÷ NAV (31/3/2020)	49
No. of units	21607 units

Date	Dividend Per Unit	NAV	Post Dividend Units	Working	Pre Dividend Unit
31/3/2019	1.50	45	21,607	$21,607 \times \frac{1.5}{45+1.5} = 697$	20,910
31/3/2018	1.00	50	20,910	$20,910 \times \frac{1}{51} = 410$	20,500
31/3/2017	1.20	48	20,500	$20,500 \times \frac{1.20}{49.20} = 500$	20,000

Issued Price = $\frac{9,20,000}{20,000 \text{ Units}}$ = ₹ 46

2. Bonus Plan

Investment 01/04/2015	10,00,000
Profit [10,00,000 × 6.4%] × 5	3,20,000
Investment	13,20,000
÷ NAV (31/03/2020)	44
No. of units (31/03/2020)	30,000 units

Date	Post Bonus Unit	Bonus Unit	Pre Bonus
31/3/2018	30,000	$30,000 \times \frac{1}{6} = 5,000$	25,000
31/12/2016	25,000	$25,000 \times \frac{1}{5} = 5,000$	20,000

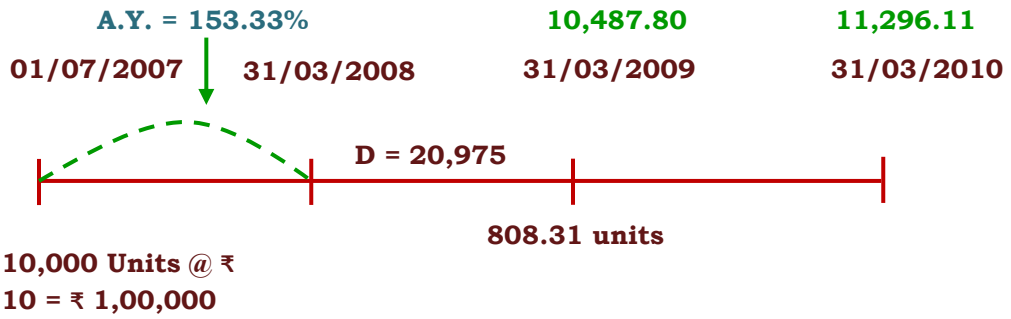
NAV (1/4/2015) = $\frac{₹\ 10,00,000}{20,000}$ = ₹ 50 Issue Price

Question – 19

Mr. X on 01.07.2007, during the initial offer of some Mutual Fund invested in 10,000 units having face value of ₹ 10 for each unit. On 31.03.2008, the dividend paid by the M.F. was 10% and Mr. X found that his annualized yield was 153.33%. On 31.03.2009, 20% dividend was given. On 31.03.2010, Mr. X redeemed all his balance of 11,296.11 units when his annualized yield was 73.52%. What are the NAVs as on 31.03.2008, 31.3.2009 and 31.03.2010?

(SM TYK – 13)

Solution:



31/3/2008

$$\text{Annualized Yield} = \text{HPR} \times \frac{12}{n}$$

$$153.33 = \text{HPR} \times \frac{12}{9}$$

$$\text{HPR} = 153.33 \times 9/12$$

$$= 115\%$$

$$\text{HPR} = \frac{\text{Closing Value} - \text{Opening Value}}{\text{Opening Value}}$$

$$115\ \% = \frac{x - 1,00,000}{1,00,000}$$

$$1,15,000 = x - 1,00,000$$

$$x = 2,15,000$$

Dividend Amount = ₹ 10,000

Pre Dividend Investment Value = 2,05,000

No. of units pre dividend = 10,000 Units

NAV (31/3/2008) $\frac{2,05,000}{10,000}$ = 20.50

Additional units = $\frac{10,000}{20.50}$ = 487.80 units

Total Units = 10,000 + 487.80 = 10,487.80

31/3/2009

Dividend amount = (10,487.80 units × 10 × 20%)

= 20,975

Additional units = (11,296.11 – 10,487.80)

= 808.31 units

NAV = $\frac{20,974}{808.31}$ = 25.95

31/3/2010

Annualized Yield = HPR × $\frac{12}{n}$

73.52 = HPR × $\frac{12}{33}$

HPR = 73.52 × $\frac{33}{12}$ = 202.18%

202.18% = $\frac{x - 1,00,000}{1,00,000}$ = 3,02,180

NAV = $\frac{3,02,180}{11,296.11}$ = ₹ 26.75

Question – 20

Mr. Alex, a practicing Chartered Accountant, can earn a return of 15 percent by investing in equity shares on his own. He is considering a recently announced equity based mutual fund scheme in which initial expenses are 6 percent and annual recurring expenses are 2 percent.

(i) How much should the mutual fund earn to provide Mr. Alex a return of 15 percent per annum?

(ii) Mr. Alex's current Annual Professional Income is ₹ 40 Lakhs. His portfolio value is ₹ 50 Lakhs and now he is spending 10% of his time to manage his portfolio. If he spends this time on profession, his professional income will go up in same proportion. He is thinking to invest his entire portfolio into a Multi-cap Fund, assuming the fund's NAV will grow at 13% per annum (including dividend).

You are requested to advise Mr. Alex, whether he can invest the portfolio into Multi-cap Funds ? If so, what is the net financial benefit?

(Exam November – 2019) (8 Marks)

Solution:

(i) Earning of Mutual Fund

$$R_2 = \frac{R_1}{1 - \text{Initial Expenses}} + \text{Recurring Expenses}$$

$$= \frac{15}{1-0.06} + 2 = 17.96\%$$

(ii) Option 1: Managed by Himself	**₹ in Lakh**
Professional Income	40.00
Portfolio Income (50 × 15%)	7.50
	47.50
Option 2: Investment in Mutual Fund	**₹ in Lakh**
Professional Income (40 × 110%)	44
Portfolio Income (50 × 13%)	6.5

50.50

It is better to invest the Portfolio in Multi Cap Fund due to higher return.

(3) HEDGE FUND

Question – 21

ANP Plan, a hedge fund currently has assets of ₹ 20 crore. CA. X, the manager of fund charges fee of 0.10% of portfolio asset. In addition to it he charges incentive fee of 2%. The incentive will be linked to gross return each year in excess of the portfolio maximum value since the inception of fund. The maximum value the fund achieved so far since inception of fund about one and half year ago was ₹ 21 crores.

You are required to compute the fee payable to CA. X, if return on the fund this year turns out to be

(a) 29%, (b) 4.5%, (c) -1.8%

(SM TYK – 23)

Solution:

(a) Return = 29%

Portfolio Value (20 × 1.29) = 25.80 Crore

Basic Fees (20 Crore × 0.10%)	= ₹ 2,00,000
Incentives (25.80 Crore – 21 Crore) × 2%	= ₹ 9,60,000
Total	= ₹ 11,60,000

(b) Return = 4.5%

Portfolio Value (20 × 1.045) = 20.90 Crore

Basic Fees	= 2,00,000
Incentives	= 0
	= 2,00,000

(c) Return = -1.8%

Portfolio Value (20 Crore × 0.982) = 19.64 Crore

Basic Fees	= 2,00,000
Incentives	= 0
	= 2,00,000

(4) PERFORMANCE EVALUATION OF MUTUAL FUND

Question – 22

Five portfolios experienced the following results during a 7- year period:

Portfolio	Average Annual Return (R_p) (%)	Standard Deviation (S_p)	Correlation with the market returns (r)
A	19.0	2.5	0.840
B	15.0	2.0	0.540
C	15.0	0.8	0.975
D	17.5	2.0	0.750
E	17.1	1.8	0.600
Market Risk (σ_m)		1.2	
Market Risk of Return (R_m)	14.0		
Risk-free rate (R_f)	9.0		

Rank the portfolios using (a) Sharpe's method, (b) Treynor's method and (c) Jensen's Alpha

(RTP November – 2021)

Solution:

Let portfolio standard deviation be σ_p

Market Standard Deviation = σ_m

Coefficient of correlation = r

Portfolio beta (β_p) = $\frac{\sigma_p r}{\sigma_m}$

Required portfolio return (R_p) = $R_f + \beta_p (R_m - R_f)$

Portfolio	Beta	Return from the portfolio (Rp) (%)
A	1.75	17.75
B	0.90	13.50

C	0.65	12.25
D	1.25	15.25
E	0.90	13.50

Portfolio	Sharpe Method		Treynor Method		Jensen's Alpha	
	Ratio	Rank	Ratio	Rank	Ratio	Rank
A	4.00	IV	5.71	V	1.25	V
B	3.00	V	6.67	IV	1.50	IV
C	7.50	I	9.23	I	2.75	II
D	4.25	III	6.80	III	2.25	III
E	4.50	II	9.00	II	3.60	I

Question – 23

There are two Mutual Funds viz. D Mutual Fund Ltd. and K Mutual Fund Ltd. Each having close ended equity schemes.

NAV as on 31-12-2014 of equity schemes of D Mutual Fund Ltd. is ₹ 70.71 (consisting 99% equity and remaining cash balance) and that of K Mutual Fund Ltd. is 62.50 (consisting 96% equity and balance in cash).

Following is the other information:

Particular	Equity Schemes	
	D Mutual Fund Ltd.	K Mutual Fund Ltd.
Sharpe Ratio	2	3.3
Treynor Ratio	15	15
Standard deviation	11.25	5

There is no change in portfolios during the next month and annual average cost is ₹ 3 per unit for the schemes of both the Mutual Funds.

If Share Market goes down by 5% within a month, calculate expected NAV after a month for the schemes of both the Mutual Funds.

For calculation, consider 12 months in a year and ignore number of days for particular month.

(SM TYK – 22, RTP Nov – 2020 & May – 2019)

Solution:

(1) Calculation of Equity & Cash Component

	D Mutual Fund Ltd.	K Mutual Fund Ltd.
NAV	₹ 70.71	₹ 62.50
Equity (%)	99%	96%
Equity per unit	70.00	60.00
Cash per unit	0.71	2.50

(2) Calculation of Beta

D Mutual Fund Ltd.

$$\text{Sharpe Ratio} = \frac{R_p - R_f}{\sigma_p}$$

$$2 = \frac{R_p - R_f}{11.25}$$

$$R_p - R_f = 22.5$$

$$\text{Treynor Ratio} = \frac{R_p - R_f}{\beta_p}$$

$$15 = \frac{22.5}{\beta_p}$$

$$\beta_p = 1.5$$

K Mutual Fund Ltd.

$$3.3 = \frac{R_P - R_f}{5}$$

$$= 16.5$$

$$15 = \frac{16.5}{\beta} \quad = 1.1$$

β = 1.1

(3) Equity component after 1 month

	D Mutual Fund Ltd.	K Mutual Fund Ltd.
Equity	70	60
Beta	1.50	1.10
Market Down	5 %	5%
Portfolio Down	7.5%	5.5%
Equity	64.75	56.70

(4) Calculation of Cash

	D Mutual Fund	K Mutual Fund
Cash Opening	0.71	2.50
(–) Expenses $\left(\frac{3}{12}\right)$	0.25	0.25
	0.46	2.25

(5) Calculation of NAV after 1 month

Equity	64.75	56.70
(+) Cash	0.46	2.25
	65.21	58.95

Question – 24

Following is the information related to three mutual funds:

Year	MF-A	MF-B	MF-C
2020	10%	5%	14%
2021	8%	10%	10%
2022	12%	8%	18%

Correlation between market and mutual fund:

	MF-A	MF-B	MF-C
Correlation with market	0.45	0.25	0.65

Variance of the market is 9% and rate of return of government bond is 7%.

You are required to Rank the Mutual fud using Sharpe's ratio and Treynor's ratio.

(Exam Nov – 2022) (8 Marks)

Solution:

Working Note 1:

Mutual Fund A

$$R_p = \frac{10+8+12}{3} = 10\%$$

$$\sigma_p = \frac{\sqrt{(10-10)^2+(8-10)^2+(12-10)^2}}{3}$$

$$= 1.63\%$$

Mutual Fund B

$$R_p = \frac{5+10+18}{3} = 7.67\%$$

$$\sigma_p = \frac{\sqrt{(5-7.67)^2+(10-7.67)^2+(8-7.67)^2}}{3}$$

$$= 2.05\%$$

Mutual Fund C

$$R_p = \frac{14+10+18}{3} = 14\%$$

$$\sigma_p = \frac{\sqrt{(14-14)^2+(10-14)^2+(18-14)^2}}{3}$$

$$= 3.27\%$$

Working Note 2:

$$B_p = \frac{\sigma_p}{\sigma_m} \times rm$$

$$B_A = \frac{1.63}{3} \times 0.45 \quad = 0.244$$

$$B_B = \frac{2.05}{3} \times 0.25 = 0.171$$

$$B_C = \frac{3.27}{3} \times 0.65 = 0.709$$

Fund	Sharpe Ratio	Rank	Treynor Ratio	Rank
A	$\frac{10-7}{1.63} = 1.84$	II	$\frac{10-7}{0.244} = 12.30$	I
B	$\frac{7.67-7}{2.05} = 0.33$	III	$\frac{7.67-7}{0.171} = 3.92$	III
C	$\frac{14-7}{3.27} = 2.14$	I	$\frac{14-7}{0.709} = 9.87$	II

Question – 25

The following are the details of three mutual funds of MFL:

	Growth Fund	Balanced Fund	Regular Fund	Market
Average Return (%)	7	6	5	9
Variance	92.16	54.76	40.96	57.76
Coefficient of Determination	0.3025	0.6561	0.9604	

The yield on 182 days Treasury Bill is 9 per cent per annum.

You are required to:

(i) Rank the funds as per Sharpe's measure.

(ii) Rank the funds as per Treynor's measure.

(iii) Compare the performance with the market.

(MTP April – 2023)

Solution:

(i) Sharpe Ratio

$$SR = \frac{R_p - R_f}{\sigma_p}$$

Growth Fund $= \frac{7-9}{\sqrt{92.16}} = -0.208$ I

Balance Fund $= \frac{6-9}{\sqrt{54.76}} = -0.405$ II

Regular Fund $= \frac{5-9}{\sqrt{40.96}} = -0.625$ III

(ii) Treynor's Ratio

Coefficient of determination $= r^2$

$r_{AM} = \sqrt{0.3025} = 0.55$

$r_{BM} = \sqrt{0.6561} = 0.81$

$r_{CM} = \sqrt{0.9604} = 0.98$

$$B_A = \frac{\sigma_A}{\sigma_M} \times r_{AM}$$

$$B_A = \frac{\sqrt{92.16}}{\sqrt{57.76}} \times 0.55 = 0.696$$

$$B_B = \frac{\sqrt{54.76}}{\sqrt{57.76}} \times 0.81 = 0.789$$

$$B_C = \frac{\sqrt{40.96}}{\sqrt{57.76}} \times 0.98 = 0.825$$

$$TR = \frac{R_p - R_f}{\beta}$$

Growth Fund $= \frac{7-9}{0.696} = -2.87$ I

Balance Fund $= \frac{6-9}{0.789} = -3.802$ II

Regular Fund $= \frac{5-9}{0.825} = -4.849$ III

(iii) Sharpe Ratio & Treynor's Ratio of Market

Sharpe Ratio $= \frac{9-9}{\sqrt{57.76}} = 0$

Treynor's Ratio $= \frac{9-9}{1} = 0$

Market performance is better than Mutual Fund.

Question – 26

Mr. Potential has made investments in two mutual funds. The following information is available:

Mutual Fund	Smart	Growth
Jensen Alpha	1.10%	1.50%
Treynor's Ratio	0.0714	0.0775
Actual Return	8.50%	9.10%
Risk Premium	4%	

You are required to calculate:

(i) Beta (β) for both the funds

(ii) Risk free Rate

(iii) Security Market Line

(Exam May – 2023) (8 Marks)

Solution:

SMART

Alpha $= R_p - R_e$

$1.10 = 8.50 - R_e$

$R_e = 7.40$

(1) CAPM

$R_e = R_f + MRP\ \beta$

$7.40 = R_f + 4\ \beta$

$R_f = 7.40 - 4\ \beta$

$TR = \frac{R_P - R_f}{\beta}$

$0.0714 = \frac{0.085 - [0.074 - 0.04\ \beta]}{\beta}$

$0.0714\ \beta = 0.085 - 0.074 + 0.04\ \beta$

$0.031\ \beta = 0.011$

$\beta = \frac{0.011}{0.031} = 0.35$

(2) Put Beta Value in CAPM Equation

$7.40 = R_f + (4 \times 0.35)$

$R_f = 6\%$

(3) SML

$6 + 4\ \beta$

GROWTH

$\text{Alpha} = R_p - R_e$

$1.50 = 9.10 - R_e$

$R_e = 7.60$

(1) CAPM

$R_e = R_f + MRP\ \beta$

$7.60 = R_f + 4\ \beta$

$R_f = 7.60 - 4\ \beta$

$TR = \frac{R_P - R_f}{\beta}$

$$0.0775 = \frac{0.0910 - [0.0760 - 0.04\ \beta]}{\beta}$$

$$0.0755\ \beta = 0.0910 - 0.0760 + 0.04\ \beta$$

$$0.0375\ \beta = 0.015$$

$$\beta = \frac{0.015}{0.0375} = 0.40$$

(2) Put Beta Value in CAPM Equation

$7.60 = R_f + (4 \times 0.40)$

$R_f = 6\%$

(3) SML

$6 + 4\ \beta$

RESIDUAL

Question – 27

On 1-4-2012 ABC Mutual Fund issued 20 lakh units at ₹ 10 per unit. Relevant initial expenses involved were ₹ 12 lakhs. It invested the fund so raised in capital market instruments to build a portfolio of ₹ 185 lakhs. During the month of April 2012 it disposed off some of the instruments costing ₹ 60 lakhs for ₹ 63 lakhs and used the proceeds in purchasing securities for ₹ 56 lakhs. Fund management expenses for the month of April 2012 was ₹ 8 lakhs of which 10% was in arrears. In April 2012 the fund earned dividends amounting to ₹ 2 lakhs and it distributed 80% of the realized earnings. On 30-4-2012 the market value of the portfolio was ₹ 198 lakhs.

Mr. Akash, an investor, subscribed to 100 units on 1-4-2012 and disposed off the same at closing NAV on 30-4-2012. What was his annual rate of earning?

(SM TYK – 16 & RTP May – 2020)

Solution:

W.N. 1: Calculation of Cash

Opening Cash (20 × 10 – 12 – 185)	3.00
(+) Investment Sold	63.00

(-) Purchase of Securities	56.00
(-) Expenses Paid (8 × 90%)	7.20
(+) Dividend Income	2.00
(-) Distribution of Income [2 + (63 – 60)] × 80%	4.00
Closing Cash	**0.80 Lacs**

Month end NAV

Closing Cash	0.80
Portfolio Value	198
Asset	198.80
(-) Outstanding Expenses	0.80
Net Asset	198.00
(÷) Units	20
NAV	9.90

Annual Rate of Earning

Beginning NAV = 10

Income per unit $= \frac{4.00}{20} = 0.20$

Closing NAV = 9.90

$$\text{HRP} = \frac{(9.90 - 10) + 0.20}{10} \times 100 = 1\%$$

Annualized return $= 1 \times \frac{12}{1} = 12\%$ p.a.

Question – 28

On 1st april, an open ended scheme of mutual fund had 300 lakh units outstanding with Net Assets Value (NAV) of ₹ 18.75. At the end of April, it issued 6 lakh units at opening NAV plus 2% load, adjusted for dividend

equalization. At the end of May, 3 Lakh units were repurchased at opening NAV less 2% exit load adjusted for dividend equalization. At the end of June, 70% of its available income was distributed.

In respect of April-June quarter, the following additional information are available:

	₹ in lakh
Portfolio value appreciation	425.47
Income of April	22.950
Income for May	34.425
Income for June	45.450

You are required to calculate

(i) Income available for distribution;

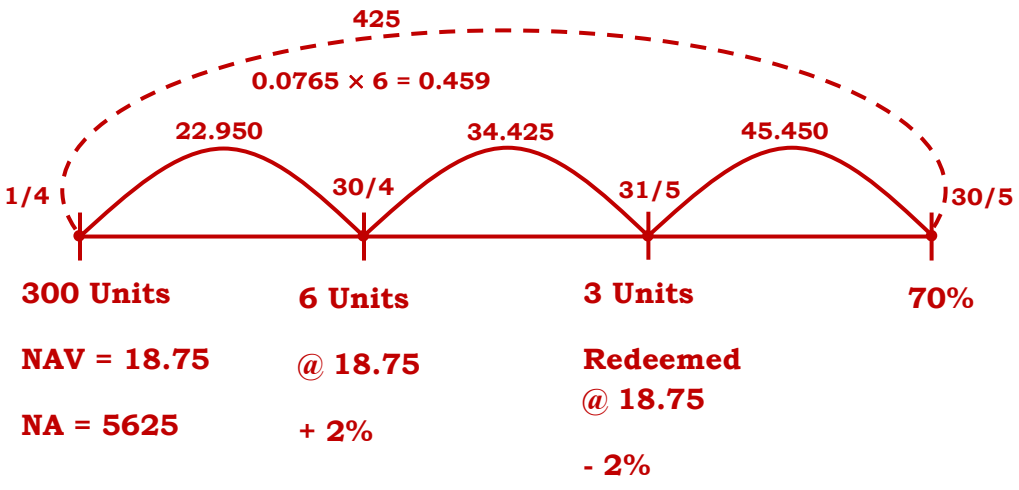
(ii) Issue price at the end of April;

(iii) repurchase price at the end of May; and

(iv) net asset value (NAV) as on 30th June.

(SM TYK & RTP November – 2018)

Solution:



1. Income available for distribution

Particulars	Units	Per unit	Total
Income from April	300	0.0765	22.950
(+) Dividend equalization of April	6	0.0765	0.459
Total	306	0.0765	23.409
Income from May	306	0.1125	34.425
	306	0.1890	57.834
(-) Dividend equalization for May	3	0.1890	(0.5670)
Total	303	0.1890	57.2670
Income from June	303	0.150	45.450
Total	303	0.3390	102.7170
Dividend (70%)	303	0.2373	(71.9019)
Income available for distribution	303	0.1017	30.8151

2. Issue price at the end of April

Opening NAV = 18.75

(+) Entry load = 2%

(+) Dividend equalization = 0.0765

= 19.2015

3. Repurchased price

Opening NAV = 18.75

(-) Exit load = 2%

(+) Dividend equalization = 0.1890

= 18.5640

4. NAV [300 lacs units]

Opening Net asset (300 × 18.75) = 5,625

(+) Income [22.950 + 34.425 + 45.450] = 102.825

(+) Appreciation in portfolio value = 425.47

(+) Unit issued [6 × 19.2015] = 115.209

(-) Units repurchased [3 × 18.5640]	= 55.692
(-) Dividend	= 71.9019
Net Asset	= 6,140.9101
÷ Units	= 303
NAV	= 20.2670

(6) FAMA NET SELECTIVITY MODEL

Question – 29

The returns of a portfolio A and market portfolio for the last 12 months are indicated as follows:

Month	Portfolio A	Market Portfolio
January	-0.52	0.82
February	2.20	0.04
March	2.17	2.80
April	4.17	1.72
May	2.04	0.27
June	3.00	0.39
July	1.99	1.95
August	4.00	0.64
September	-1.38	1.53
October	2.67	2.70
November	3.99	2.52
December	1.86	2.09
Standard Deviation (σ)	1.6223	0.9498

(i) You are required to find out the monthly returns attributable to the sheer skill of the Portfolio Manager.

(ii) What part of the monthly return is attributable to the higher risk assumed by the Portfolio Manager?

Assume that the risk-free rate of return is 12% per annum and the portfolio is fully diversified.

(Exam November – 2019) (8 Marks)

Solution:

(i) The monthly risk free rate of return = (12%/12) = 1%