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Total No. of Questions : 18

Total No. of Pages : 03

B.Tech. (Electrical Engg./ECE) (2018 & Onwards) (Sem.–2)

MATHEMATICS-II

Subject Code : BTAM-202-18

M.Code : 76255

Time : 3 Hrs.

Max. Marks : 60

INSTRUCTIONS TO CANDIDATES :

1. SECTION-A is COMPULSORY consisting of TEN questions carrying TWO marks each.
2. SECTION - B & C have FOUR questions each.
3. Attempt any FIVE questions from SECTION B & C carrying EIGHT marks each.
4. Select atleast TWO questions from SECTION - B & C.

SECTION-A

Answer briefly :

1) Is this differential equation $x^2\left(\frac{d^2y}{dx^2}\right)^3 + y\left(\frac{dy}{dx}\right)^4 + y^4 = 0$ linear?

2) Is this differential equation $(e^y + 1)\cos x\,dx + e^y \sin x dy = 0$ exact?

3) Write the solution of the Clairaut's equation $y = px + \cos^{-1}(p + 1)$.

4) Find complete solution of $\frac{\partial^2 z}{\partial x^2} - 4\frac{\partial^2 z}{\partial x \partial y} + 4\frac{\partial^2 z}{\partial y^2} = 0$.

5) Find particular integral of $\frac{\partial^2 z}{\partial x^2} - 7\frac{\partial^2 z}{\partial x \partial y} + 12\frac{\partial^2 z}{\partial y^2} = e^{x-y}$.

6) Give geometric interpretation of Newton Raphson method.

7) Give the Gauss's forward interpolation formula.

8) Write the formula for Simpson's $\frac{3}{8}$ rule.

9) Give the Adam's predictor corrector formula.

10) Write the one dimensional heat equation.

SECTION-B

11) Solve :

a) $\frac{dy}{dx} = \frac{2xy\cos x^2 - 2xy + 1}{x^2 - \sin x^2 - 3}$.

b) $\tan y \frac{dy}{dx} + \tan x = \cos y \cos^2 x$.

12) a) Solve $(x^2D^2 - 2xD - 4)\, y = x^4$.

b) Solve using method of variation of parameters $\frac{d^2y}{dx^2} - 6\frac{dy}{dx} + 9y = \frac{e^{3x}}{x^2}$.

13) Solve a) $yzp + zxq = xy$.

b) $\frac{\partial^2 z}{\partial x^2} + \frac{\partial^2 z}{\partial x \partial y} - 6\frac{\partial^2 z}{\partial y^2} = \cos(3x + y)$.

14) a) Solve the PDE $(D + D' - 1)(D + 2D' - 3)\, z = 4 + 3x + 6y$.

b) Using method of separation of variables, solve $3\frac{\partial u}{\partial x} + 2\frac{\partial u}{\partial y} = 0$ with $u(x, 0) = 4e^{-x}$.

SECTION-C

15) a) Find a root of $\cos x = xe^x$ using regula falsi method correct upto three decimal places.

b) Using interpolation, find missing values in the following table :

x	45	50	55	60	65
y	3.0	-	2.0	-	-2.4

16) a) Estimate $f(38)$, using Gauss backward difference formula :

x	20	25	30	35	40	45
$f(x)$	354	332	291	260	231	204

b) Estimate $\int_0^2 e^x dx$, using Trapezoidal rule by taking 10 intervals.

17) a) Use Taylor's series method to find the value of y at $x = 0.2$ upto 3 decimals, where $y(0) = 0$, $\frac{dy}{dx} = 1 - 2xy$.

b) Use Runge-Kutta method of order 4 to find the value of y at $x = 0.1$ upto 3 decimals, where $y(0) = 1$, $\frac{dy}{dx} = x + y$.

18) Using Crank-Nicholson method, solve the PDE $2\frac{\partial^2 f}{\partial x^2} = \frac{\partial f}{\partial t}$; $0 < t < 1.5$, $0 < x < 4$ subject to conditions $f(x, 0) = 50(4 - x)$, $f(0, t) = 0$, $f(4, t) = 0$.

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B.Tech. (Aeronautical Engg./Aerospace Engg./ Automation & Robotics/Automobile Engg./BT/CE/CSE/Electrical & Electronics Engg./EE/ECE/Electronics & Electrical Engg./IT/ICE/Marine Engg./Mechanical Engg./Petroleum Refinary Engg./Textile Engg.) (2012 to 2017) (Sem.–2)

ENGINEERING MATHEMATICS – II

Subject Code : BTAM-102

M.Code : 54092

Time : 2 Hrs. **Max. Marks : 30**

INSTRUCTIONS TO CANDIDATES :

1. **Attempt any FIVE question(s), each question carries 6 marks.**

1. Sum the series $e^{\alpha} \cos\beta - \frac{e^{3\alpha}}{3}\cos 2\beta + \frac{e^{5\alpha}}{5}\cos 5\beta - \ldots\ldots \infty$

2. Verify Cayley's Hamilton theorem for the matrix $A = \begin{bmatrix} 1 & 3 & 7 \\ 4 & 2 & 3 \\ 1 & 2 & 1 \end{bmatrix}$ and hence obtain the inverse of the given matrix.

3. Test the convergence of the following series :

$$1 + \frac{2}{2!}x + \frac{3^2}{3!}x^2 + \frac{4^3}{4!}x^3 + \ldots\ldots$$

4. a) Prove $Log_i^i = \frac{4m+1}{4n+1}$ where m, n are integers.

   b) Discuss the convergence of $\sum ne^{-n^2}$.

5. Solve $(2x^2y - 3y^4)\,dx + (3x^3 + 2xy^3)\,dy = 0$

6. a) Solve : $(1 + y^2)\,dx = (\tan^{-1} y - x)\,dy$

   b) Solve $y'' - 6y' + 9y = \frac{e^{3x}}{x^2}$ by variation of parameter method

7. Solve $x^2\frac{d^2y}{dx^2} - 3x\frac{dy}{dx} + y = \log x\frac{\sin(\log x) + 1}{x}$.

8. A constant electromotive force E volts is applied to a circuit containing a constant resistance R ohms in series and a constant inductance L henries. If the initial current is zero, show that the current builds up to half its theoretical maximum in (Llog2)/R seconds.

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B.Tech. (CSE/IT) (2018 & Onwards) (Sem.–2)

MATHEMATICS-II

Subject Code : BTAM-204-18

M.Code : 76257

Time : 3 Hrs.

Max. Marks : 60

INSTRUCTIONS TO CANDIDATES :

1. **SECTION-A is COMPULSORY consisting of TEN questions carrying TWO marks each.**
2. **SECTION - B & C have FOUR questions each.**
3. **Attempt any FIVE questions from SECTION B & C carrying EIGHT marks each.**
4. **Select atleast TWO questions from SECTION - B & C.**

SECTION-A

Answer the following :

1. Give any four characteristics for an ideal measure of dispersion.

2. Define skewness.

3. A bag contains 3 red, 6 white and 7 blue balls. What is the probability that two balls drawn are white and blue?

4. Give the formula of mean and standard deviation for Binomial distribution.

5. Write any four properties of normal distribution.

6. Find the coefficient of correlation of two uncorrelated variables x and y.

7. Write the normal equations for the curve $x = b + cy$.

8. Define sampling error and confidence interval.

9. Define Type-I error.

10. Define degrees of freedom.

SECTION-B

11. a) Calculate standard deviation from the table giving age distribution of 542 members :

Age group	20-30	30-40	40-50	50-60	60-70	70-80	80-90
No. of members	3	61	132	153	140	51	2

b) The first four moments of a distribution about the value 4 of the distribution are –1.5, 17, –30 and 108. Find the moments about mean.

12. a) Estimate $E(X)$ and $E(X)^2$ from the following probability distribution :

X	–3	6	9
P(X)	1/6	1/2	1/3

b) A can hit a target 3 times in 5 shots, B 2 times in 5 shots and C 3 times in 4 shots. All of them fire one shot each simultaneously at the target. What is the probability that (i) 2 shots hit (ii) at least 2 shots hit?

13. a) During war 1 ship out of 9 was sunk on an average in making a certain voyage. What was the probability that (i) exactly 3 out of a convoy of 6 ships would arrive safely (ii) a minimum of 7 ships would arrive safely.

b) A car hire firm has two cars which it fires out day by day. The number of demands for a car on each day is distributed as Poisson variate with mean 1.5. Calculate the proportion of days on which (i) neither car is used, and (ii) some demand is refused.

14. a) If X is normally distributed and the mean of X is 2 and standard deviation is 4. Find out the probability of the following :

(i) $X \geq 20$ (ii) $0 \leq X \leq 12$.

b) Calculate the coefficient of correlation for the following height (in inches) of fathers (X) and their sons (Y) :

X	65	66	67	67	68	69	70	72
Y	67	68	65	68	72	72	69	71

SECTION-C

15. The diameter of an electric cable, say X, is assumed to be a continuous random variable with probability density function $f(x) = 6x\,(1-x)$, $0 \le x \le 1$,

    i) Check that above is p.d.f., (ii) Determine a number b such that P $\{X < b\} = P\,\{X > b\}$.

16. Fit a parabola of second degree to the data :

X	0	1	2	3	4
Y	1	1.8	1.3	2.5	6.3

17. a) If 60 new entrants in a given university are found to have a mean height of 68.60 inches, and 50 seniors a mean height of 69.51 inches, is the evidence, conclusive that the mean height of the seniors is greater than that of the new entrants? Assume the standard deviation of height to be 2.48 inches.

    b) A dice is thrown 9000 times and a throw of 3 or 4 is observed 3240 times. Show that the dice cannot be regarded as an unbiased.

18. a) In an experiment on the immunization of goats from anthrax the following results were obtained. Derive your inference on the efficiency of the vaccine.

	Died of anthrax	**Survived**	**Total**
Vaccinated	2	10	12
Not vaccinated	6	6	12

    (Take $\chi^2_{0.05}$ for 1 degree of freedom = 3.841)

    b) The means of two single large samples of 1000 and 2000 members are 67.5 inches and 68.0 inches respectively. Can be samples be regarded as drawn from the same population of standard deviation 2.5 inches? (Test at 5% level of significance).

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