VTU B.E/B.TECH QUESTION PAPER SET

CBCS
SEMESTER IV

ADDITIONAL MATHEMATICS- II

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CBCS Scheme

USN

15MATDIP41

Fourth Semester B.E. Degree Examination, June/July 2017
Additional Mathematics – II

Time: 3 hrs. Max. Marks: 80

Note: *Answer any FIVE full questions, choosing ONE full question from each module.*

Module-1

1 a. Find the rank of the matrix :
$$\begin{bmatrix} 1 & 2 & 3 & 2 \\ 2 & 3 & 5 & 1 \\ 1 & 3 & 4 & 5 \end{bmatrix}$$ by elementary row transformations. **(06 Marks)**

b. Solve the following system of equations by Gauss elimination method :
$2x + y + 4z = 12$
$4x + 11y - z = 33$
$8x - 3y + 2z = 20$. **(05 Marks)**

c. Find all the eigen values and eigen vector corresponding to largest eigen value of the matrix :
$$\begin{bmatrix} 1 & 1 & 3 \\ 1 & 5 & 1 \\ 3 & 1 & 1 \end{bmatrix}.$$ **(05 Marks)**

OR

2 a. Solve the following system of equations by Gauss elimination method :
$x + y + z = 9$
$2x + y - z = 0$
$2x + 5y + 7z = 52$. **(06 Marks)**

b. Reduce the matrix $\begin{bmatrix} 1 & 2 & 3 \\ 1 & 4 & 2 \\ 2 & 6 & 5 \end{bmatrix}$ into its echelon form and hence find its rank. **(05 Marks)**

c. Find the inverse of the matrix $A = \begin{bmatrix} 1 & 4 \\ 2 & 3 \end{bmatrix}$ using Cayley – Hamilton theorem. **(05 Marks)**

Module-2

3 a. Solve $(D^2 - 4D + 13)y = \cos 2x$ by the method of undetermined coefficients. **(06 Marks)**

b. Solve $(D^2 + 2D + 1)y = x^2 + 2x$. **(05 Marks)**

c. Solve $(D^2 - 6D + 25)y = \sin x$. **(05 Marks)**

OR

4 a. Solve $(D^2 + 1)y = \tan x$ by the method of variation of parameters. **(06 Marks)**

b. Solve $(D^3 + 8)y = x^4 + 2x + 1$. **(05 Marks)**

c. Solve $(D^2 + 2D + 5)y = e^{-x} \cos 2x$. **(05 Marks)**

Module-3

5 a. Find the Laplace transforms of :
i) $e^{-t}\cos^2 3t$ ii) $\frac{\cos 2t - \cos 3t}{t}$. **(06 Marks)**

b. Find:
i) $L\left[t^{-5/2} + t^{5/2}\right]$ ii) $L[\sin 5t \cdot \cos 2t]$. **(05 Marks)**

c. Find the Laplace transform of the function : $f(t) = E\sin\left(\frac{\pi t}{\omega}\right)$, $0 < t < \omega$, given that $f(t+\omega) = f(t)$. **(05 Marks)**

OR

6 a. Find :
i) $L[t^2 \sin t]$ ii) $L\left[\frac{\sin 2t}{t}\right]$. **(06 Marks)**

b. Evaluate : $\int_0^\infty \frac{\cos 6t - \cos 4t}{t}\,dt$ using Laplace transform. **(05 Marks)**

c. Express $f(t) = \begin{cases} \sin 2t, & 0 < t < \pi \\ 0, & t > \pi \end{cases}$, in terms of unit step function and hence find $L[f(t)]$. **(05 Marks)**

Module-4

7 a. Solve the initial value problem $\frac{d^2y}{dx^2} + \frac{5dy}{dx} + 6y = 5e^{2x}$, $y(0) = 2$, $y'(0) = 1$ using Laplace transforms. **(06 Marks)**

b. Find the inverse Laplace transforms : i) $\frac{3(s^2-1)^2}{2s^2}$ ii) $\frac{s+1}{s^2+6s+9}$. **(05 Marks)**

c. Find the inverse Laplace transform : $\log\left[\frac{s^2+4}{s(s+4)(s-4)}\right]$. **(05 Marks)**

OR

8 a. Solve the initial value problem :
$\frac{d^2y}{dt^2} + \frac{4dy}{dt} + 3y = e^{-t}$ with $y(0) = 1 = y'(0)$ using Laplace transforms. **(06 Marks)**

b. Find the inverse Laplace transform : i) $\frac{1}{s\sqrt{5}} + \frac{3}{s^2\sqrt{5}} - \frac{8}{\sqrt{5}}$ ii) $\frac{3s+1}{(s-1)(s^2+1)}$. **(05 Marks)**

c. Find the inverse Laplace transform : $\frac{2s-1}{s^2+4s+29}$. **(05 Marks)**

Module-5

9 a. State and prove Baye's theorem. **(06 Marks)**

b. A can hit a target 3 times in 5 shots, B 2 times in 5 shots and C 3 times in 4 shots. They fire a volley. What is the probability that i) two shots hit ii) atleast two shots hit? **(05 Marks)**

c. Find P(A), P(B) and $P(A \cap \overline{B})$, if A and B are events with $P(A \cup B) = \frac{7}{8}$, $P(A \cap B) = \frac{1}{4}$ and $P(\overline{A}) = \frac{5}{8}$. **(05 Marks)**

OR

10 a. Prove that $P(A \cup B) = P(A) + (B) - P(A \cap B)$, for any two events A and B. **(06 Marks)**

b. Show that the events $\overline{A}$ and $\overline{B}$ are independent, if A and B are independent events. **(05 Marks)**

c. Three machines A, B and C produce respectively 60%, 30%, 10% of the total number of items of a factory. The percentage of defective output of these machines are respectively 2%, 3% and 4%. An item is selected at random and is found defective. Find the probability that the item was produced by machine C. **(05 Marks)**

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CBCS Scheme

USN | | | | | | | | | |

15MATDIP41

Fourth Semester B.E. Degree Examination, Dec.2017/Jan.2018
Additional Mathematics – II

Time: 3 hrs. Max. Marks: 80

Note: Answer any FIVE full questions, choosing one full question from each module.

Module-1

1 a. Find the rank of the matrix $A=\begin{bmatrix} 2 & 3 & -1 & -1 \\ 1 & -1 & -2 & -4 \\ 3 & 1 & 3 & -2 \\ 6 & 3 & 0 & -7 \end{bmatrix}$ by applying elimentary row transformations. **(06 Marks)**

b. Solve the following system of equations by Gauss-elimination method: $x+y+z=9$, $x-2y+3z=8$ and $2x+y-z=3$. **(05 Marks)**

c. Find the inverse of the matrix $\begin{bmatrix} 5 & -2 \\ 3 & 1 \end{bmatrix}$ using Cayley-Hamilton theorem. **(05 Marks)**

OR

2 a. Find the rank of the matrix $\begin{bmatrix} 1 & 3 & -1 & 2 \\ 0 & 11 & -5 & 3 \\ 2 & -5 & 3 & 1 \\ 4 & 1 & 1 & 5 \end{bmatrix}$ by reducing it to echelon form. **(06 Marks)**

b. Solve the following system of equations by Gauss-elimination method: $x+y+z=9$, $2x-3y+4z=13$ and $3x+4y+5z=40$. **(05 Marks)**

c. Find the eigen values of $A=\begin{bmatrix} 8 & -6 & 2 \\ -6 & 7 & -4 \\ 2 & -4 & 3 \end{bmatrix}$. **(05 Marks)**

Module-2

3 a. Solve $(D^4-2D^3+5D^2-8D+4)y=0$. **(05 Marks)**

b. Solve $\frac{d^2y}{dx^2}-4y=\cosh(2x-1)+3^x$. **(05 Marks)**

c. Solve by the method of variation of parameters $y''+a^2y=\sec ax$. **(06 Marks)**

OR

4 a. Solve $\frac{d^3y}{dx^3}-3\frac{d^2y}{dx^2}+4\frac{dy}{dx}-2y=e^x$. **(05 Marks)**

b. Solve $(D^2+5D+6)y=\sin x$. **(05 Marks)**

c. Solve by the method of undetermined coefficients $y''+2y'+y=x^2+2x$ **(06 Marks)**

Module-3

5 a. Find the Laplace transform of $\cos t.\cos 2t.\cos 3t$. **(06 Marks)**

b. Find the Laplace transform $f(t)=\frac{Kt}{T}$, $0<t<\pi$, $f(t+T)=f(t)$. **(05 Marks)**

c. Express $f(t)=\begin{cases}\cos t, & 0<t<\pi\\ \sin t, & t>\pi\end{cases}$ in terms of unit step function, and hence find $L[f(t)]$. **(05 Marks)**

OR

6 a. Find the Laplace transform of (i) $t\cos at$, (ii) $\dfrac{1-e^{-at}}{t}$. **(06 Marks)**

b. Find the Laplace transform of a periodic function a period 2a, given that $f(t)=\begin{cases}t, & 0\le t<a\\ 2a-t, & a\le t<2a\end{cases}$ $f(t+2a)=f(t)$. **(05 Marks)**

c. Express $f(t)=\begin{cases}1, & 0<t<1\\ t, & 1<t\le 2\\ t^2, & t>2\end{cases}$ in terms of unit step function and hence find its Laplace transform. **(05 Marks)**

Module-4

7 a. Find the inverse Laplace transform of (i) $\dfrac{(s+2)^3}{s^6}$, (ii) $\dfrac{s+5}{s^2-6s+13}$. **(06 Marks)**

b. Find inverse Laplace transform of $\log\left[\dfrac{s^2+4}{s(s+4)(s-4)}\right]$. **(05 Marks)**

c. Solve by using Laplace transforms $\dfrac{d^2y}{dt^2}+k^2y=0$, given that $y(0)=2$, $y'(0)=0$. **(05 Marks)**

OR

8 a. Find the inverse Laplace transform of $\dfrac{4s+5}{(s+1)^2(s+2)}$. **(06 Marks)**

b. Find the inverse Laplace transform of $\cot^{-1}\left(\dfrac{s+a}{b}\right)$. **(05 Marks)**

c. Using Laplace transforms solve the differential equation $y''+4y'+3y=e^{-t}$ with $y(0)=1$, $y'(0)=1$. **(05 Marks)**

Module-5

9 a. If A and B are any two events of S, which are not mutually exclusive then $P(A\cup B)=P(A)+P(B)-P(A\cap B)$. **(05 Marks)**

b. The probability that 3 students A, B, C, solve a problem are ½, ⅓, ¼ respectively. If the problem is simultaneously assigned to all of them, what is the probability that the problem is solved? **(05 Marks)**

c. In a class 70% are boys and 30% are girls. 5% of boys, 3% of girls are irregular to the classes. What is the probability of a student selected at random is irregular to the classes and what is the probability that the irregular student is a girl? **(06 Marks)**

OR

10 a. If A and B are independent events then prove that $\overline{A}$ and $\overline{B}$ are also independent events. **(05 Marks)**

b. State and prove Baye's theorem. **(05 Marks)**

c. A Shooter can hit a target in 3 out of 4 shots and another shooter can hit the target in 2 out of 3 shoots. Find the probability that the target is being hit:
(i) when both of them try (ii) by only one shooter. **(06 Marks)**

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CBCS Scheme

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15MATDIP41

Fourth Semester B.E. Degree Examination, June/July 2018
Additional Mathematics – II

Time: 3 hrs. Max. Marks: 80

Note: ***Answer any FIVE full questions, choosing one full question from each module.***

Module-1

1 a. Find the rank of the matrix $\begin{bmatrix} 5 & 3 & 14 & 4 \\ 0 & 1 & 2 & 1 \\ 1 & -1 & 2 & 0 \end{bmatrix}$ by reducing to echelon form. **(06 Marks)**

b. Use Cayley-Hamilton theorem to find the inverse of the matrix $\begin{bmatrix} 1 & 4 \\ 2 & 3 \end{bmatrix}$. **(05 Marks)**

c. Apply Gauss elimination method to solve the equations $x+4y-z=-5$, $x+y-6z=-12$; $3x-y-z=4$ **(05 Marks)**

OR

2 a. Find all the eigen values and eigen vector corresponding to the largest eigen value of $\begin{bmatrix} 1 & 0 & -1 \\ 1 & 2 & 1 \\ 2 & 2 & 3 \end{bmatrix}$. **(06 Marks)**

b. Find the rank of the matrix by elementary row transformations $\begin{bmatrix} 1 & 1 & 1 \\ 2 & 2 & 2 \\ 3 & 3 & 3 \end{bmatrix}$. **(05 Marks)**

c. Solve the system of linear equations $x+y+z=6$; $2x-3y+4z=8$; $x-y+2z=5$ by Gauss elimination method. **(05 Marks)**

Module-2

3 a. Solve $\frac{d^2y}{dx^2}+4y=\tan 2x$ by the method of variation of parameters. **(06 Marks)**

b. Solve $\frac{d^2x}{dt^2}+5\frac{dx}{dt}+6x=0$, given $x(0)=0$, $\frac{dx}{dt}(0)=15$. **(05 Marks)**

c. Solve $(D^2+5D+6)y=e^x$. **(05 Marks)**

OR

4 a. Solve by the method of undetermined coefficients $(D^2-2D+5)y=25x^2+12$. **(06 Marks)**

b. Solve $(D^2+3D+2)y=\sin 2x$. **(05 Marks)**

c. Solve $(D^2-2D-1)y=e^x\cos x$. **(05 Marks)**

Module-3

5 a. Find the Laplace transforms of, (i) $t\cos^2 t$ (ii) $\frac{1-e^{-t}}{t}$ **(06 Marks)**

b. Find the Laplace transforms of, (i) $e^{-2t}(2\cos 5t-\sin 5t)$ (ii) $3\sqrt{t}+\frac{4}{\sqrt{t}}$. **(05 Marks)**

c. Express the function, $f(t)=\begin{cases} t, & 0<t<4 \\ 5, & t>4 \end{cases}$ in terms of unit step function and hence find its Laplace transform. **(05 Marks)**

OR

6 a. Find the Laplace transform of the periodic function defined by $f(t) = E\sin\omega t$, $0 < t < \frac{\pi}{\omega}$ having period $\frac{\pi}{\omega}$. (06 Marks)

b. Find the Laplace transform of $2^t + t\sin t$. (05 Marks)

c. Find the Laplace transform of $\frac{2\sin t\sin 5t}{t}$. (05 Marks)

Module-4

7 a. Using laplace transforms method, solve $y'' - 6y' + 9 = t^2e^{3t}$, $y(0) = 2$, $y'(0) = 6$. (06 Marks)

b. Find the inverse Laplace transforms of, (i) $\frac{s^2 - 3s + 4}{s^3}$ (ii) $\frac{s+3}{s^2 - 4s + 13}$ (05 Marks)

c. Find the inverse Laplace transforms of, (i) $\log\left(\frac{s+1}{s-1}\right)$ (ii) $\frac{s^2}{(s-2)^3}$ (05 Marks)

OR

8 a. Solve the simultaneous equations $\frac{dx}{dt} + 5x - 2y = t$, $\frac{dy}{dt} + 2x + y = 0$ being given $x = y = 0$ when $t = 0$. (06 Marks)

b. Find the inverse Laplace transforms of $\cot^{-1}\left(\frac{s}{2}\right)$. (05 Marks)

c. Find the inverse Laplace transforms of $\frac{2s^2 - 6s + 5}{s^3 - 6s^2 + 11s - 6}$. (05 Marks)

Module-5

9 a. For any three arbitrary events A, B, C prove that,
$$P(A \cup B \cup C) = P(A) + P(B) + P(C) - P(A \cap B) - P(B \cap C) - P(C \cap A) + P(A \cap B \cap C)$$
(04 Marks)

b. A class has 10 boys and 5 girls. Three students are selected at random, one after the other. Find probability that, (i) first two are boys and third is girl (ii) first and third boys and second is girl. (iii) first and third of same sex and the second is of opposite sex. (06 Marks)

c. In a certain college 25% of boys and 10% of girls are studying mathematics. The girls constitute 60% of the student body. (i) what is the probability that mathematics is being studied ? (ii) If a student is selected at random and is found to be studying mathematics, find the probability that the student is a girl? (iii) a boy? (06 Marks)

OR

10 a. State and prove Bayes theorem. (04 Marks)

b. A problem in mathematics is given to three students A, B and C whose chances of solving are $\frac{1}{2}$, $\frac{1}{3}$ and $\frac{1}{4}$ respectively. What is the probability that the problem will be solved? (06 Marks)

c. A pair of dice is tossed twice. Find the probability of scoring 7 points. (i) Once, (ii) at least once (iii) twice. (06 Marks)

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CBCS SCHEME

USN | | | | | | | | | |

15MATDIP41

Fourth Semester B.E. Degree Examination, Dec.2018/Jan.2019
Additional Mathematics – II

Time: 3 hrs. Max. Marks: 80

Note: Answer any FIVE full questions, choosing one full question from each module.

Module-1

1 a. Find the rank of matrix $A=\begin{bmatrix}2 & -1 & -3 & -1\\ 1 & 2 & 3 & -1\\ 1 & 0 & 1 & 1\\ 0 & 1 & 1 & -1\end{bmatrix}$ **(05 Marks)**

b. Solve by Gauss elimination method:
$2x+y+4z=12 \qquad 4x+11y-z=33 \qquad 8x-3y+2z=20$ **(05 Marks)**

c. Find all the eigen values of the matrix
$$A=\begin{bmatrix}8 & -6 & 2\\ -6 & 7 & -4\\ 2 & -4 & 3\end{bmatrix}$$ **(06 Marks)**

OR

2 a. Find the values of K, such that the matrix A may have the rank equal to 3:
$$A=\begin{bmatrix}1 & 1 & 1 & 1\\ 1 & 2 & 4 & K\\ 1 & 4 & 10 & K^2\end{bmatrix}$$ **(05 Marks)**

b. Solve by Gauss elimination method
$x_1-2x_2+3x_3=2 \qquad 3x_1-x_2+4x_3=4 \qquad 2x_1+x_2-2x_3=5$ **(05 Marks)**

c. Find all the eigen values and corresponding eigen vectors of the matrix
$$A=\begin{bmatrix}-19 & 7\\ -42 & 16\end{bmatrix}$$ **(06 Marks)**

Module-2

3 a. Find C.F of $(4D^4-8D^3-7D^2+11D+6)y=0$. **(05 Marks)**

b. Solve the initial value problem $\frac{d^2x}{dt^2}+4\frac{dx}{dt}+29x=0$
Subject to the conditions $x(0)=0,\ \frac{dx}{dt}(0)=15$ **(05 Marks)**

c. Using the method of undetermined coefficients, solve $(D^2-4D+3)y=20\cos x$ **(06 Marks)**

OR

4 a. Solve $(D^2-2D+4)y=e^x\cos x$. **(05 Marks)**

b. Solve $(D^2+4)y=x^2+2^{-x}$. **(05 Marks)**

c. Using the method of variation of parameters, find the solution of $(D^2-2D+1)y=e^x/x$. **(06 Marks)**

Module-3

5 a. Find the Laplace transform of $\frac{\cos 3t - \cos 4t}{t}$. (05 Marks)

b. Find $L\{t\sin^2 t\}$ (05 Marks)

c. Express the following function interms of Heaviside unit step function and hence find the Laplace transform where

$$f(t)=\begin{cases} t^2 & 0<t\le 2 \\ 4t & t>2 \end{cases}$$ (06 Marks)

OR

6 a. Find $L\left[\frac{e^{-t}.\sin t}{t}\right]$. (05 Marks)

b. Using Laplace transform evaluate $\int_0^\infty e^{-t} t\sin^2 3t\,dt$. (05 Marks)

c. If $f(t)=\begin{cases} t & 0\le t\le a \\ 2a-t & a\le t\le 2a \end{cases}$ $f(t+2a)=f(t)$, show that $L[f(t)]=\frac{1}{s^2}\tan h\left(\frac{as}{2}\right)$. (06 Marks)

Module-4

7 a. Find inverse Laplace transform of $\frac{s+5}{s^2-6s+13}$. (05 Marks)

b. Find inverse Laplace transform of $\log\left[\frac{s^2+4}{s(s+4)(s-4)}\right]$. (05 Marks)

c. Solve by using Laplace transform method $y''(t)+4y(t)=0$, given that $y(0)=2$, $y'(0)=0$. (06 Marks)

OR

8 a. Find $L^{-1}\left[\frac{s^2}{(s^2+1)(s^2+4)}\right]$. (05 Marks)

b. Find $L^{-1}\left[\frac{(s+2)e^{-s}}{(s+1)^4}\right]$ (05 Marks)

c. Solve by using Laplace transform method $y''+5y'+6y=5e^{2x}$, $y(0)=2$, $y'(0)=1$. (06 Marks)

Module-5

9 a. There are 10 students of which three are graduates. If a committee of five is to be formed, what is the probability that there are (i) only 2 graduates (ii) atleast 2 graduates? (05 Marks)

b. In a school 25% of the students failed in the first language, 15% of the students failed in second language and 10% of the students failed in both. If a student is selected at random find the probability that :
  i) He failed in first language if he had failed in the second language.
  ii) He failed in second language if he had failed in the first language. (05 Marks)

c. In a bolt factory there are four machines A, B, C and D manufacturing respectively 20%, 15%, 25%, 40% of the total production. Out of these 5%, 4%, 3% and 2% are defective. If a bolt drawn at random was found defective what is the probability that it was manufactured by A or D. (06 Marks)

OR

10 a. From 6 positive and 8 negative numbers, 4 numbers are chosen at random (without replacement) and multiplied. What is the probability that the product is a positive number? **(05 Marks)**

b. Three students A, B, C write an entrance examination. Their chances of passing are $\frac{1}{2}$, $\frac{1}{3}$ and $\frac{1}{4}$ respectively. Find the probability that (i) atleast one of them passes (ii) all of them passes. **(05 Marks)**

c. Three major parties A, B, C are contending for power in the elections of a state and the chance of their winning the election is in the ratio 1:3:5. The parties A, B, C respectively have probability of banning the online lottery $\frac{2}{3}$, $\frac{1}{3}$, $\frac{3}{5}$. What is the probability that there will be a ban on the online lottery in the state? What is the probability that the ban is from the party 'C'? **(06 Marks)**

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15MATDIP41

Fourth Semester B.E. Degree Examination, June/July 2019
Additional Mathematics – II

Time: 3 hrs. Max. Marks: 80

Note: Answer any FIVE full questions, choosing ONE full question from each module.

Important Note : 1. On completing your answers, compulsorily draw diagonal cross lines on the remaining blank pages.
2. Any revealing of identification, appeal to evaluator and /or equations written eg, 42+8 = 50, will be treated as malpractice.

Module-1

1 a. Find the rank of the matrix

$$A = \begin{bmatrix} 1 & 2 & 3 & 2 \\ 2 & 3 & 5 & 1 \\ 1 & 3 & 4 & 5 \end{bmatrix}$$ by elementary row operation. **(06 Marks)**

b. Find the inverse of the matrix $\begin{bmatrix} 3 & 1 \\ 1 & 2 \end{bmatrix}$ using Cayley - Hamilton theorem. **(05 Marks)**

c. Find all eigen values of the matrix $A = \begin{bmatrix} 8 & -6 & 2 \\ -6 & 7 & -4 \\ 2 & -4 & 3 \end{bmatrix}$ **(05 Marks)**

OR

2 a. Solve the system of equation by Gauss - Elimination method.

$$x + y + z = 9$$
$$x - 2y + 3z = 8$$
$$2x + y - z = 3$$ **(06 Marks)**

b. Using Cayley – Hamilton theorem find A^{-1}, given $A = \begin{bmatrix} 1 & 4 \\ 2 & 3 \end{bmatrix}$ **(05 Marks)**

c. Reduce the matrix $A = \begin{bmatrix} 2 & -1 & -3 & -1 \\ 1 & 2 & 3 & -1 \\ 1 & 0 & 1 & 1 \\ 0 & 1 & 1 & -1 \end{bmatrix}$ into row echelon form and hence find its rank. **(05 Marks)**

Module-2

3 a. Solve by the method of undetermined co-efficient $y'' - 4y' + 4y = e^x$. **(06 Marks)**

b. Solve $(D^3 + 6D^2 + 11D + 6)y = 0$. **(05 Marks)**

c. Solve $y'' + 2y' + y = 2x$. **(05 Marks)**

OR

4 a. Solve by the method of variation of parameter $y'' + a^2y = \sec ax$. **(06 Marks)**

b. Solve $y'' - 4y' + 13y = \cos 2x$. **(05 Marks)**

c. Solve $(D^2 - 1)y = e^{2x}$. **(05 Marks)**

Module-3

5 a. If $f(t) = t^2$, $0 < t < 2$ and $f(t+2) = f(t)$ for $t > 2$, find $L[f(t)]$. (06 Marks)

b. Find $L[\cos t \,.\, \cos 2t \,.\, \cos 3t]$ (05 Marks)

c. Find $L[e^{-2t}(2\cos 5t - \sin 5t)]$ (05 Marks)

OR

6 a. Find $L[e^{-t} . \cos^2 3t]$ (06 Marks)

b. Express the following function into unit step function and hence find $L[f(t)]$ given

$$f(t) = \begin{cases} t, & 0 < t < 4 \\ 5, & t > 4 \end{cases}$$ (05 Marks)

c. Find $L[t \,.\, \cos at]$ (05 Marks)

Module-4

7 a. Using Laplace transforms solve the differential equation $y'' + 4y' + 4y = e^{-t}$ given $y(0) = 0$, $y'(0) = 0$. (06 Marks)

b. Find $L^{-1}\left[\dfrac{2s-5}{4s^2+25}\right] + L^{-1}\left[\dfrac{8-6s}{16s^2+9}\right]$ (05 Marks)

c. Find $L^{-1}\left[\dfrac{1}{s(s+1)(s+2)(s+3)}\right]$ (05 Marks)

OR

8 a. Employ Laplace transform to solve the equation

$y'' + 5y' + 6y = 5e^{2x}$, $y(0) = 2$, $y'(0) = 1$. (06 Marks)

b. Find $L^{-1}\left[\dfrac{s+5}{s^2-6s+13}\right]$ (05 Marks)

c. Find $L^{-1}\left[\log\left(\dfrac{s+a}{s+b}\right)\right]$ (05 Marks)

Module-5

9 a. If A and B are any two mutually exclusive events of S, then show that

$P(A \cup B) = P(A) + P(B) - P(A \cap B)$ (06 Marks)

b. Prove the following :

(i) $P(\phi) = 0$ (ii) $P(\overline{A}) = 1 - P(A)$ (05 Marks)

c. Three machines A, B and C produce respectively 60%, 30%, 10% of the total number of items of a factory. The percentages of defective output of these machines are respectively 2%, 3% and 4%. An item is selected at random and is found defective. Find the probability that the item was produced by machine C. (05 Marks)

OR

10 a. State and prove Bay's theorem. (06 Marks)

b. If A and B are events with $P(A \cup B) = \dfrac{7}{8}$, $P(A \cap B) = \dfrac{1}{4}$ and $P(\overline{A}) = \dfrac{5}{8}$ find P(A), P(B) and $P(A \cap \overline{B})$. (05 Marks)

c. A shooter can hit a target in 3 out of 4 shots and another shooter can hit the target in 2 out of 3 shots. Find the probability that the target is being hit.

(i) when both of them try (ii) by only one shooter. (05 Marks)

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CBCS SCHEME

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15MATDIP41

Fourth Semester B.E. Degree Examination, Dec.2019/Jan.2020
Additional Mathematics – II

Time: 3 hrs. Max. Marks: 80

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2. Any revealing of identification, appeal to evaluator and /or equations written eg, 42+8 = 50, will be treated as malpractice.

Module-1

1 a. Find the rank of the matrix by $A = \begin{bmatrix} 1 & 2 & 3 & 2 \\ 2 & 3 & 5 & 1 \\ 1 & 3 & 4 & 5 \end{bmatrix}$ by applying elementary row transformations. (06 Marks)

b. Find the inverse of the matrix $\begin{bmatrix} 1 & 4 \\ 2 & 3 \end{bmatrix}$ using Caylery-Hamilton theorem. (05 Marks)

c. Solve the following system of equations by Gauss elimination method.
$2x + y + 4z = 12, \quad 4x + 11 - z = 33, \quad 8x - 3y + 2z = 20$ (05 Marks)

OR

2 a. Find the rank of the matrix $\begin{bmatrix} 2 & -1 & -3 & -1 \\ 1 & 2 & 3 & -1 \\ 1 & 0 & 1 & 1 \\ 0 & 1 & 1 & -1 \end{bmatrix}$ by reducing it to echelon form. (06 Marks)

b. Find the eigen values of $A = \begin{bmatrix} 7 & -2 & 0 \\ -2 & 6 & -2 \\ 0 & -2 & 5 \end{bmatrix}$ (05 Marks)

c. Solve by Gauss elimination method: $x + y + z = 9, \quad x - 2y + 3z = 8, \quad 2x + y - z = 3$ (05 Marks)

Module-2

3 a. Solve $\frac{d^3y}{dx^3} + 6\frac{d^2y}{dx^2} + 11\frac{dy}{dx} + 6y = 0$ (05 Marks)

b. Solve $y'' - 4y' + 13y = \cos 2x$ (05 Marks)

c. Solve by the method of undetermined coefficients $y'' + 3y' + 2y = 12x^2$ (06 Marks)

OR

4 a. Solve $\frac{d^2y}{dx^2} + 5\frac{dy}{dx} + 6y = e^x$ (05 Marks)

b. Solve $y'' + 4y' - 12y = e^{2x} - 3\sin 2x$ (05 Marks)

c Solve by the method of variation of parameter $\frac{d^2y}{dx^2} + y = \tan x$ (06 Marks)

Module-3

5 a. Find the Laplace transform of
i) $e^{-2t} \sin h\, 4t$ ii) $e^{-2t}(2\cos 5t - \sin 5t)$ (06 Marks)

b. Find the Laplace transform of $f(t) = t^2 \quad 0 < t < 2$ and $f(t+2) = f(t)$ for $t > 2$. (05 Marks)

c. Express $f(t)=\begin{cases} t & 0<t<4 \\ 5 & t>4 \end{cases}$ interms of unit step function and hence find L[f(t)]. **(05 Marks)**

OR

6 a. Find the Laplace transform of i) t cosat ii) $\frac{\cos at - \cos bt}{t}$ **(06 Marks)**

b. Given $f(t)=\begin{cases} E & 0<t<a/2 \\ -E & a/2<t<a \end{cases}$ where f(t + a) = f(t). Show that $L[f(t)]=\frac{E}{S}\tanh\left(\frac{as}{4}\right)$. **(05 Marks)**

c. Express $f(t)=\begin{cases} 1 & 0<t<1 \\ t & 1<t\le 2 \\ t^2 & t>2 \end{cases}$ interms of unit step function and hence find L[f(t)]. **(05 Marks)**

Module-4

7 a. Find the inverse Laplace transform of i) $\frac{2s-1}{s^2+4s+29}$ ii) $\frac{s+2}{s^2+36}+\frac{4s-1}{s^2+25}$ **(06 Marks)**

b. Find the inverse Laplace transform of $\log\sqrt{\frac{s^2+1}{s^2+4}}$ **(05 Marks)**

c. Solve by using Laplace transforms $y''+4y'+4y=e^{-t}$, given that y(0) = 0, y′(0) = 0. **(05 Marks)**

OR

8 a. Find the inverse Laplace transform of $\frac{1}{(s+1)(s+2)(s+3)}$. **(06 Marks)**

b. Find the inverse Laplace transform of $\cot^{-1}\left(\frac{s+a}{b}\right)$. **(05 Marks)**

c. Using Laplace transforms solve the differential equation $y'''+2y''-y'-2y=0$ given y(0) = y′(0) = 0 and y″(0) = 6. **(05 Marks)**

Module-5

9 a. State and prove Baye's theorem. **(06 Marks)**

b. The machines A, B and C produce respectively 60%, 30%, 10% of the total number of items of a factory. The percentage of defective output of these machines are respectively 2%, 3% and 4%. An item is selected at random and is found defective. Find the probability that the item was produced by machine "C". **(05 Marks)**

c. The probability that a team wins a match is 3/5. If this team play 3 matches in a tournament, what is the probability that i) win all the matches ii) lose all the matches. **(05 Marks)**

OR

10 a. If A and B are any two events of S, which are not mutually exclusive then $P(A\cup B)=P(A)+P(B)-P(A\cap B)$. **(06 Marks)**

b. If A and B are events with $P(A\cup B)=7/8$, $P(A\cap B)=1/4$, $P(\overline{A})=5/8$. Find P(A), P(B) and $P(A\cap\overline{B})$. **(05 Marks)**

c. The probability that a person A solves the problem is 1/3, that of B is 1/2 and that of C is 3/5. If the problem is simultaneously assigned to all of them what is the probability that the problem is solved? **(05 Marks)**

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CBCS SCHEME

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15MATDIP41

Fourth Semester B.E. Degree Examination, Aug./Sept. 2020
Additional Mathematics – II

Time: 3 hrs. Max. Marks: 80

Note: *Answer any FIVE full questions, choosing ONE full question from each module.*

Module-1

1 a. Find the rank of the matrix,
$$\begin{bmatrix} -2 & -1 & -3 & -1 \\ 1 & 2 & 3 & -1 \\ 1 & 0 & 1 & 1 \\ 0 & 1 & -1 & -1 \end{bmatrix}$$
By reducing it to the echelon form. **(05 Marks)**

b. Solve the following system of equations by Gauss Elimination method.
$4x + y + z = 4$
$x + 4y - 2z = 4$
$3x + 2y - 4z = 6$ **(05 Marks)**

c. Find all the eigen values and the eigen vector corresponding to the least eigen value of the matix.
$$\begin{bmatrix} 6 & -2 & 2 \\ -2 & 3 & -1 \\ 2 & -1 & 3 \end{bmatrix}$$ **(06 Marks)**

OR

2 a. Find the rank of the matrix,
$$\begin{bmatrix} 1 & 2 & 3 & 2 \\ 2 & 3 & 5 & 1 \\ 1 & 3 & 4 & 5 \end{bmatrix}$$
By applying elementary row transformations. **(05 Marks)**

b. Solve the following system of equations, by Gauss-Elimination method:
$x + 2y + z = 3$,
$2x + 3y + 3z = 10$,
$3x - y + 2z = 13$ **(05 Marks)**

c. Using Cayley-Hamilton theorem, find the inverse of the matrix,
$$\begin{bmatrix} 5 & 3 \\ 3 & 2 \end{bmatrix}$$ **(06 Marks)**

Module-2

3 a. Solve : $(D^2 - 6D + 9)y = e^x + e^{3x}$ **(05 Marks)**

b. Solve : $(D^2 + 3D + 2)y = 1 + 3x + x^2$ **(05 Marks)**

c. Using the method of variation of parameters, solve :
$(D^2 + 1)y = \sec x \tan x$. **(06 Marks)**

OR

4 a. Solve : $(D^3 - 5D^2 + 8D - 4)y = e^{2x}$. **(05 Marks)**

b. Solve : $(D^2 - 2D + 4)y = e^x \cos x$. **(05 Marks)**

c. By the method of undetermined coefficients, solve : $(D^2 - D - 2)y = 10\sin x$. **(06 Marks)**

Module-3

5 a. Find the Laplace transform of,
(i) $\sin^2 2t$ (ii) $e^{-t}(3\sinh 2t - 2\cosh 3t)$ **(05 Marks)**

b. Find $L\left\{\frac{\cos at - \cos bt}{t}\right\}$. **(05 Marks)**

c. If $f(t) = t^2$, $0 < t < 2$ and $f(t+2) = f(t)$ for $t > 2$. Find $\alpha\{f(t)\}$. **(06 Marks)**

OR

6 a. Find $L\{\sin t \sin 2t \sin 3t\}$. **(05 Marks)**

b. Find (i) $L\{te^{-t}\sin 4t\}$ (ii) $L\left\{\int_0^t e^{-t}\cos t\,dt\right\}$. **(05 Marks)**

c. Express $f(t) = \begin{cases} \cos t, & 0 < t < \pi \\ \sin t, & t > \pi \end{cases}$ in terms of unit-step function and hence find $L\{f(t)\}$. **(06 Marks)**

Module-4

7 a. Find the inverse Laplace transform of :
(i) $\frac{3s-4}{16-s^2}$ (ii) $\frac{s}{s^2-a^2}$ **(06 Marks)**

b. Find $L^{-1}\left\{\frac{3s+7}{s^2-2s-3}\right\}$ **(05 Marks)**

c. Solve the equation, $y'' + 4y' + 3y = e^{-t}$, with $y(0) = 1$, $y'(0) = 1$, using Laplace transforms. **(05 Marks)**

OR

8 a. Find $L^{-1}\left\{\frac{5s+3}{(s-1)(s^2+2s+5)}\right\}$. **(06 Marks)**

b. Find $L^{-1}\left\{\log\left(\frac{s^2+a^2}{s^2+b^2}\right)\right\}$. **(05 Marks)**

c. Solve the equation $y'' + 6y' + 9y = 12t^2e^{-3t}$, with $y(0) = y'(0) = 0$, using Laplace transforms. **(05 Marks)**

Module-5

9 a. For any two events A and B, prove that
(i) $P(A \cup B) = P(A) + P(B) - P(A \cap B)$
(ii) $P(\bar{A} \cap B) = P(B) - P(A \cap B)$ **(05 Marks)**

b. Given $P(A) = 0.4$, $P\left(\frac{B}{A}\right) = 0.9$ and $P\left(\frac{\bar{B}}{\bar{A}}\right) = 0.6$, find $P\left(\frac{A}{B}\right)$ and $P\left(\frac{A}{\bar{B}}\right)$. **(06 Marks)**

c. State and prove Bayes's theorem. **(05 Marks)**

OR

10 a. Let A and B be events with $P(A)=\frac{1}{2}$, $P(A\cup B)=\frac{3}{4}$, $P(\overline{B})=\frac{5}{8}$. Find $P(A\cap B)$, $P(\overline{A}\cap\overline{B})$, $P(\overline{A}\cup\overline{B})$ and $P(B\cap\overline{A})$. **(06 Marks)**

b. In a certain engineering college, 25% of First semester students have failed in Mathematics, 15% have failed in Chemistry and 10% have failed in both Mathematics and Chemistry. A student is selected at random.

(i) If he has failed in Chemistry, what is the probability that he has failed in Mathematics?

(ii) If he has failed in Mathematics, what is the probability that he has failed in Chemistry? **(05 Marks)**

c. Three machines A, B and C produce respectively 60%, 30%, 10% of total number of items in a factory. Percentage of defective output of these machines are respectively 2%, 3% and 4%. An item selected at random is found to be defective. Find the probability that it is produced by machine C. **(05 Marks)**

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CBCS SCHEME

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17MATDIP41

Fourth Semester B.E. Degree Examination, June/July 2019
Additional Mathematics – II

Time: 3 hrs. Max. Marks: 100

Note: Answer any FIVE full questions, choosing ONE full question from each module.

Important Note : 1. On completing your answers, compulsorily draw diagonal cross lines on the remaining blank pages.
2. Any revealing of identification, appeal to evaluator and /or equations written eg, 42+8 = 50, will be treated as malpractice.

Module-1

1 a. Find the rank of the matrix $\begin{bmatrix} 2 & 3 & 4 \\ -1 & 2 & 3 \\ 1 & 5 & 7 \end{bmatrix}$ by elementary row operations. **(08 Marks)**

b. Test for consistency and solve $x+y+z=6$, $x-y+2z=5$, $3x+y+z=8$. **(06 Marks)**

c. Solve the system of equations by Gauss elimination method :
$x+y+z=9$ $x-2y+3z=8$ $2x+y-z=3$ **(06 Marks)**

OR

2 a. Find all the eigen values and the corresponding eigen vectors of the matrix
$$A=\begin{bmatrix} 8 & -6 & 2 \\ -6 & 7 & -4 \\ 2 & -4 & 3 \end{bmatrix}$$ **(08 Marks)**

b. Solve by Gauss elimination method $x_1-2x_2+3x_3=2$, $3x_1-x_2+4x_3=4$, $2x_1+x_2-2x_3=5$. **(06 Marks)**

c. If $A=\begin{bmatrix} 2 & -3 \\ 3 & 4 \end{bmatrix}$ find A^{-1} by Cayley Hamilton theorem. **(06 Marks)**

Module-2

3 a. Solve $\frac{d^3y}{dx^2}-2\frac{d^2y}{dx^2}+4\frac{dy}{dx}-8y=0$. **(08 Marks)**

b. Solve $6\frac{d^2y}{dx^2}+17\frac{dy}{dx}+12y=e^{-x}$. **(06 Marks)**

c. Solve $y''-4y'+13y=\cos 2x$. **(06 Marks)**

OR

4 a. Solve $\frac{d^3y}{dx^3}+6\frac{d^2y}{dx^2}+11\frac{dy}{dx}+6y=0$. **(08 Marks)**

b. Solve $y''+2y+y=\frac{e^{\frac{x}{2}}+e^{-\frac{x}{2}}}{2}$ **(06 Marks)**

c. Solve $y''+2y'+y=2x+x^2$. **(06 Marks)**

Module-3

5 a. Find $L[\cosh at]$. **(08 Marks)**

b. Find $L[e^{-2t}\sinh 4t]$ **(06 Marks)**

c. Find $R\{t\sin 2t\}$. **(06 Marks)**

OR

6 a. Show that $\int_0^\infty t^3 e^{-st} \sin t\,dt = 0$. **(08 Marks)**

b. If $f(t) = t^2, 0 < t < 2$ and $f(t + 2) = f(t)$ for $t > 2$, find $L[f(t)]$. **(06 Marks)**

c. Express $f(t) = \begin{cases} t, & 0 < t < 4 \\ 5, & t > 4 \end{cases}$ in terms of unit step function and hence find their Laplace Transforms. **(06 Marks)**

Module-4

7 a. Find the inverse Laplace Transform of $\frac{3}{s^2} + \frac{2e^{-s}}{s^3} - \frac{3e^{-2s}}{s}$. **(08 Marks)**

b. Find $L^{-1}\left[\frac{s^3 + 6s^2 + 12s + 8}{s^6}\right]$. **(06 Marks)**

c. Find the inverse Laplace Transform of $\frac{s+5}{s^2 - 6s + 13}$. **(06 Marks)**

OR

8 a. Solve by using Laplace Transform $\frac{d^2y}{dt^2} + k^2 y = 0$, given that $y(0) = 2$, $y'(0) = 0$. **(08 Marks)**

b. Find inverse Laplace Transform of $\frac{1}{(s+1)(s+2)(s+3)}$. **(06 Marks)**

c. Find $L^{-1}\left[\frac{s+1}{s^2 + 6s + 9}\right]$. **(06 Marks)**

Module-5

9 a. Find the probability that a leap year selected at random will contain 53 Sundays. **(08 Marks)**

b. A six faced die on which the numbers 1 to 6 are marked is thrown. Find the probability of (i) 3 (ii) an odd number coming up. **(06 Marks)**

c. State and prove Bayee's theorem. **(06 Marks)**

OR

10 a. A problem is given to three students A, B, C whose chances of solving it are $\frac{1}{2}, \frac{1}{4}, \frac{1}{5}$ respectively. Find the probability that the problem is solved. **(08 Marks)**

b. For any three events A, B, C, prove that $P\{(A \cup B)/C\} = P(A/C) + P(B/C) - P\{(A \cap B)/C\}$. **(06 Marks)**

c. Three machines A, B and C produce respectively 60%, 30% and 10% of the total number of items of a factory. The percentages of defective output of these machines are respectively 2%, 3% and 4%. An item is selected at random and is found defective. Find the probability that the item was produced by machine C. **(06 Marks)**

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CBCS SCHEME

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17MATDIP41

Fourth Semester B.E. Degree Examination, Aug./Sept. 2020
Additional Mathematics – II

Time: 3 hrs. Max. Marks: 100

Note: ***Answer any FIVE full questions, choosing ONE full question from each module.***

Module-1

1 a. Find the rank of the matrix $A = \begin{bmatrix} 1 & 2 & 3 & -1 \\ 2 & -1 & -3 & -1 \\ 1 & 0 & 1 & 1 \\ 0 & 1 & 1 & -1 \end{bmatrix}$. **(07 Marks)**

b. Find the inverse of the matrix $\begin{bmatrix} 3 & 1 \\ 1 & 2 \end{bmatrix}$ using Cayley-Hamilton theorem. **(07 Marks)**

c. Find the Eigen values of the matrix $\begin{bmatrix} 8 & -6 & 2 \\ -6 & 7 & -4 \\ 2 & -4 & 3 \end{bmatrix}$. **(06 Marks)**

OR

2 a. Solve the system of equation by Gauss elimination method,

$2x + y + 4z = 12$

$4x + 11y - z = 33$

$8x - 3y + 2z = 20$ **(07 Marks)**

b. Using Cayley-Hamilton theorem find A^{-1}, given

$A = \begin{bmatrix} 1 & 4 \\ 2 & 3 \end{bmatrix}$. **(07 Marks)**

c. Find the rank of the matrix by reducing in to row echelon form, given

$A = \begin{bmatrix} 1 & 2 & 3 & 2 \\ 2 & 3 & 5 & 1 \\ 1 & 3 & 4 & 5 \end{bmatrix}$. **(06 Marks)**

Module-2

3 a. Solve by method of undetermined co-efficient $y'' - 4y' + 4y = e^x$. **(07 Marks)**

b. Solve $\frac{d^3y}{dx^3} - 2\frac{d^2y}{dx^2} + 4\frac{dy}{dx} - 8y = 0$. **(07 Marks)**

c. Solve $y'' + 2y' + y = 2x$. **(06 Marks)**

OR

4 a. Solve $\frac{d^2y}{dx^2} + y = \sec x \tan x$ by method of variation of parameter. **(07 Marks)**

b. Solve $y'' - 4y' + 13y = \cos 2x$. **(07 Marks)**

c. Solve $6\frac{d^2y}{dx^2} + 17\frac{dy}{dx} + 12y = e^{-x}$. **(06 Marks)**

Module-3

5 a. Express the following function into unit step function and hence find $L[f(t)]$ given $f(t)=\begin{cases} t, & 0<t<4 \\ 5, & t>4 \end{cases}$. **(07 Marks)**

b. Find $L\left[\frac{1-e^{-at}}{t}\right]$. **(07 Marks)**

c. Find $L[t.\cos at]$. **(06 Marks)**

OR

6 a. Find $L[\sin 5t.\cos 2t]$. **(07 Marks)**

b. Find $L[e^{-t}\cos^2 3t]$. **(07 Marks)**

c. Find $L[\cos 3t.\cos 2t.\cos t]$. **(06 Marks)**

Module-4

7 a. Employ Laplace transform to solve the equation $y''+5y'+6y=5e^{2x}$ given $y(0)=2,\ y'(0)=1$. **(07 Marks)**

b. Find $L^{-1}\left[\frac{1}{s(s+1)(s+2)(s+3)}\right]$. **(07 Marks)**

c. Find $L^{-1}\left[\frac{s+5}{s^2-6s+13}\right]$. **(06 Marks)**

OR

8 a. Using Laplace transforms solve $y''+4y'+4y=e^{-t}$ given $y(0)=0,\ y'(0)=0$. **(07 Marks)**

b. Find $L^{-1}\left[\log\left(\frac{s+a}{s+b}\right)\right]$. **(07 Marks)**

c. Find $L^{-1}\left[\frac{2s-5}{4s^2+25}\right]+L^{-1}\left[\frac{8-6s}{16s^2+9}\right]$. **(06 Marks)**

Module-5

9 a. State and prove Baye's theorem. **(07 Marks)**

b. A shooter can hit a target in 3 out of 4 shots and another shooter can hit the target in 2 out of 3 shots. Find the probability that the target is being hit.
   (i) When both of them try.
   (ii) By only one shooter. **(07 Marks)**

c. If A and B are any two mutually exclusive events of S, then show that $P(A\cup B)=P(A)+P(B)-P(A\cap B)$. **(06 Marks)**

OR

10 a. Three machines A, B and C produce respectively 60%, 30%, 10% of the total number of items of a factory. The percentages of defective out put of these machines are respectively 2%, 3% and 4%. An item is selected at random and is found defective. Find the probability that the item non produced by machine C. **(07 Marks)**

b. Prove the following : (i) $P(\phi)=0$ (ii) $P(\overline{A})=1-P(A)$ **(07 Marks)**

c. If A and B are events with $P(AUB)=\frac{7}{8}$, $P(A\cap B)=\frac{1}{4}$ and $P(\overline{A})=\frac{5}{8}$ find P(A), P(B) and $P(A\cap\overline{B})$. **(06 Marks)**

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