

University Institute of Engineering & Technology
(Recognised Under Section 2(f) and 12B of UGC)
Kurukshetra University, Kurukshetra

TIME – 3 Hrs 15 Min

THEORY EXAMINATION – FEB 2021	
B.TECH -CSE	SEMESTER - III

M.M. - 56

PAPER - BS-205

SUBJECT- Mathematics-III

INSTRUCTIONS TO BE FOLLOWED

- Allotted time for examination is 3 hours 15 minutes that includes time for downloading the question paper, writing answers, scanning of answer sheets and E-mailing the PDF files to the designated Email ID.
- For CSE-A Regular Students, the Email ID is:- btech3rdcsea@kuk.ac.in
- For CSE-B Regular and All Reappear Students, the Email ID is:- btech3rdcseb@kuk.ac.in
- The candidates will be required to attempt 75% of the question paper (maximum) by choosing to their any best questions accumulating 56 marks.
- The PDF files should be saved as Roll No. and Subject Code. Proper attention should be given while sending the email and in the subject line, the Roll Number and Subject Code should be mentioned.
- Maximum Page Limit should be 20 (Twenty) for attempting the question paper on A4 sheets which could be downloaded and printed from the sample sheets given in the Kurukshetra University Examination guidelines.
- Over-attemptation should be avoided.
- Handwriting should be neat and clean and diagrams should be clear and contrasted.
- The candidate should not write their Mobile No. otherwise Unfair Means Case will be made.
- While attempting the paper, the candidate will use blue/black pen only.
- Before attempting the paper, the candidate will ensure that he/she has downloaded the correct question paper. No complaint for attempting wrong question paper by the candidate will be entertained.
- Candidate must ensure that he/she has put his/her signature on each page of the answer sheet used by him/her. Answer sheet without the signature of the candidate will not be evaluated.

PART A

Q.No.1 Answer the following questions

- (i) State D'Alembert's ratio test for Convergence of infinite series. 2

- (ii) Find the directional derivative of $f(x, y, z) = xy^3 + yz^3$ at the point $(2, -1, 1)$ in the direction of vector $I + 2J + 2K$. 2

- (iii) Evaluate $\int_0^1 \int_0^1 x(x^2 + y^2) dx dy$ 2

- (iv) Solve $(x^2 - ay)dx - (ax - y^2)dy = 0$ 2

- (v) Find the general solution of the equation $p = \sin(y - xp)$ 2

- (VI) Evaluate $divF$ at the point $(1, 2, 3)$ given $F = 3x^2I + 5xy^2J + 5xyz^3K$ 2

- (VII) Discuss the boundedness of the sequence $\left\langle \frac{2n + 3}{3n + 4} \right\rangle$ 2

- (VIII) Find the particular integral (P.I.) of $(D^2 + 5D + 6)y = e^x$ 1

Part B(4×5=20 Marks)

Q. No.2 Using Cauchy's second theorem on limits, prove that

$$\lim_{n \rightarrow \infty} \left[\left(\frac{2}{1}\right)^1 \left(\frac{3}{2}\right)^2 \left(\frac{4}{3}\right)^3 \dots \left(\frac{n+1}{n}\right)^n \right]^{\frac{1}{n}} = e$$

Q.No. 3 Solve $(x + 1) \frac{dy}{dx} - y = e^{3x} (x + 1)^2$

Q.No. 4 Evaluate the integral $\int_0^a \int_0^x \int_0^{x+y} e^{x+y+z} dz dy dx$.

Q. No. 5 If $u = x + y + z$, $v = x^2 + y^2 + z^2$, $w = yz + zx + xy$, prove that $grad u$, $grad v$ and $grad w$ are coplanar.

Part C(4×10=40 Marks)

Unit-I

Q. No. 6 Test for Convergence of the series $1 + \frac{2^p}{\angle 2} + \frac{3^p}{\angle 3} + \frac{4^p}{\angle 2} + \dots \dots \dots \infty$

Q. No. 7 Find the Fourier series to represent x^2 in the interval $(-a, a)$.

Unit II

Q. No. 8 Solve $(1 + xy) y dx + (1 - xy) x dy = 0$

Q. No. 9 Solve $\frac{d^2 y}{dx^2} - 3 \frac{dy}{dx} + 2y = e^{3x} + \sin 2x$

Unit-III

Q. No. 10 Change the order of integration $\int_0^{4a} \int_{\frac{x^2}{4a}}^{2\sqrt{ax}} dy dx$ and hence evaluate.

Q. No. 11 Evaluate $\int_0^\infty \int_0^\infty e^{-(x^2+y^2)} dx dy$ by changing to polar coordinates. Hence show that

$$\int_0^\infty e^{-x^2} dx = \sqrt{\frac{\pi}{2}}.$$

Unit-IV

Q. No. 12 Show that $\nabla^2(r^n) = n(n+1)r^{n-2}$

Q. No. 13 Verify Green's theorem for $\int_C [(xy + y^2)dx + x^2 dy]$, where C is bounded by $y = x$ and $y = x^2$.