



Test Series: CSIR NET/JRF- June 2017 Exam

Physical Sciences

Test Paper: Mathematical Physics

Level: CSIR-UGC NET/JRF

Instructions:

1. Attempt all Questions.

Max Marks: 50

2. There is a negative marking of 1/4 for each wrong answer.

3. Each Question carry 5 marks.

Q.1. The value of α so that the vectors, $\vec{A} = z\hat{i} - 4\hat{j} + 5\hat{k}$, $\vec{B} = \hat{i} - \alpha\hat{j} + \hat{k}$, $\vec{C} = 3\hat{i} + 2\hat{j} - 5\hat{k}$ are coplanar is –

- a. $\frac{25}{26}$ b. $\frac{11}{25}$ c. $\frac{26}{26}$ d. $\frac{13}{25}$

Q.2. The integrating factor of differential equation $X(Y' + Y) = 1 - Y$ is

- a. xe^x b. e^x c. xe^{-x} d. x^2e^x

Q.3. The value of C_1 & C_2 such that the function $f(z) = (x^2 + C_1y^2 - 2xy) + i(C_2x^2 - y^2 + 2xy)$ is analytic –

- a. $C_1 = -1$ & $C_2 = 2$ b. $C_1 = -1$ & $C_2 = 1$ c. $C_1 = C_2 = 1$ d. $C_1 = C_2 = -1$

Q.4. The value of integral $\oint_C \frac{z}{z^2 - 3z + 2}$

Where C is the circle $|Z - 2| = \frac{1}{2}$ is

- a. $4\pi i$ b. $2\pi i$ c. $-4\pi i$ d. $-2\pi i$





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Q.5. The Legendre's equation is given by

$$(1-X^2)P_l''(X) - 2XP_l'(X) + l(l+1)P_l(X) = 0$$

The value of $P_l'(1)$ is given by

- a. $\frac{l+1}{2}$ b. $\frac{2(l+1)}{2}$ c. $l(l+1)$ d. $\frac{l}{2}$

Q.6. A matrix A is defined as

$$A = \begin{bmatrix} 1 & 2 & -3 \\ 0 & 3 & +2 \\ 0 & 0 & -2 \end{bmatrix}. \text{ The Eigenvalues of } 3A^3 + 5A^2 - 6A + 2I \text{ are -}$$

- a. 4,120,10 b. 2,110,10 c. 8,120,10 d. 4,110,10

Q.7. The Laplace transform of

$$f(t) = \frac{e^{-4t}\sin 3t}{t} \text{ is given by } F(s) \text{ which is}$$

- a. $\sin^{-1} \frac{s+3}{s+4}$ b. $\cot^{-1} \frac{s+3}{2}$ c. $\tan^{-1} \frac{4}{s+3}$ d. $\tan^{-1} \frac{3}{s+4}$

Q.8. Find the Fourier Series to represent the function

$$f(x) = -K, -\pi < x < 0$$

$+K, 0 < x < \pi,$ and then show that the value of resulting series $(1 - \frac{1}{3} + \frac{1}{5} - \frac{1}{7} + \dots)$ is

- a. $\frac{\pi}{6}$ b. $\frac{\pi}{4}$ c. $\frac{\pi}{3}$ d. $\frac{\pi}{2}$

Q.9. The following table give values of $f(x)$ as a function of x -

| X | f(x) |
|------|------|
| 0.00 | 1.00 |
| 0.25 | 1.22 |



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| | |
|------|------|
| 0.50 | 1.41 |
| 0.75 | 1.58 |
| 1.00 | 1.73 |

The value of $\int_0^1 f(x)dx$ using Trapezium rule is

- a. 1.39 b. 1.47 c. 1.93 d. 1.25

Q.10. Two balls are picked up randomly from one of two boxes called A & B. The probability of picking the box A = $\frac{1}{3}$. The box A contains 2 white, 3 red & 4 green balls. The box B contains 3 white, 2 red and 5 green balls. The probability of picking 1 white and 1 red ball is

- a. 0.72 b. 0.55 c. 0.60 d. 0.67



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