AZAD JAMMU AND KASHMIR
PUBLIC SERVICE COMMISSION

Examination for the Post: Assistant Professor (B-18)

Question Paper Date: 15-12-2015

Subject: Math Paper: Subjective

Time Allowed 3 hrs Hours Maximum Marks: 100/=

NOTE: Attempt any five questions. All questions carry equal marks

Q.

Q_1 a Express the vector $(2, -5, 3)$ in $\mathbb{R}^3$ as a linear combination of the vectors $(1, -3, 2)$, $(2, -4, -1)$ and $(1, -5, 7)$ (10)

b Compute Laplace transform of $\sin(7t + 4)$ (10)

Q_2

Q_2 a Show that the force (10)

$$\underline{F} = (y^2 - x^2)\underline{i} + 2xy\underline{j}$$ is Conservative

b A force $\underline{F} = -2\underline{i} + 3\underline{j} + 4\underline{K}$ is acting at a point $(5\underline{i} + 4\underline{j} + 3\underline{k})$. obtain the moment of the force about origin (10)

Q_3

Q_3 a Let X be a metric space. A subset F of X is closed iff its Complement F' is open (10)

b Find Coordinate of point $(2, 5)$ with respect to basis $\{(1, 1), (-1, 2)\}$. (10)

(12)

Q4 a For what value of p the equations

$$(5-p)x_1 + 4x_2 + 2x_3 = 0$$
$$4x_1 + (5-p)x_2 + 2x_3 = 0$$
$$2x_1 + 2x_2 + (2-p)x_3 = 0$$

have non-trivial solutions. (10)

b If $\sum_{1}^{\infty} a_n$ Converges then prove that $\lim_{n\to\infty} a_n = 0$ (10)

Q5 a Prove that

$$u(x,y) = e^x(x\cos y - y\sin y)$$

is harmonic also obtain its corresponding Conjugates (10)

b Prove that $\int_{-\infty}^{\infty} \frac{\sin x}{x^2-2x+5}\,dx = \frac{\pi}{2e^2}\sin(1)$ (10)

Q6 a Solve $\frac{d^2y}{dx^2} - 3\frac{dy}{dx} + 2y = 2x^3 - 9x^2 + 6x$ (10)

b Show that e^{2x} & xe^{2x} are linearly independent Solutions of $\frac{d^2y}{dx^2} - 5\frac{dy}{dx} + 6y = 0$ (10)

Q7 a Express the Complex number $-\sqrt{3} + i$ in the Polar form (10)

b If $A = \begin{bmatrix} -1 & 2 & 2 \\ 2 & 1 & 2 \\ 2 & 2 & 1 \end{bmatrix}$.

Show that $A^2 - 4A - 5I_3 = 0$. (10)

Q8 a Solve the first order differential equation (10)

$$x\frac{dy}{dx} + 2y = \sin x$$

b Find the period of the function $\sin 3x$ (10)