Unit III
Time Series
Section - A

One mark questions:

1. Define time series. (K)
2. Give an example for time series. (U)
3. What is Historigram? (K)
4. Mention a use of time series. (K)
5. Mention two components of time series. (K)
6. Define secular trend. (U)
7. Give an example for secular trend. (U)
8. Give an example for upward trend. (U)
9. Give an example for downward trend. (U)
10. Define seasonal variation. (U)
11. Is seasonal variation of the time series predictable? (K)
12. Mention a factor causing seasonal variation. (K)
13. Give an example for seasonal variation. (U)
14. Which component of a time series is associated with 'Increase in the sales of text books in the month of June'? (K)
15. Which index is used for the measurement of seasonal variation? (K)
16. Define cyclical variation. (U)
17. Define irregular (random) variation. (U)
18. Mention a factor causing random variation. (K)
19. Give an example for random variation. (U)
20. Which component of a time series is associated with 'Sudden increase in the price of vegetables due to strike'? (K)
21. Which variation of the time series is unpredictable? (K)
22. Name two methods of measuring trend. (K)
23. Write a merit of method moving averages for measuring trend. (K)
24. Write a demerit of method moving averages for measuring trend. (K)
25. Write a merit of method least squares for measuring trend. (K)

Section - B

Two mark questions:

26. Define time series. Give an example. (U)
27. Mention two uses of time series. (K)
28. Mention four components of time series. (K)
29. Define secular trend. Give an example. (U)
30. Define seasonal variation. Give an example. (U)
31. What are the different phases in a business cycle? (K)
32. Diagrammatically represent 'Business Cycle' with stages. (S)
33. Define random variation. Give an example. (U)
34. Mention a factor causing following variations: (K)
    i) Seasonal variation   ii) Irregular variation

35. Which component of a time series is associated with the following sentences? (K)

(a) Fall in death rate due to advance in science.

(b) An increase in employment during harvest season.

36. Name four methods of measuring trend. (K)

37. State two conditions of least squares method of measuring trend. (K)

38. Write down the normal equations for fitting linear trend. (K)

39. Given a second degree trend equation $Y = 25 - 0.75X + 2X^2$. Estimate the value of Y, when $X = 3$. (A)

Section - C

Five mark questions:

40. Draw a trend line to the following data by graphical method. (S)

Year	2003	2004	2005	2006	2007	2008	2009
Profits	65	95	85	115	110	120	130

OR

(For visually challenged students only)

Explain the moving averages method of measuring trend.

41. Draw a trend line to the following data by the graphical method. (S)

Year	2001	2002	2003	2004	2005	2006	2007	2008	2009
Production (in tons)	20	22	24	21	23	25	23	26	25

OR

(For visually challenged students only)

Write three merits and two demerits of least squares method of measuring trend.

42. Draw a trend line by the semi averages method. (S)

Year	2005	2006	2007	2008	2009	2010
Sales ('000)	110	105	115	110	120	130

OR

(For visually challenged students only)

Explain the semi averages method of measuring trend.

43. Draw a trend line by the semi averages method. (S)

Year	2002	2003	2004	2005	2006	2007	2008	2009	2010
Sales ('000)	412	444	438	454	470	480	500	490	530

OR

(For visually challenged students only)

Explain the semi averages method of measuring trend.

44. Obtain trend values by 3 yearly moving averages for the following data. (U)

Year	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004
Sales ('000)	86	63	45	58	43	57	98	120	100	150

45. Obtain trend values by 3 yearly moving averages for the following data. (U)

Year	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
No. of Students	15	18	17	20	23	25	29	36	33	40

46. The following figures relate to the profits of 10 years. Find the trend values of the profits by 3 yearly moving averages method. (U)

Year	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
Profits (in lakhs)	30	27	39	36	42	48	45	51	48	54

47. Find trend values by five yearly moving averages for the following time series. (U)

Year	2000	2001	2002	2003	2004	2005	2006	2007	2008
Value	10	15	18	21	25	30	33	40	50

48. For the following time series compute trend values by five yearly moving averages. (U)

Year	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
Value	14.6	15.9	17.4	17.9	16.5	16	17.1	18.3	19.6	20.1	18.5

49. Calculate trend values for the following data by 5 yearly moving averages. (U)

Year	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
Sales ('000)	18	18	21	20	16	17	17	16	21	20	20

50. Compute trend values by four yearly moving averages for the following data. (U)

Year	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
Sales ('000)	75	60	55	60	65	70	70	75	85	70

51. Estimate the trend values by taking four yearly moving averages. (A)

Year	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
Value	12	25	39	54	70	87	105	100	82	65

52. Calculate trend values by 4 yearly moving averages for the following data. (A)

Year	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
Profit (in crores)	80	85	82	90	100	95	85	84	98	100

53. Calculate trend values by 4 yearly moving averages for the following data. (A)

Year	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
Production	464	515	518	467	502	540	557	571	586	612

54. Fit a straight line trend for the following data by least squares method and estimate the production for 2010. (A)

Year	2003	2004	2005	2006	2007
Production (in lakhs)	70	74	81	86	89

55. Fit a straight line trend for the following data by least squares method and estimate the price for 2013.

Year	2007	2008	2009	2010	2011
Price (in Rs.)	12	20	31	40	47

56. For the following time series fit a linear trend by the method of least squares. (A)

Year	1980	1984	1988	1992	1996	2000
Sales ('000)	16	20	19	14	18	21

57. The production of steel of a factory is given below. Fit a linear trend by the method of least squares. (A)

Year	2011	2012	2013	2014	2015	2016
Production (million tons)	8	12	10	14	12	10

58. For the following time series fit a linear trend by the method of least squares. (A)

Year	2002	2004	2006	2008	2010	2012
Profit (in crores)	10	20	32	36	52	60

59. Below are given the figures of production of a sugar factory. Fit a linear trend by the method of least squares. (A)

Year	2010	2011	2012	2013	2014	2015	2016
Production ('000 tons)	79	83	90	94	90	95	99

Section - D

Ten mark questions:

60. Production in 1000 quintals of sugar is given below. Fit a straight line trend, find trend values and estimate production for 2009. (U)

Year	2002	2003	2004	2005	2006	2007	2008
Production	12	10	14	11	13	15	16

61. Fit a straight line trend for the following data by the method of least squares, find trend values and estimate the production for the year 2007. (U)

Year	2000	2001	2002	2003	2004	2005	2006
Production ('000 tons)	50	47	52	45	48	55	60

62. For the following data fit a straight line trend of the form Y = a + b X. Find the trend values and estimate the sale for 2007. (U)

Year	2000	2001	2002	2003	2004	2005	2006
Sale of Vehicles ('000)	160	350	340	580	770	910	950

63. Below are given the figures of production (in thousand tons) of a sugar factory

Year	2001	2002	2003	2004	2005	2006	2007
Production	80	90	92	83	94	99	92

 (i) Fit a st. line by the method of least squares and obtain the trend values.

 (ii) Also estimate the production for the year 2008. (A)

64. Fit a straight line trend for the following data by the method of least squares, find trend values and estimate the production for 2015. (U)

Year	2007	2008	2009	2010	2011	2012	2013
Production ('000 tons)	80	100	110	122	138	150	162

65. For the following time series fit a second degree trend of the type $y = a + bx + cx^2$ by the method of least squares. Estimate the profit for the year 2010. (A)

Year	2005	2006	2007	2008	2009
Profit (in lakhs)	10	12	16	24	38

66. By the method of least squares fit a parabolic trend for the following time series. Estimate the profit for the year 2016. (A)

Year	2011	2012	2013	2014	2015
Profit ('000)	10	12	14	10	8

67. By the method of least squares fit a parabolic trend for the following time series. Estimate the production for the year 2017. (A)

Year	2011	2012	2013	2014	2015
production ('000 tons)	15	11	10	11	13

68. For the following time series data fit a trend equation of the type $y = a + bx + cx^2$. Estimate the value for 2011. (A)

Year	2004	2005	2006	2007	2008	2009	2010
Value	14	16	20	29	42	60	80

69. The following figures give the annual production of a commodity. Estimate the production in 2011 by using the trend equation of the type $y = a + bx + cx^2$. (A)

Year	2004	2005	2006	2007	2008	2009	2010
Production ('000 tons)	8	10	13	17	22	28	35

70. Population figures for a city are given below.

Year	2008	2009	2010	2011	2012
Population ('000)	132	142	157	170	191

Fit a curve of the type $y = ab^x$ and estimate the population for the year 2014 (A)

71. Following data shows the population of India. Fit a curve of the type $y = ab^x$ and estimate the population for the year 2011. (A)

Year	1961	1971	1981	1991	2001
Population (in crores)	43.9	54.8	68.4	84.4	102.7

72. Following data shows the population of India. Fit a curve of the type $y = ab^x$. Estimate the population for the year 2021. (A)

Year	1951	1961	1971	1981	1991	2001	2011
Population (in crores)	36.1	43.9	54.8	68.4	84.4	102.7	121

73. Following data shows the population of Karnataka. Fit a curve of the type $y = ab^x$. Estimate the population for the year 2021. (A)

Year	1951	1961	1971	1981	1991	2001	2011
Population (in lakhs)	194	236	293	371	448	527	611

74. The sales of a company in lakhs of rupees for the year 2006 to 2012 are given below.

Year	2006	2007	2008	2009	2010	2011	2012
Sales	32	47	65	92	132	190	275

Fit an equation of the form $y = ab^x$ and estimate the sales for the year 2013. (A)

75. For the following data fit an exponential trend of the form $y = ab^x$. (A)

Year	2005	2006	2007	2008	2009	2010
Production (in crores)	7	10	12	14	17	24