160
Objective
Paper Code
8198

FBD-12-2-23

Intermediate Part Second - 136

MATHEMATICS (Objective) Group – II

Time: 30 Minutes Marks: 20

Roll No. : ________

Q.No.1 You have four choices for each objective type question as A, B, C and D. The choice which you think is correct, fill the relevant circle in front of that question number on computerized answer sheet. Use marker or pen to fill the circles. Cutting or filling two or more circles will result in zero marks in that question. Attempt as many questions as given in objective type question paper and leave other circles blank.acf

S.#	Questions	A	B	C	D
1	(0 , 0) is one of the solutions of inequality:	$3x+4y>4$	$2x-3y\geq 4$	$x+3y>5$	$x-3y>-4$
2	If a straight line is parallel to x-axis then its slope is:	1	-1	0	∞
3	Intercepts form of equation of line is:	$y=mx+c$	$\frac{x}{a}+\frac{y}{b}=1$	$y-y_1=m(x-x_1)$	$x\cos\alpha+y\sin\alpha=p$
4	A linear equation in two variable represents:	Circle	Ellipse	Hyperbola	Straight line
5	Center of the circle $(x-1)^2+(y+3)^2=3$ is:	$(1,-3)$	$(-1,3)$	$(-1,-3)$	$(1,3)$
6	Parabola $x^2=-8y$ opens:	Rightwards	Leftwards	Upwards	Downwards
7	Length of major axis of an ellipse $\frac{(x-1)^2}{2^2}+\frac{(y+1)^2}{3^2}=1$ is:	18	8	6	4
8	Which conics is represented by the equation $x^2-y^2=4$?	Circle	Parabola	Ellipse	Hyperbola
9	Which vector is equal to vector $\underline{i}\cdot\underline{j}\times\underline{k}$?	0	1	-1	$\underline{i}$
10	The angle between the vectors $2\underline{i}+3\underline{j}+\underline{k}$ and $2\underline{i}-\underline{j}-\underline{k}$ is:	$30°$	$45°$	$60°$	$90°$
11	If $f(x)=x^2+\cos x$, then $f(x)$ is:	Constant function	Linear function	Odd function	Even function
12	The range of the function $y=2+\sqrt{x-1}$ is:	$[2,\infty)$	$(3,\infty)$	$[1,\infty)$	$[-1,\infty)$
13	$\frac{d}{dx}(\log_a^x)=$:	$\frac{1}{x}$	$\frac{1}{x}\ell na$	$\frac{1}{x\ell na}$	$\frac{1}{a\ell nx}$
14	$\frac{d}{dx}=(e^x+e^{-x})=$:	$2\sinh x$	$2\cosh x$	$\sinh x$	$\cosh x$
15	If $f(x)=3x^2-2x+1$, then $f'(0)=$:	5	-2	1	2
16	$\frac{1}{\sqrt{1+x^2}}$ is the derivative of:	$\sinh^{-1}x$	$\cosh^{-1}x$	$\tanh^{-1}x$	$\tan^{-1}x$
17	$\int \tan x\,dx=$:	$\ell n\lvert\cos x\rvert+c$	$\ell n\lvert\operatorname{cosec}x\rvert+c$	$\ell n\lvert\sec x\rvert+c$	$\ell n\lvert\cot x\rvert+c$
18	$\int_0^1\frac{1}{1+x^2}dx=$:	$\frac{\pi}{4}$	$\frac{\pi}{3}$	$\frac{\pi}{2}$	$\frac{\pi}{6}$
19	$\int(\sin^2x+\cos^2x)\,dx=$:	$\sin x+\cos x+c$	$\sin 2x+\cos 2x+c$	$\frac{x^2}{2}+c$	$x+c$
20	Suitable substitution for $\int\sqrt{a^2-x^2}\,dx$ is:	$x=a\sec\theta$	$x=a\sin\theta$	$x=a\tan\theta$	$x=a\cot\theta$

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MATHEMATICS (Subjective) Group – II

FBD-12-2-23 Time: 02:30 Hours Marks: 80

SECTION – I

2. Attempt any EIGHT parts: 16

(i) Show that the parametric equations $x = a\sec\theta, y = b\tan\theta$ represent the equation of hyperbola $\frac{x^2}{a^2} - \frac{y^2}{b^2} = 1$

(ii) Express the limit $\lim_{x \to 0} (1+3x)^{\frac{2}{x}}$ in terms of e.

(iii) Evaluate $\lim_{x \to -2} \frac{2x^3 + 5x}{3x - 2}$

(iv) Differentiate $\frac{1}{x-a}$ by definition

(v) If $y = \left(\sqrt{x} - \frac{1}{\sqrt{x}}\right)^2$ then find $\frac{dy}{dx}$

(vi) If $y = (3x^2 - 2x + 7)^6$, then find $\frac{dy}{dx}$ by making a suitable substitution.

(vii) If $y = e^x(1 + \ell nx)$ then find $\frac{dy}{dx}$

(viii) If $y = x^2 e^{-x}$ then find y_1, y_2

(ix) Define increasing and decreasing function.

(x) If $x = at^2$, $y = 2at$ then find $\frac{dy}{dx}$

(xi) Graph the solution region of $4x - 3y \le 12$, $x \ge \frac{-3}{2}$

(xii) Define optimal solution.

3. Attempt any EIGHT parts: 16

(i) Find δy and dy of $y = x^2 - 1$ when x changes from 3 to 3.02

(ii) Evaluate the indefinite integral $\int (\sqrt{x} + 1)^2 dx$

(iii) Evaluate $\int \tan^2 x \, dx$

(iv) Evaluate $\int a^{x^2} x \, dx$, $a > 0$, $a \ne 1$

(v) Evaluate $\int \frac{-2x}{\sqrt{4 - x^2}} dx$

(vi) Evaluate $\int \frac{1}{(1+x^2)\tan^{-1} x} dx$

(vii) Find integral by parts $\int x \sin x \, dx$

(viii) Find a unit vector in direction of $\underline{v} = [3, -4]$

(ix) Write a unit vector whose magnitude is 2 and direction is same as of $\underline{v} = -\hat{i} + \hat{j} + \hat{k}$

(x) If $\underline{a} = 4\hat{i} + 3\hat{j} + \hat{k}$, $\underline{b} = 2\hat{i} - \hat{j} + 2\hat{k}$, find $|\underline{a} \times \underline{b}|$

(xi) Find a scalar α so that the vectors $2\hat{i} + \alpha\hat{j} + 5\hat{k}$ and $3\hat{i} + \hat{j} + \alpha\hat{k}$ are perpendicular.

(xii) A force $\underline{F} = 4\hat{i} - 3\hat{k}$ passes through the point A(2, –2, 5). Find the moment of force $\underline{F}$ about the point B(1, –3, 1).

4. Attempt any NINE parts: 18

(i) Show that points A(0, 2), B($\sqrt{3}$, –1) and C(0, –2) are vertices of a right triangle.

(ii) Find h such that A(–1, h), B(3, 2) and C(7, 3) are collinear.

(iii) The coordinates of point P are (– 6, 9). The axes are translated through the point O′(–3, 2). Find the coordinates of point P referred to new axes.

(iv) Find equation of a straight line if its slope is 2 and y-intercepts is 5.

(v) Find the equation of the line through the points (–2, 1) and (6, –4).

(Continued P/2)

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(vi) Find the point of intersection of lines $x + 4y - 12 = 0$ and $x - 3y + 3 = 0$

(vii) Find the lines represented by $3x^2 + 7xy + 2y^2 = 0$

(viii) Find the center and radius of the circle $5x^2 + 5y^2 + 24x + 36y + 10 = 0$

(ix) Find the equation of normal to the circle $x^2 + y^2 = 25$ at (4, 3)

(x) Check position of a point (5, 6) with respect to the circle $x^2 + y^2 = 81$

(xi) Find the focus and vertex of a parabola $x^2 = 5y$

(xii) Find the equation of ellipse with foci (± 3 , 0) and minor axis of length 10

(xiii) Find foci and vertices of $x^2 - y^2 = 9$

SECTION – II Attempt any THREE questions. Each question carries 10 marks.

5. (a) Evaluate: $\lim_{\theta \to 0} \dfrac{1-\cos p\theta}{1-\cos q\theta}$ 05

   (b) Differentiate w.r.t. x, $\dfrac{\sqrt{1+x}-\sqrt{1-x}}{\sqrt{1+x}+\sqrt{1-x}}$ 05

6. (a) Evaluate: $\int \dfrac{dx}{\sqrt{7-6x-x^2}}$ 05

   (b) Find equation of two parallel lines perpendicular to $2x - y + 3 = 0$ such that the product of the x- and y-intercepts of each is 3. 05

7. (a) Evaluate $\int_0^{\frac{\pi}{4}} \cos^4 t \, dt$ 05

   (b) Maximize $f(x, y) = x + 3y$ subject to the constraints: $2x + 5y \le 30$; $5x + 4y \le 20$; $x \ge 0$; $y \ge 0$ 05

8. (a) If $x = \sin\theta$, $y = \sin m\theta$ show that $(1-x^2)y_2 - xy_1 + m^2y = 0$ 05

   (b) Find an equation of the circle passing through the points A(1, 2) and B(1, –2) and touching to the line $x + 2y + 5 = 0$ 05

9. (a) Find center, foci, eccentricity and vertices of ellipse $x^2 + 16x + 4y^2 - 16y + 76 = 0$ 05

   (b) Prove that $\sin(\alpha - \beta) = \sin\alpha\cos\beta - \cos\alpha\sin\beta$ 05

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