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27323(New)

B.Sc. III Semester Degree Examination, March/April - 2021

MATHEMATICS-III

Paper : 3

(New)

Time : 3 Hours **Maximum Marks : 80**

Instructions to Candidates:

1) **PART - A** All questions are compulsory.
2) **PART - B** Solve any **Five** questions from **Seven** questions.
3) Write the question number correctly.

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PART - A

I. Answer the following questions. **(10×2=20)**

1) Define Infimum and Suprimum of the sequence.
2) State P - Series.
3) State Raabe's Test.
4) Discuss the convergence of the series $\frac{1}{1.2.3}+\frac{3}{2.3.4}+\frac{5}{3.4.5}+\ldots\ldots$.
5) Test the convergence of $\sum\frac{1}{\sqrt{n}}\tan\frac{1}{n}$.
6) Find the angle between the radius vector and the tangent for the curve $r=a(1-\cos\theta)$.
7) For the curve $r=a\theta$ show that $p=\frac{r^2}{\sqrt{r^2+a^2}}$.
8) Find the ratio of the Polar subnormal to the polar subtangent for the curve $r=ae^{b\theta^2}$.

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9) Evaluate $\int_0^{\frac{\pi}{4}} \tan^n x dx$.

10) Evaluate $\int_0^{\frac{\pi}{2}} \sin^3 x \cos^4 x dx$.

PART - B

Answer any **Five** complete questions. **(5×12=60)**

II. 11) State and prove De - Alembert's ratio test.

12) Examine the convergence of the series $1+\frac{1}{2}+\frac{1.3}{2.4}+\frac{1.3.5}{2.4.6}+\ldots\ldots$ by Raabes test.

III. 13) State Cauchy's root test and hence test the convergence of the series $\sum\left(\frac{nx}{n+1}\right)^n$

14) Sum the series by C+ is method $\cos\alpha+\cos(\alpha+2\beta)+\ldots\ldots+$ to n term.

IV. 15) Show that the following pair of curves intersect orthogonally $r=a\theta, r=\frac{a}{\theta}$.

16) For the curve cardiod $r=a(1+\cos\theta)$ Show that $2ap^2=r^3$.

V. 17) Derive the length of the perpendicular from the pole to the tangent at a point to the curve.

18) (i) Find the pedal equation of the curve $r=ae^{\theta\cot\alpha}$

(ii) Find the angle between the radius vector and the tangent for the curve $r^2=a^2\cos 2\theta$ at $\theta=\frac{\pi}{6}$

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VI. 19) Show that the curve $r^2 = a^2 \sec 2\theta$ the length of the perpendicular from the pole to the tangent $a\sqrt{\cos 2\theta}$.

20) Show that the angle between the normal at any point (r,θ) on the curve $r^n = a^n \cos n\theta$, and the initial line is $(n+1)\theta$.

VII. 21) Find the reduction formula for $\int \sec^n x dx$.

22) Evaluate (i) $\int_0^1 x^{1/2}\sqrt{(1-x)^3}\,dx$

(ii) $\int_0^\infty \frac{x}{(4+x^2)^{3/2}}\,dx$

VIII.23) Evaluate (i) $\int_0^\pi x \sin^7 x \cos^2 x dx$

(ii) $\int_0^{\pi/4} \tan^4 x\,dx = \frac{3\pi - 8}{12}$

24) Compute the definite integral $\int_0^1 \frac{x^\alpha - 1}{\log x}dx$, where '$\alpha$' is a parameter using Leibnitz's rule of differentiation under integral sign.

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