FSD

Objective
Paper Code
**8198**

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. 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 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 $\vec{u}$, $\vec{v}$ and $\vec{w}$ 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 $\vec{u} = i + j$ 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 $f(x) = x^n$, $\lim_{x \to a} \frac{x^n - a^n}{x - a} =$ : | $nx^{n-1}$ | $na^{n-1}$ | 0 | $\infty$ |
| 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 $\ln(1 + x)$ at $x = 2$ is: | $\ln 3$ | $\ln 2$ | $\ln 1$ | $\ln 0$ |
| 17 | $\int \tan x \, dx =$ : | $\sec^2 x$ | $\sec x \tan x$ | $\ln \sec x$ | $\ln \cos x$ |
| 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 | $\int \frac{2}{x + 2}\,dx =$ : | $\ln\lvert x + 2 \rvert$ | $\ln\lvert x + 2 \rvert^2$ | $\frac{1}{\ln\lvert x + 2 \rvert}$ | 2 |

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**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 $\lim\limits_{\theta \to 0} \frac{1-\cos\theta}{\theta}$

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

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4. **Attempt any NINE parts:**

(i) Graph the solution set of $2x + y \leq 6$ 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 $f(x) = \begin{cases} \dfrac{\sqrt{2x+5} - \sqrt{x+7}}{x-2}, & x \neq 2 \\ k, & x = 2 \end{cases}$, 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 $\int \frac{\sqrt{2}}{\sin x + \cos x} dx$ 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 $\int_0^{\frac{\pi}{4}} \frac{\sin x - 1}{\cos^2 x} dx$ 05

(b) Maximize $f(x, y) = 2x + 5y$ subject to the constraints: $2y - x \leq 8$, $x - y \leq 4$, $x \geq 0$, $y \geq 0$ 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 $x^2\frac{d^2y}{dx^2} + x\frac{dy}{dx} + y = 0$ 05

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

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