

Q.P. Code – 50722

Second Year B.Sc. Degree Examination

OCTOBER/NOVEMBER 2014

(Directorate of Distance Education)

(DSB 230) Paper II – MATHEMATICS

Time : 3 Hours]

[Max. Marks : 90

Instructions to Candidates :

*Answer any **SIX** full questions of the following choosing atleast **ONE** from each Part.*

PART – A

1. (a) (i) Find the order and degree of differential equation
$$\frac{d^3 y}{dx^3} + \frac{d^2 y}{dx^2} + \left(\frac{dy}{dx}\right)^4 = e^{4x}. \quad \mathbf{2}$$

(ii) Solve $\frac{d^2 y}{dx^2} - 4 \frac{dy}{dx} + 3y = 0$. $\mathbf{2}$
- (b) Solve $\frac{dy}{dx} = \frac{6x - 2y - 7}{3x - y + 4}$. $\mathbf{5}$
- (c) Solve $y(2x - y + 1)dx + x(3x - 4y + 3)dy = 0$. $\mathbf{6}$
2. (a) (i) Solve $P^2 - 3P + 2 = 0$. $\mathbf{2}$
(ii) Find the general and singular solution of $y = xP + P^2$. $\mathbf{2}$
- (b) Solve $16x^2 + 2P^2y - P^3x = 0$. $\mathbf{5}$
- (c) Find orthogonal trajectories of the family $\frac{x^2}{a^2} + \frac{y^2}{b^2 + \lambda} = 1$, where ' λ ' is being a parameter. $\mathbf{6}$

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PART – B

3. (a) (i) Solve $(D^2 + 9)y = \cos 3x$, where $D = \frac{d}{dx}$. **2**
- (ii) Solve $(4D^3 + 4D^2 + D)y = 0$, where $D = \frac{d}{dx}$. **2**
- (b) Solve $(D^4 - 18D^2 + 81)y = 36e^{3x}$, where $D = \frac{d}{dx}$. **5**
- (c) Solve $(D^2 - 4D + 3)y = 2xe^{3x}$, where $D = \frac{d}{dx}$. **6**
4. (a) (i) Evaluate $\lim_{x \rightarrow 0} \frac{x \cdot \sin x}{x^3}$. **2**
- (ii) Evaluate $\lim_{x \rightarrow 0} (\operatorname{cosec} x - \cot x)$. **2**
- (b) State and prove Cauchy's mean value theorem. **5**
- (c) Expand $\log(\sec x)$ upto the term containing x^6 using Maclaurin's series. **6**

PART – C

5. (a) (i) Show that in a group G , $(a^{-1})^{-1} = a$. **2**
- (ii) Find the distinct generators of the cyclic group of order 15. **2**
- (b) Prove that every subgroup of a cyclic group is cyclic. **5**
- (c) State and prove Fermat's theorem. **6**
6. (a) (i) Solve $x - 6 < 2x - 5 \leq x - 3$. **2**
- (ii) For any two real numbers x and y show that $|x - y| \geq |x| - |y|$. **2**
- (b) Find the order of the permutation and find whether they are odd or even.
 $\phi = \begin{pmatrix} 1 & 2 & 3 & 4 & 5 & 6 & 7 & 8 & 9 \\ 4 & 5 & 1 & 7 & 2 & 8 & 3 & 9 & 6 \end{pmatrix}$. **5**
- (c) Find the envelopes of family of lines $x \cdot \cos^3 \alpha + y \cdot \sin^3 \alpha = a$, where ' α ' is a parameter. **6**

Q.P. Code – 50722**PART – D**

7. (a) (i) Find whether the sequence $\left\{\frac{n}{n+1}\right\}$ is bounded or not. **2**
- (ii) Examine the nature of the sequence $\left\{\left(\frac{n}{n+1}\right)^n\right\}$. **2**
- (b) If the sequence $\{x_n\}$ converges to l and $\{y_n\}$ converges to m then show that $\left\{\frac{x_n}{y_n}\right\}$ converges to $\frac{l}{m}$. **5**
- (c) Prove that every convergent sequence is bounded. **6**
8. (a) (i) Show that $\sum \frac{1}{(\log n)^n}$ series is convergent. **2**
- (ii) Verify whether series $1^2 + 2^2 + 3^2 + 4^2 + \dots$ converges or not. **2**
- (b) State and prove D'Alembert's Ratio test. **5**
- (c) Find sum to infinity of the series
- $$1 + \frac{1+3}{2!} + \frac{1+3+3^2}{3!} + \dots$$
- 6**
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