FSD

Objective
Paper Code
8197

Intermediate Part Second

FBD-41-21

Roll No. : ________

MATHEMATICS (Objective) Group – I

Time: 30 Minutes Marks: 20

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.**

S.#	Questions	A	B	C	D
1	The lines represented by $ax^2+2hxy+by^2=0$ are parallel if:	$h^2-ab=0$	$h^2-ab>0$	$h^2-ab<0$	$h^2=a+b$
2	The slope intercept form of equation of line is:	$1=\frac{x}{a}+\frac{y}{b}$	$y=mx+c$	$y=\frac{x}{m}+c$	$y-y_1=m(x-x_1)$
3	Two lines ℓ_1 and ℓ_2 with slope m_1 and m_2 are parallel if:	$m_1=-m_2$	$m_1=m_2$	$m_1m_2=-1$	$m_1=\frac{1}{m_2}$
4	$x=5$ is not solution of inequality:	$x+4>0$	$2x+3<0$	$x-4>0$	$x+y>4$
5	The parametric equations $x=a\cos\theta$, $y=a\sin\theta$ represent equation of:	Circle	Ellipse	Hyperbola	Parabola
6	The length of tangent from (0 , 1) to circle $x^2+y^2+6x-3y+3=0$ is:	2	-2	1	3
7	For parabola value of eccentricity e is:	$e=0$	$e<1$	$e>1$	$e=1$
8	$\hat{\underline{i}}\cdot(\hat{\underline{j}}\times\hat{\underline{j}})=$:	1	i	0	2
9	If $\underline{u}$ is non-zero vector then $\underline{u}\cdot\underline{v}=$:	0	1	-1	u^2
10	A vector perpendicular to both vectors $\underline{a}$ and $\underline{b}$ is:	$\underline{a}\cdot\underline{b}$	$\underline{a}\times\underline{b}$	$\frac{\underline{a}\cdot\underline{b}}{\lvert\underline{a}\rvert}$	$\underline{b}\cdot\underline{a}$
11	$\lim_{n\to\infty}\left(1-\frac{1}{n}\right)^n=$:	e^{-1}	e	e^2	$\frac{1}{e^2}$
12	Domain of $f(x)=2+\sqrt{x-1}$, $\forall x\in R$ is:	$(-1,\infty)$	$(1,\infty)$	$(2,\infty)$	$(-2,\infty)$
13	If $f(x)=\cos x$ then $f'(\sin^{-1}x)=$:	$-\sin x$	$-x$	1	x
14	If $y=e^{2x}$ then $y_4=$:	$16e^{2x}$	$8e^{2x}$	$4e^{2x}$	$-16e^{2x}$
15	$\frac{1}{x}\frac{d}{dx}(\sin x^2)=$:	$2x\cos x^2$	$2\cos x^2$	$2x\sin x^2$	$\sin x^2$
16	If $y=5e^{3x-4}$ then $\frac{dy}{dx}=$:	$5e^{3x}$	e^{3x-4}	$15e^{3x-4}$	$5(3x-4)$
17	$\int\frac{a}{x}dx=$:	$ax+c$	$a\ln\lvert x\rvert+c$	$-\frac{a}{x^2}+c$	$\frac{1}{a}\ln x+c$
18	$\int e^x(\sin x+\cos x)\,dx=$:	$e^x\cos x+c$	$e^x\sin x$	$e^x\sin x+c$	$e^x\cos x$
19	$\int\sin 5x\,dx=$:	$-\frac{1}{a}\cos x$	$-\frac{1}{5}\cos 5x+c$	$\frac{1}{5}\sin x+c$	$\frac{1}{5}\cos 5x+c$
20	Solution of different equation $\frac{dy}{dx}=-y$ is :	$y=ce^x$	$y=ce^{-x}$	e^x	$\frac{1}{c}e^{-x}$

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Intermediate Part Second

Roll No. ________

MATHEMATICS (Subjective) Group – I

Time: 02:30 Hours Marks: 80

SECTION – I

2. Attempt any EIGHT parts: 16

(i) Find the domain and range of $g(x)=\sqrt{x^2-4}$

(ii) Find $f^{-1}(x)$ if $f(x)=\dfrac{2x+1}{x-1}$

(iii) Find $\lim\limits_{x \to a} \dfrac{x^n-a^n}{x^m-a^m}$

(iv) Find $\lim\limits_{x \to 0} \dfrac{e^{\frac{1}{x}}-1}{e^{\frac{1}{x}}+1}$, $x>0$

(v) If $y=x^4+2x^2+2$, prove that $\dfrac{dy}{dx}=4x\sqrt{y-1}$

(vi) Differentiate sin x w.r.t. cot x

(vii) Find $\dfrac{dy}{dx}$ if $x^2-4xy-5y=0$

(viii) If $f(x)=\ell n\sqrt{e^{2x}+e^{-2x}}$, find $f'(x)$

(ix) If $y=\ell n(\tanh x)$, find $\dfrac{dy}{dx}$

(x) If $y=x^2\,\ell n\left(\dfrac{1}{x}\right)$, find $\dfrac{dy}{dx}$

(xi) If $x=a\,(\cos t+\sin t)$, $y=a\,(\sin t-t\cos t)$, find $\dfrac{dy}{dx}$

(xii) Apply Maclaurin series prove that $e^{2x}=1+2x+4\dfrac{x^2}{2!}+\ldots\ldots$

3. Attempt any EIGHT parts: 16

(i) Use differential to approximate the value of $\sqrt{17}$

(ii) Evaluate $\int x\sqrt{x^2-1}\,dx$

(iii) Evaluate $\int\left(\sqrt{x}+\dfrac{1}{\sqrt{x}}\right)dx$

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

(v) Evaluate $\int \dfrac{\sec^2 x}{\sqrt{\tan x}}\,dx$

(vi) Evaluate $\int \ell nx\,dx$

(vii) Evaluate $\int_0^{\frac{\pi}{6}} x\cos x\,dx$

(viii) Solve the differential equation $y\,dx+x\,dy=0$

(ix) Find the coordinates of the point that divides the join of A(–6, 3) and B(5,–2) in the ratio 2 : 3 internally.

(x) By means of slopes that the points (4, – 5) , (7 , 5) and (10 , 15) lie on the same line.

(xi) Fi... e with y-intercept: –7 and slope: –5.

...y $2x^2+3xy-5y^2=0$

(Continued P/2)

FBD-G2-21

4. **Attempt any NINE parts:** 18

(i) Graph the solution set of $3x - 2y \geq 6$

(ii) Find equation of circle with center at $(\sqrt{2}, -3\sqrt{3})$ and radius $2\sqrt{2}$

(iii) Find length of tangent from point P (–5, 10) to circle $5x^2 + 5y^2 + 14x + 12y - 10 = 0$

(iv) Find vertex and directrix of parabola $x^2 = -16y$

(v) Find equation of parabola with focus (– 3 , 1) and directrix x = 3

(vi) Find center and foci of $\frac{x^2}{4} - \frac{y^2}{9} = 1$

(vii) Find eccentricity and vertex of $\frac{y^2}{16} - \frac{x^2}{9} = 1$

(viii) Write the vector $\overrightarrow{PQ}$ in the form $x\underline{i} + y\underline{j}$, P(2 , 3) , Q(6 , –2)

(ix) Find a unit vector in the direction of $\underline{v} = 2\underline{i} - \underline{j}$

(x) Find a vector whose magnitude is 4 and is parallel to $2\underline{i} - 3\underline{j} + 6\underline{k}$

(xi) Find a real number α so that $\underline{u} = \alpha\underline{i} + 2\alpha\underline{j} - \underline{k}$, $\underline{v} = \underline{i} + \alpha\underline{j} + 3\underline{k}$ are perpendicular.

(xii) Compute $\underline{b} \times \underline{a}$ if $\underline{a} = 2\underline{i} + \underline{j} - \underline{k}$, $\underline{b} = \underline{i} - \underline{j} + \underline{k}$

(xiii) Prove that $\underline{u} \cdot (\underline{v} \times \underline{w}) + \underline{v} \cdot (\underline{w} \times \underline{u}) + \underline{w} \cdot (\underline{u} \times \underline{v}) = 3\underline{u} \cdot (\underline{v} \times \underline{w})$

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

5. (a) Evaluate $\lim_{\theta \to 0} \frac{\tan\theta - \sin\theta}{\sin^3\theta}$ 05

(b) Show that $\frac{dy}{dx} = \frac{y}{x}$ if $\frac{y}{x} = \tan^{-1}\frac{x}{y}$ 05

6. (a) Solve $\int e^{-x} \sin 2x \, dx$ 05

(b) Find the angles of the triangle whose vertices are A(–5 , 4) , B(–2 , –1) and C(7 , –5) 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: $2x + 5y \leq 30$; $5x + 4y \leq 20$; $x \geq 0$, $y \geq 0$ 05

8. (a) Write an equation of circle passing through the points A(–7 , 7) , B(5 , –1) , C(10 , 0) 05

(b) Given force $\vec{F} = 2i + j - 3k$ acting at a point A(1, – 2, 1) find the moment of $\vec{F}$ about the point B(2 , 0, – 2) 05

9. (a) Show that $y = \frac{\ell nx}{x}$ has maximum value at x = e 05

(b) Show that the ordinate at any point P of the parabola is a mean proportional between the length of the latus rectum and the abscissa of P. 05

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Intermediate Part Second FBD-G2-21

Roll No. : __________

MATHEMATICS (Objective) Group – II

Time: 30 Minutes Marks: 20

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. 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.**

S.#	Questions	A	B	C	D
1	The altitudes of a triangle are:	Concurrent	Parallel	Perpendicular	Imaginary
2	The line $y = 3x$ passes through:	Origin	$(4, 3)$	$(3, 1)$	$(0, 3)$
3	A quadrilateral having two parallel and two non-parallel sides is called:	Parallelogram	Rhombus	Trapezium	Triangle
4	The maximum or minimum values of objective function occur at corner points of the feasible region, is called:	The theorem of linear programming	Feasible theorem	Optional theorem	Convex
5	The focus of $y^2 = -4ax$ is:	$(0, 0)$	$(a, 0)$	$(-a, 0)$	(a, a)
6	The eccentricity of parabola is:	0	1	Less than one	Not defined
7	The center of $\frac{x^2}{a^2} - \frac{y^2}{b^2} = 1$ is:	$(0, 0)$	$(a, 0)$	$(0, b)$	(a, b)
8	If $\bar{u}$, $\bar{v}$ and $\bar{w}$ are coplaner vectors than the volume of the parallelopiped so formed is:	1	0	$\lvert u \times v \times w \rvert$	$\sqrt{u^2 + v^2 + w^2}$
9	The magnitude of $\bar{u} = i + j$ is:	$2\sqrt{i^2 + j^2}$	2	$\sqrt{2}$	$\frac{\hat{i} + \hat{j}}{\sqrt{2}}$
10	The unit vector in the direction of $2\hat{i} - \hat{j}$ is:	5	$\sqrt{5}$	$\frac{2i - j}{5}$	$\frac{2i - j}{\sqrt{5}}$
11	A function $C : R \to R$ defined by $C(x) = 2$ for all $x \in R$ is called:	Domain	Range	Constant function	Objective function
12	For the function $f(x) = x^n$, $\lim\limits_{x \to a} \frac{x^n - a^n}{x - a} =$:	nx^{n-1}	na^{n-1}	0	∞
13	If $f(x) = \lvert x \rvert$ then $f'(0) =$:	0	1	-1	Does not exist
14	The sum of two integers is 9. If one integer is x, then other will be:	$9x$	$9 - x$	$x - 9$	$x + 9$
15	The derivative of arc cos x is:	$\frac{-1}{\sqrt{1 - x^2}}$	$\frac{1}{\sqrt{1 + x^2}}$	$\frac{1}{\sqrt{x^2 - 1}}$	$\frac{-1}{\sqrt{x^2 - 1}}$
16	The first term of Taylor Series Expansion of $\ell n(1 + x)$ at $x = 2$ is:	$\ell n\, 3$	$\ell n\, 2$	$\ell n\, 1$	$\ell n\, 0$
17	$\int \tan x \, dx =$:	$\sec^2 x$	$\sec x \tan x$	$\ell n \sec x$	$\ell n \cos x$
18	The suitable substitution to integrate $\sqrt{x^2 - a^2}$:	$x = a\sin\theta$	$x = a\cos\theta$	$x = a\sec\theta$	$x = a\tan\theta$
19	$\int e^{ax}[af(x) + f'(x)]\,dx =$:	$e^{ax}f(x)$	$e^{ax}a \cdot f(x)$	$e^{ax}f'(x)$	$a\,f'(x)$
20	$\int \frac{2}{x + 2}\,dx =$:	$\ell n \lvert x + 2 \rvert$	$\ell n \lvert x + 2 \rvert^2$	$\frac{1}{\ell n \lvert x + 2 \rvert}$	2

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FSD

Intermediate Part Second FBD-G2-21 Roll No. ______

MATHEMATICS (Subjective) Group – II

Time: 02:30 Hours Marks: 80

SECTION – I

2. **Attempt any EIGHT parts:** 16

(i) Determine whether the function is even or odd for $f(x) = x^{\frac{2}{3}} + 6$

(ii) Without finding inverse state domain and range of $f(x) = \frac{x-1}{x-4}$, $x \neq 4$

(iii) Evaluate $\lim_{\theta \to 0} \frac{1-\cos\theta}{\theta}$

(iv) Show that $x = at^2$, $y = 2at$ represent parametric equation of $y^2 = 4ax$

(v) Differentiate w.r.t. 'x' if $y = \frac{x^2+1}{x^2-3}$

(vi) Differentiate $x^2 - \frac{1}{x^2}$ w.r.t. x^4

(vii) Find $\frac{dy}{dx}$ if $y = xe^{\sin x}$

(viii) Find y_2 if $x^3 - y^3 = a^3$

(ix) Prove that $\frac{d}{dx}(\cot^{-1}x) = \frac{-1}{1+x^2}$

(x) Differentiate w.r.t. x, $\sin^{-1}\sqrt{1-x^2}$

(xi) Find $\frac{dy}{dx}$ if $y = e^{-2x}\sin 2x$

(xii) Find y_4 if $y = \ell n(x^2 - 9)$

3. **Attempt any EIGHT parts:** 16

(i) Using differentials find $\frac{dy}{dx}$ when $\frac{y}{x} - \ell nx = \ell nc$

(ii) Evaluate $\int \frac{3-\cos 2x}{1+\cos 2x}\,dx$

(iii) Evaluate the indefinite integral $\int \frac{(\sqrt{\theta}-1)^2}{\sqrt{\theta}}\,d\theta$

(iv) Evaluate $\int \frac{\sqrt{2}}{\sin x + \cos x}\,dx$

(v) Find the antiderivative of $x\ell nx$

(vi) Evaluate the given integral $\int \sec^4 x\,dx$

(vii) Solve the differential equation $\sec x + \tan y \frac{dy}{dx} = 0$

(viii) Find the area, above the x-axis and under the curve $y = 5 - x^2$ from $x = -1$ to $x = 2$

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

(x) Convert the given equation into normal form: $15y - 8x + 3 = 0$

(xi) Find the interior angles (any two) of the triangle whose vertices are $A(2, -5)$, $B(-4, -3)$, $C(-1, 5)$

(xii) Find an equation of each of the lines represented by $2x^2 + 3xy - 5y^2 = 0$

(Continued P/2)

FBD-G2-21 18

4. **Attempt any NINE parts:**

(i) Graph the solution set of $2x + y \le 6$ by shading.

(ii) Find the value of α so that the vectors $\alpha\underline{i} + \underline{j}$, $\underline{i} + \underline{j} + 3\underline{k}$ and $2\underline{i} + \underline{j} - 2\underline{k}$ are coplaner.

(iii) If 0 is the origin and $\overrightarrow{OP} = \overrightarrow{AB}$. Find the point P when A and B are (– 3 , 7) and (1 , 0) respectively.

(iv) If $\underline{v} = 3\underline{i} - 2\underline{j} + 2\underline{k}$ and $\underline{w} = 5\underline{i} - \underline{j} + 3\underline{k}$, then find $|3\underline{v} + \underline{w}|$

(v) Find a unit vector perpendicular to plane containing $\underline{a}$ and $\underline{b}$ and $\underline{a} = -\underline{i} - \underline{j} - \underline{k}$, $\underline{b} = 2\underline{i} - 3\underline{j} + 4\underline{k}$

(vi) Compute cross product, $\underline{a} \times \underline{b}$, $\underline{b} \times \underline{a}$, if $\underline{a} = -4\underline{i} + \underline{j} - 2\underline{k}$ and $\underline{b} = 2\underline{i} + \underline{j} + \underline{k}$

(vii) Find work done, if the point at which the constant force $\underline{F} = 4\underline{i} + 3\underline{j} + 5\underline{k}$ is applied to an object moves from $P_1(3, 1, -2)$ to $P_2(2, 4, 6)$

(viii) Find an equation of circle with center at $(\sqrt{2}, -3\sqrt{3})$ and radius is $2\sqrt{2}$

(ix) Find length of tangent drawn from point $P(-5, 4)$ to the circle $5x^2 + 5y^2 - 10x + 15y - 131 = 0$

(x) Find focus and vertex of the parabola $x^2 = 4(y-1)$

(xi) Find center and eccentricity of $4y^2 + 12y - x^2 + 4x + 1 = 0$.

(xii) Define circle and just write its standard equation.

(xiii) Find equation of tangent to the circle $4x^2 + 3y^2 + 5x - 13y + 2 = 0$ at $\left(1, \frac{10}{3}\right)$.

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

5. (a) If $f(x) = \begin{cases} \dfrac{\sqrt{2x+5} - \sqrt{x+7}}{x-2}, & x \ne 2 \\ k, & x = 2 \end{cases}$, find the value of k so that f is continuous at $x = 2$ 05

(b) Differentiate ab-initio w.r.t. 'x'; $\sin\sqrt{x}$ 05

6. (a) Evaluate $\int \dfrac{\sqrt{2}}{\sin x + \cos x} dx$ 05

(b) Find the condition that lines $y = m_1x + c_1$, $y = m_2x + c_2$ and $y = m_3x + c_3$ are concurrent. 05

7. (a) Evaluate $\int_0^{\frac{\pi}{4}} \dfrac{\sin x - 1}{\cos^2 x} dx$ 05

(b) Maximize $f(x, y) = 2x + 5y$ subject to the constraints: $2y - x \le 8$, $x - y \le 4$, $x \ge 0$, $y \ge 0$ 05

8. (a) Find an equation of a circle which passes through A(–3 , 1) with radius 2 and center at $2x - 3y + 3 = 0$ 05

(b) If $\underline{a} + \underline{b} + \underline{c} = 0$ then prove that $\underline{a} \times \underline{b} = \underline{b} \times \underline{c} = \underline{c} \times \underline{a}$ 05

9. (a) If $y = a\cos(\ell nx) + b\sin(\ell nx)$ prove that $x^2 \dfrac{d^2y}{dx^2} + x\dfrac{dy}{dx} + y = 0$ 05

(b) Find the center, foci and vertices of hyperbola $9x^2 - y^2 - 36x - 6y + 18 = 0$ 05

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