-axis , the line y = x and the circle $x^2 + y^2 = 32$** **OR** **Find the area of the ellipse $x^2 + 9y^2 = 36$ using integration.**	3 3
35	**Find the general solution of the differential equation**	3

	dy/dx + y tan x = 3 x^2 + x^3 tan x , x $\neq \frac{\pi}{2}$	
	SECTION –V	
36	**Use the product** $\begin{bmatrix}1 & -1 & 2\\ 0 & 2 & -3\\ 3 & -2 & 4\end{bmatrix}\begin{bmatrix}-2 & 0 & 1\\ 9 & 2 & -3\\ 6 & 1 & -2\end{bmatrix}$ **to solve the system of equations** **x-y +2z = 1, 2y – 3z =1 , 3x -2y +4z =2.** **OR** **If A =** $\begin{bmatrix}1 & 3 & 4\\ 2 & 1 & 2\\ 5 & 1 & 1\end{bmatrix}$ **find A^{-1} and hence solve the system of equations** **x + 3y +4z =8 , 2x +y +2z =5 , 5x +y +z =7**	**5** **5**
37	**Find the shortest distance between the two lines** $\vec{r} = (\hat{i}+2\hat{j}+\hat{k}) + \lambda(\hat{i}-\hat{j}+\hat{k})$ **and** $\vec{r} = (2\hat{i}-\hat{j}-\hat{k}) + \mu(2\hat{i}+\hat{j}+2\hat{k})$ **OR** **Find the vector equation of plane passing through the three points** **(1,1,-2),(2,-1,1) and (1,2,1).Also find the coordinates of the point of intersection of this plane and the line** $\vec{r} = (3\hat{i}-\hat{j}-\hat{k}) + \lambda(2\hat{i}-2\hat{j}+\hat{k})$	**5**
38	**Solve graphically, the following Linear programming problem.** **Maximise Z = 22x +18y** **Subject to 3x +2y $\leq$ 48** **x+ y $\leq$ 20 , x $\geq$ 0, y $\geq$ 0** **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 = 5x -2y be the objective function . Find the maximum and minimum value of Z and also the corresponding points at which the maximum and minimum values occurs.**

(ii) **Corner points of the feasible region determined by the system of linear constraints are (0,3),(1,1)and (3,0).Let Z= px +qy ,where p,q > 0.**
Find the condition on p and q so that the minimum of Z occurs at (3,0) and (1,1).