Pre Board
MT -04

INFINITY THINK BEYOND.....
AN EDUCATIONAL INSTITUTE

12 th

Mock Test 0:4 Syllabus -Integration ,Application of Integration, Differential Equation

Time: 90 min **Maximum marks :40**

INSTRUCTIONS TO THE STUDENTS

1 . Read each question carefully .
2. Mark of each question is mention in front of question .
3. Attempt one question in internal choice based question .
4. Use of calculators is not allowed.
5. No negative marking .

SECTION A

(Questions 1 – 10 carry 1 marks)

1	The solution of $\int \frac{3ax}{b^2+c^2x^2}\,dx$ (a) $\frac{3a}{2c^2}\log\lvert b^2+c^2x^2\rvert + C$ (b) $\frac{3a}{2c^2}\log\lvert b^2-c^2x^2\rvert + C$ (c) $\frac{3a}{2c^2}\log\lvert c^2x^2-b^2\rvert + C$ (d) $\frac{3a}{2c^2}\log\lvert b^2+c^2x^2\rvert$	1
2	$\int_{a+c}^{b+c} f(x)dx$ is equal to (a) $\int_a^b f(x-c)dx$ (b) $\int_a^b f(x+c)dx$ (c) $\int_a^b f(x)dx$ (d) $\int_{a-c}^{b-c} f(x)dx$	1
3	The area of the region bounded by the ellipse $\frac{x^2}{25}+\frac{y^2}{16}=1$ is (a) 5π sq units (b) 20 πsq units (c) 25 πsq units (d) 16 πsq units	1
4	The area of the region bounded by the parabola $y^2 = x$ and the straight line 2y=x is (a) $\frac{4}{3}$ sq units (b) 1sq units (c) $\frac{2}{3}$ sq units (d) $\frac{1}{3}$ sq units	1
5	The number of arbitrary constants in the general solution of the differential equation: $\frac{dy}{dx}+y=0$ (a)0 (b)1 (c)2 (d)3	1
6	If P and q are respectively the order and degree of the differential equation , $\frac{d}{dx}\left(\frac{dy}{dx}\right)=0$, then (p-q) is (a)0 (b) 1 (c)2 (d) 3	1
7	For the value of $\int_0^{\pi/2}\sqrt{sin\theta}cos^5\theta\,d\theta$ will be : (a) $\frac{32}{231}$ (b) $\frac{44}{231}$ (c) $\frac{54}{231}$ (d)none of these	1
8	The L.F of the differential equation (1- y^2) $\frac{dx}{dy}-yx=1$ is: (a) $\frac{3}{\sqrt{1-y^2}}$ (b) $\sqrt{1-y^2}$ (c) $\frac{1}{y^2}$ (d) 1-y^2	1
9	Area of the region bounded by the curve x=2y+3 , the y- axis and between y=-1 & y= 1 is : (a)6u^2 (b)4 u^2 (c)8 u^2 (d)none of these	1
10	In the following questions, a statement of Assertion (A) is followed by a statement of Reason(R). Pick the correct option: (a) Both Assertion (A) and Reason(R) are true and Reason(R) is the correct explanation of Assertion (A).	1

	(b) Both Assertion (A) and Reason(R) are true but Reason(R) is NOT the correct explanation of Assertion (A). (c) Assertion (A) is true but Reason(R) is false. (d) Assertion (A) is false but Reason(R) is true **Assertion(A) :** $\int \sin^2 x\, dx = \frac{x}{2} - \frac{\sin 2x}{4} + c$ **Reason (R)**: 1-cos2x= 2sin^{2}x	
	SECTION B **(Questions 11 – 13 carry 2 marks)**	
11	(a)Evaluate $\int x^2 \tan^{-1} x\, dx$ **OR** (b)Evaluate : $\int \frac{dx}{2\sin^2 x + 5\cos^2 x}$	**2**
12	(a)Write the integrating factor of the differential equation (y-x)dy = (1+y^2)dx **OR** (b)Evaluate $\int_0^1 f(x)\, dx$, where f(x) = $\lvert x+1\rvert + \lvert x\rvert + \lvert x-1\rvert$	**2**
13	Find the area of the region bounded by y = $\sqrt{x}$ and y = x	**2**
	SECTION C **(Questions 14 – 15 carry 3 marks)**	
14	Evaluate : $\int \frac{x^3}{x^4+3x^2+2} dx$ **OR** Find the particular solution of the differential equation : 2xy+y^2 - 2x^2 $\frac{dy}{dx}$ = 0 y=2 when x=1	**3**
15	Using integration, find the area of Δ ABC, the coordinates of whose vertices are A (2, 5), B (4, 7) and C (6, 2).	**3**
	SECTION D **(Questions 16 – 17 carry 5 marks)**	
16	Prove $\int_0^{\pi} \log(\sin x) dx = -\pi \log 2$ using properties of definite integration.	**5**
17	Evaluate : $\int_0^{\pi} \frac{x}{a^2\cos^2 x + b^2 \sin^2 x} dx$ **OR** Find $\int \frac{x \tan^{-1} x}{(1+x^2)^{\frac{3}{2}}} dx$	**5**
	SECTION E **(Questions 18 – 19 carry 4 marks)**	
18	The bridge connects two hills 100 feet apart. The arch on on the bridge is in a parabolic form. The highest point on the bridge is 10 feet above the road at the middle of the bridge as seen in the figure. Based on the information given above, answer the following questions: i)Find the equation of the parabola designed on the bridge. ii)Find the value of the integral $\int_{-50}^{50} \frac{x^2}{250} dx$ iii)(a)The integrand of the integral $\int_{-50}^{50} x^2 dx$ is either even or odd function. **OR** (b) Find the area formed by the curve x^2 = 250y, x-axis , y = 0 and y = 10	**4**
19	COVID-19 vaccine was delivered to 90 K senior citizens in a state. The rate at which COVID-19 vaccine are given is directly proportional to the number of senior citizens who have not been administered the vaccines. By the end of 3rd week, $\frac{3}{4}$ th number of senior citizens have been given the COVID-19 vaccines. How many will have been given the vaccines by the end of 4th week can be estimated using	**4**

	the solution to the differential equation $\frac{dy}{dx}$ = k (90 − y), where x denotes the number of weeks and y the number of senior citizens who have been given the vaccines. Based on the above information, solve the following questions: (a)Find the particular solution for the above differential equation stated in the case study , if y(0) = 10 and k =0.025 (b)Prove that $y = 90(1-e^{-kx})$ is the required solution to find the number of senior citizens who have been given Covid-19 vaccines	