FACULTY RECRUITMENT TEST

CATEGORY-C

Formal School Education/XI, XII

MATHEMATICS

PAPER – B

Time: 60 Minutes. ***Maximum Marks: 40***

Name: .... **Subject:**	**Marks:**	

<u>Instructions:</u>

- Attempt all questions.
- This question paper has two **Parts, I and II.** Each question of **Part I carries 2 marks** and of **Part II carries 5 marks.**
- Calculators and log tables are not permitted

PART – I

1. Let $f(x) = \begin{cases} x^3 - x^2 + 10x - 5 & , \ x \le 1 \\ -2x + \log_2\left(b^2 - 2\right) & , \ x > 1 \end{cases}$, find the set of values of b for which f(x) have greatest value at x = 1.

2. In the expansion of $(1 + x + x^2 + ... + x^{27})(1 + x + x^2 + ... + x^{14})^2$, find the coefficient of x^{28}?

3. Find the greatest & the least values of $|Z_1 + Z_2|$ if $Z_1 = 24 + 7i$ & $|Z_2| = 6$.

4. Prove that, the normal to $y^2 = 12x$ at (3, 6) meets the parabola again in (27, –18) and circle on this normal chord as diameter is $x^2 + y^2 - 30x + 12y - 27 = 0$.

5. Show that: $\begin{vmatrix} \sin\alpha & \cos\alpha & 1 \\ \sin\beta & \cos\beta & 1 \\ \sin\gamma & \cos\gamma & 1 \end{vmatrix} = \sin(\alpha - \beta) + \sin(\beta - \gamma) + \sin(\gamma - \alpha)$.

6. For all real values of a and b lines (2a + b) x + (a + 3b) y + (b – 3a) = 0 and mx + 2y + 6 = 0 are concurrent, then find the value of m.

7. Evaluate $\lim\limits_{n\to\infty}\left[\frac{1}{1+n} + \frac{1}{2+n} + \frac{1}{3+n} + ... + \frac{1}{2n}\right]$

8. Find $\int_{2}^{e}\left(\frac{1}{\ell n x}-\frac{1}{\ell n^2 x}\right)dx$

9. Find $\lim\limits_{x\to 0^+}\left(\ln\sin^3 x-\ln(x^4+ex^3)\right)$

10 A question paper on mathematics consists of twelve questions divided into three parts A, B and C, each containing four questions . In how many ways can an examinee answer five questions, selecting atleast one from each part .

PART – II

1. Examine which is greater sinx tanx or x^2. Hence evaluate $\lim\limits_{x\to 0}\left[\frac{\sin x\tan x}{x^2}\right]$, where x $\in\left(0,\frac{\pi}{2}\right)$

2. Let $f(x)$ be continuous and differentiable function for all reals. $f(x + y) = f(x) - 3xy + f(y)$. If $\lim\limits_{h\to 0}\frac{f(h)}{h} = 7$, then find the value of $f'(x)$.

3. Suppose families always have one, two or three children, with probabilities $\frac{1}{4}, \frac{1}{2}$ and $\frac{1}{4}$ respectively. Assume everyone eventually gets married and has children, find the probability of a couple having exactly four grandchildren.

4. If the solution of the differential equation $\frac{dy}{dx}+\frac{\cos x\left(3\cos y-7\sin x-3\right)}{\sin y\left(3\sin x-7\cos y+7\right)}=0$ is $(\sin x + \cos y - 1)^{\lambda} (\sin x - \cos y + 1)^{\mu} = c$, where c is arbitrary constant. Then find the value of $\lambda\mu$.

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