Hall Ticket Number :										

R-20

Code: 20AC45T

II B.Tech. II Semester Regular & Supplementary Examinations July 2023

Managerial Economics & Financial Analysis

(Common to EEE & ME)

Max. Marks: 70 Time: 3 Hours

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Note: 1. Question Paper consists of two parts (**Part-A** and **Part-B)**
2. In Part-A, each question carries **Two marks.**
3. Answer **ALL** the questions in **Part-A** and **Part-B**

PART-A

(Compulsory question)

1.	Answer ALL the following short answer questions (5 X 2 = 10M)		CO	BL
a)	Write the demand determinants		CO1	L1
b)	Describe the economies of scale		CO2	L3
c)	Define Cooperative society		CO3	L1
d)	What are the internal sources of capital		CO4	L1
e)	Write the features of trial balance		CO5	L2

PART-B

Answer *five* questions by choosing one question from each unit (5 x 12 = 60 Marks)

			Marks	CO	BL
		UNIT–I			
2.		Discuss the scope of managerial economics in business decision making.	12M	CO1	L2
		OR			
3.	a)	Define elasticity of demand. Discuss the methods to measure elasticity of demand	6M	CO1	L2
	b)	What do you mean by demand forecasting? How demand of particular commodity can be forecasted?	6M	CO1	L2
		UNIT–II			
4.		If machines were variable and labour fixed, how would the general shape of the short run average cost curve and marginal cost curve change?	12M	CO2	L3
		OR			
5.	a)	Explain the production function and influencing factors.	6M	CO2	L3
	b)	From the following details, find out : (i) Contribution per unit (ii) BEP (iii) Margin of safety (iv) Profit and (v) Volume of sales to earn a profit of Rs.24,000. Fixed cost Rs. 18,000; Variable cost Rs. 30,000 ; Sales Rs. 60,000 ; and units sold 20000.	6M	CO2	L3
		UNIT–III			
6.		Distinguish between the sole trader concern and partnership firm.	12M	CO3	L2
		OR			
7.		Explain the price determination of a firm under perfect competition in the product market.	12M	CO3	L2
		UNIT–IV			
8.		A company is considering the replacement of its existing machine which is obsolete and unable to meet the rapidly rising demand for its product. The company is faced with two alternatives: 1. To buy machine A which is similar to the existing machine or 2. To go in for machine B which is more expensive and has much greater capacity. The cash flows the present level of operations under the TWO alternatives are as follows:			

Cash flows (in lakhs of Rs.) at the end of year:

Years/Machines	0	1	2	3	4	5
Machine-A	-25	-	5	20	14	14
Machine-B	-40	10	14	16	17	15

The company's cost of capital is 10%. Evaluate the machine by calculating the Net Present Value. 12M CO4 L4

OR

9. Define Capital. What are the main sources of raising capital in detail? 12M CO4 L4

UNIT–V

10. From the following balances of Ved & Co. prepare the trading and profit and loss account and balance sheet as on 31-03-2020.

Debit Balances	Amount	Credit Balances	Amount
Drawings	6,300	Capital	1,50,000
Cash at bank	13,870	Discount received	2,980
Bills receivable	1,860	Loans	15,000
Loan and Building	42,580	Purchases return	1,450
Furniture	5,130	Sales	2,81,500
Discount allowed	3,960	Reserve for bad debts	4,650
Bank charges	100	Creditors	18,670
Salaries	6,420		
Purchases	1,99,080		
Stock (opening)	60,220		
Sales return	1,870		
Carriage	5,170		
Rent and Taxes	7,680		
General expenses	3,630		
Plant and Machinery	31,640		
Debtors	82,740		
Bad debts	1,250		
Insurance	750		
	4,74,250		**4,74,250**

Adjustments:

a) Closing stock Rs. 70,000
b) Create a reserve for bad and doubtful debts @10%
c) Insurance prepaid Rs. 50
d) Rent outstanding Rs. 150 and

Interest on loan is due @ 6% p. a. 12M CO5 L5

OR

11. a) Write the advantages of financial analysis for an organization. 6M CO5 L5

b) Given the following information:

Particulars	Rs.
Revenue from Operations	3,40,000
Cost of Revenue from Operations	1,20,000
Selling expenses	80,000
Administrative Expenses	40,000

Find out Gross profit ratio and Operating ratio. 6M CO5 L5

*** End ***

Hall Ticket Number :										

R-20

Code: 20AC41T

II B.Tech. II Semester Regular & Supplementary Examinations July 2023

Probability and Statistics

(Common to CE, ME, CSE, AI&DS and AI&ML)

Max. Marks: 70 Time: 3 Hours

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Note: 1. Question Paper consists of two parts (**Part-A** and **Part-B)**
2. In Part-A, each question carries **Two marks.**
3. Answer **ALL** the questions in **Part-A** and **Part-B**

PART-A

(Compulsory question)

1.	**Answer ALL the following short answer questions** (5 X 2 = 10M)	CO	BL
a)	Write the formula for Rank correlation coefficient with repeated ranks.	CO1	L1
b)	Two cards are drawn from a well shuffled pack of cards .Find probability that they are both aces if the first card is (i) replaced (ii) not replaced	CO2	L2
c)	If the mean of a Poisson variable is 1.8, then find P(X>1)	CO3	L3
d)	Define Type-I and Type-II Errors.	CO4	L3
e)	Explain briefly the Variance Ratio test(F-Test)	CO5	L2

PART-B

Answer *five* questions by choosing one question from each unit (5 x 12 = 60 Marks)

			Marks	CO	BL

UNIT–I

2. Calculate Mean, Median and Mode from the following data.

Class interval	10-20	20-30	30-40	40-50	50-60	60-70	70-80	80-90
Frequency	5	9	13	21	20	15	8	3

12M CO1 L3

OR

3. Find Karl Pearson's coefficient of correlation from the following data

Wages	100	101	102	102	100	99	97	98	96	95
Cost of living	98	99	99	97	95	92	95	94	90	91

12M CO1 L3

UNIT–II

4. a) State Baye's Theorem 2M CO2 L-1

b) In a bolt factory machines A, B, C manufacture 20%, 30% and 50% of the total of their output and 6%, 3% and 2% are defective. A bolt is drawn at random and found to be defective. Find the probabilities that is manufactured from (i) Machine A (ii) Machine B (iii) Machine C 10M CO2 L-3

OR

5. a) A random variable X is defined as the sum of the numbers on the faces when two dice are thrown. Construct Probability distribution table. 3M CO2 L-3

b) For the continuous probability function $f(x) = kx^{-e^{-x}}$ where x≥0,find (i) k (ii) Mean (iii) Variance 9M CO2 L-2

UNIT–III

6. a) Out of 800 families with 5 children each, how many would you expect to have (i) 3 boys (ii) either 2 or 3 boys (iii) atleast one boy? Assume equal probabilities for boys and girls 6M CO3 L-3

b) In a Normal distribution 7% of the items are under 35 and 89% are under 63. Determine the mean and variance of the distribution — 6M CO3 L-3

OR

7. a) Average number of accidents on one day on a national highway is 1.6. Determine the probability that the number of accidents are (i) at least one (ii) Atmost one — 6M CO3 L-3

b) In a sample of 1000 cases the mean of a certain test is 14 and standard deviation is 2.5.Assuming the distribution to be normal, find (i) how many score between 12 and 15? (ii) how many score above 18? (iii) how many score below 18? — 6M CO3 L-3

UNIT–IV

8. a) The mean life of a sample of 10 electric bulbs was found to be 1456 hours with standard deviation of 423 hours. The second sample of 17 bulbs chosen from a different batch shoed a mean life of 1280 hours with standard deviation of 398 hours. Is there a significant difference between the means of two batches at 5% level of significance? — 8M CO4 L-4

b) A random sample of 400 items is found to have mean 82 and Standard deviation of 18. Determine maximum error of estimation at 95% confidence interval. Also construct 95% confidence interval. — 4M CO4 L-4

OR

9. a) An oceanographer wants to whether the depth of the ocean in a certain region is 57.4 fathoms, as had previously been recorded. What can he conclude at the 0.05 level of significance, if readings taken at 40 random locations in the given region yielded a mean of 59.1 fathoms with standard deviation of 5.2 fathoms? — 4M CO4

b) In a random sample of 1000 persons from town A, 400 are found to be consumers of wheat. In a sample of 800 from town B, 400 are found to be consumers of wheat. Do these data reveal a significant difference between town A and town B, so far as the proportion of wheat consumers is concerned? Consider level of significance as 1%. — 8M CO4 L-4

UNIT–V

10. To compare two kinds of bumper guards, 6 of each kind were mounted on a car and then the car was run into a concrete wall. The following are the costs of repairs.

Guard I	107	148	123	165	102	119
Guard II	134	115	112	151	133	129

Use 0.01 level of significance to test whether the difference between two sample means is significant. — 12M CO5 L-4

OR

11. Mechanical engineers, testing a new welding technique, classified welds both with respect to appearance and an X-ray inspection. Test for performance with respect to appearance and X ray inspection are independent (consider level of significance as 5%)

Quality

X-Ray	Bad	Normal	Good
Bad	20	7	3
Normal	13	51	16
Good	7	12	21

12M CO5 L-4

*** End ***

Hall Ticket Number :										

R-20

Code: 20A341T

II B.Tech. II Semester Regular & Supplementary Examinations July 2023

Theory of Machines

(Mechanical Engineering)

Max. Marks: 70 Time: 3 Hours

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Note: 1. Question Paper consists of two parts (**Part-A** and **Part-B)**
2. In Part-A, each question carries **Two marks.**
3. Answer **ALL** the questions in **Part-A** and **Part-B**

PART-A

(Compulsory question)

			CO	BL
1.	**Answer ALL the following short answer questions**	(5 X 2 = 10M)		
	a) Differentiate structure and machine.		CO1	L2
	b) Give an expression for coriolosis component of acceleration.		CO2	L2
	c) Define interference in gears.		CO3	L2
	d) List out the conditions for dynamic balancing.		CO4	L2
	e) List out various types of vibrations		CO5	L2

PART-B

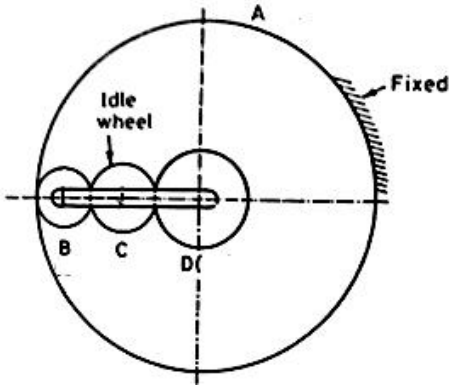
Answer *five* questions by choosing one question from each unit (5 x 12 = 60 Marks)

			Marks	CO	BL
	UNIT–I				
2.	What do you mean by inversion of mechanism? Explain with sketches all inversions of four bar chain		12M	CO1	L2
	OR				
3.	a) Define kinematic pair. How kinematic pairs are classified? Explain with neat sketches.		6M	CO1	L2
	b) Differentiate between i) Binary joint and binary link ii) Mechanism and machine iii) Completely constrained motion and incompletely constrained motion		6M	CO1	L2
	UNIT–II				
4.	A link AB of a four-bar linkage ABCD revolves uniformly at 120 r.p.m in a clockwise direction. The link AD is fixed. Find the angular acceleration of links BC and CD. Given AB = 7.5 cm, BC = 17.5 cm, EC = 5 cm, CD = 15 cm, DA=10 cm and angle BAD = 90^o.		12M	CO2	L4
	OR				
5.	Each wheel of a four-wheeled, rear engine automobile has a moment of inertia of 2.4 kg-m^2 and an effective diameter of 660 mm. The rotating parts of the engine have a moment of inertia of 1.2 kg-m^2. The gear ratio of the engine to the back wheel is 3 to 1. The engine axis is parallel to the rear axle and the crank shaft rotates in the same sense as the road wheels. The mass of the vehicle is 2200 kg and the centre of mass is 550 mm above the road level. The track width of the vehicle is 1.5 m. Determine the limiting speed of the vehicle around a curve with 80 m radius so that all the four wheels maintain contact with the road surface.		12M	CO2	L4
	UNIT–III				
6.	a) Derive an expression for the minimum number of teeth required on the wheel in order to avoid interference in involute gear teeth.		6M	CO3	L2

a) Calculate (i) length of path of contact, (ii) arc of contact and (iii) the contact ratio when a pinion having 23 teeth drives a gear having teeth 57. The profile of the gears is involute with pressure angle 20°, module 8 mm and addendum equal to one module. 6M CO3 L4

OR

7. An epicyclic gear train as shown in figure is composed of a fixed annular wheel A having 180 teeth. Meshing with A is a wheel B which drives wheel D through an idle wheel C, D being concentric with A. Wheels B and C are carried on an arm which revolves clockwise at 80 r.p.m about the axis of A or D. If the wheels B and D are having 30 teeth and 48 teeth respectively, find the number of teeth of C and the speed and sense of rotation of C.



12M CO3 L4

UNIT–IV

8. A shaft carries four masses A, B, C and D of magnitude 200 kg, 300 kg, 400kg and 200 kg respectively and revolving at radii 80 mm, 70 mm, 60 mm and 80 mm in planes measured from A at 300 mm, 400 mm and 700 mm. The angles between the cranks measured anti-clockwise are A to B 45°, B to C 70° and C to D 120°. The balancing masses are to be placed in planes X and Y. The distance between the planes A and X is 100 mm, between X and Y is 400 mm and between Y and D is 200 mm. If the balancing masses revolve at a radius of 100mm, find their magnitudes and angular positions. 12M CO4 L4

OR

9. The cranks of a two-cylinder, uncoupled inside cylinder locomotive, are at right angles and are 325 mm long. The cylinders are 675 mm apart. The rotating mass per cylinder is 200 kg at the crank pin and the mass of the reciprocating parts per cylinder is 240 kg. The wheel centre lines are 1.5 m apart. The whole of the rotating and two-third of the reciprocating masses are to be balanced and balance masses are to be placed in the planes of the rotation of the driving wheels at a radius of 800 mm. Find (i) the magnitude and direction of balancing masses (ii) the magnitude of hammer blow (iii) variation of tractive force and (iv) maximum swaying couple at a crank sped of 240 r.p.m. 12M CO4 L4

UNIT–V

10. Explain the term 'whirling speed' or 'critical speed' of a shaft. Prove that the whirling speed for a rotating shaft is the same as the frequency of natural transverse vibration. 12M CO5 L4

OR

11. Write about torsional equivalent shaft. Derive natural frequency of free torsional vibrations of two rotor system. 12M CO5 L4

*** End ***

Hall Ticket Number :										

R-20

Code: 20A343T

II B.Tech. II Semester Regular & Supplementary Examinations July 2023

Design of Machine Elements - I

(Mechanical Engineering)

Max. Marks: 70 Time: 3 Hours

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Note: 1. Question Paper consists of two parts (**Part-A** and **Part-B)**
2. In Part-A, each question carries **Two marks.**
3. Answer **ALL** the questions in **Part-A** and **Part-B**

PART-A

(Compulsory question)

1.	Answer ALL the following short answer questions (5 X 2 = 10M)	CO	BL
a)	What are preferred numbers?	CO1	L1
b)	Define Endurance limit	CO2	L1
c)	What are the types of stresses induced in welded joints.	CO3	L1
d)	What are the applications of cotter joints	CO4	L1
e)	What type of stresses is induced in shafts?	CO5	L1

PART-B

Answer *five* questions by choosing one question from each unit (5 x 12 = 60 Marks)

			Marks	CO	BL
		UNIT–I			
2.	a)	Explain the design considerations in machine design process.	7M	CO1	L2
	b)	A solid shaft of length 1m, transmits 100 kW at 180 rpm. If the permissible shear stress for the shaft material is 60 MPa and the angle of twist in the shaft is not to exceed 0.50, determine the diameter of the shaft. Take the modulus of rigidity as 84 GPa.	5M	CO1	L6
		OR			
3.		A bolt is subjected to an axial pull of 10 kN and a transverse shear force of 5kN. The yield strength of the bolt material is 300 MPa. Considering a factor of safety of 2.5. Determine the diameter of the bolt using (i) maximum normal stress theory (ii) Maximum shear stress theory. Take poisson's ratio as 0.25	12M	CO1	L6
		UNIT–II			
4.	a)	Define fluctuating stress. Draw the stress strain curve for fluctuating stress	6M	CO2	L1
	b)	Explain Soderberg criterion for fatigue failure	6M	CO2	L2
		OR			
5.		A machine component is subjected to a flexural stress which fluctuates between + 300 MN/m^2 and – 150 MN/m^2. Determine the value of minimum ultimate strength according to (i) Goodman relation and (ii) Soderberg relation. Take yield strength = 0.55 Ultimate strength; Endurance strength = 0.5 Ultimate strength; and factor of safety = 2.	12M	CO2	L6
		UNIT–III			
6.	a)	Define the following terms for screwed joints: (i) Major diameter (ii) Pitch	4M	CO3	L1
	b)	Enumerate the design procedure of bolted joints subjected to eccentric loading.	8M	CO3	L2

OR

7. A rectangular steel plate is welded as a cantilever to a vertical column and supports a single concentrated load P, as shown in Fig.1.Determine the weld size if shear stress in the same is not to exceed 140 MPa.

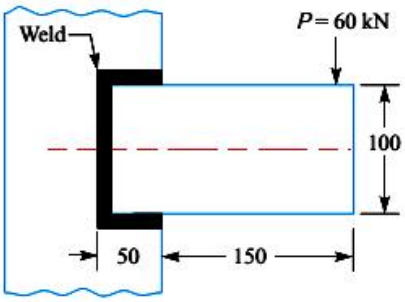

Fig.1 12M CO3 L6

UNIT–IV

8. a) Explain the design procedure for a sunk key. 4M CO4 L2

   b) It is required to design a square key for fixing a gear to a shaft which transmits 20kW power at 800 RPM. Both the shaft and the key are made of 45C8 steel having the stress value of 480MPa and assume factor of safety of 2. 8M CO4 L6

OR

9. Design a knuckle joint for a tie rod of a circular section to sustain a maximum pull of 70 kN. The ultimate strength of the material of the rod against tearing is 420 MPa. The ultimate tensile and shearing strength of the pin material are 510 MPa and 396 MPa respectively. Determine the tie rod section and pin section. Take factor of safety = 6. 12M CO4 L6

UNIT–V

10. A shaft supported at the ends in ball bearings as shown in Fig.2 carries a straight tooth spur gear at its mid span and is to transmit 7.5 kW at 300 r.p.m. The pitch circle diameter of the gear is 150 mm. The distances between the centre line of bearings and gear are 100 mm each. If the shaft is made of steel and the allowable shear stress is 45 MPa, determine the diameter of the shaft. Show in a sketch how the gear will be mounted on the shaft; also indicate the ends where the bearings will be mounted? The pressure angle of the gear may be taken as 20°.

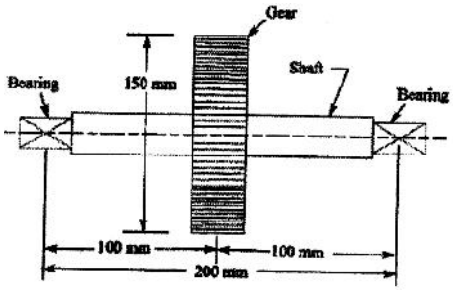

Fig.2 12M CO5 L6

OR

11. Design a protected type of Cast iron flange coupling for a steel shaft transmitting 15KW at 200 rpm, having an allowable shear stress of 40 N/mm^2 .The working stress in the bolts should not exceed 30 N/mm^2 .Assume that the same material is used for the shaft and key and that the crushing stress is twice the value of its shear stress and maximum torque is 25 % greater than the full load torque. Take shear stress of Cast iron as 15 N/mm^2. 12M CO5 L6

*** End ***

Hall Ticket Number :										

R-20

Code: 20A342T

II B.Tech. II Semester Regular & Supplementary Examinations July 2023

Fluid Mechanics and Hydraulic Machines

(Mechanical Engineering)

Max. Marks: 70 Time: 3 Hours

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Note: 1. Question Paper consists of two parts (**Part-A** and **Part-B)**
2. In Part-A, each question carries **Two marks.**
3. Answer **ALL** the questions in **Part-A** and **Part-B**

PART-A

(Compulsory question)

		CO	BL
1.	Answer ALL the following short answer questions (5 x 2 = 10 Marks)		
a)	Express the absolute pressure of 4 bar in the water head, if the barometer reading is 760 mm of Hg.	1	3
b)	Highlight the fundamental difference between a Venturi meter and an Orifice meter.	2	2
c)	A 50 mm diameter water jet moves with a velocity of 20 m/s and impinges normally on a plate. Determine the force exerted on the plate, which moves with a velocity of 7 m/s.	3	3
d)	Differentiate between the turbine and pump.	4	2
e)	Define indicator diagram?	5	2

PART-B

Answer *five* questions by choosing one question from each unit (5 x 12 = 60 Marks)

			Marks	CO	BL
		UNIT–I			
2.	a)	Define mass density, specific weight, specific volume and specific gravity	4M	1	2
	b)	The dynamic viscosity of oil used for lubrication between a shaft and sleeve is 6 poise. The shaft is of diameter 0.4m and rotates at 190 r.p.m. Calculate the power lost in the bearing for a sleeve length of 90mm. The thickness of the oil film is 1.5mm	8M	1	5
		OR			
3.		A U-tube differential manometer has been arranged to measure the pressure difference between two points A and B in a sloping pipeline conveying water. The point B lies 20 cm higher than point A. If the difference in the level of mercury in limbs of U-tube is 60 cm, calculate the pressure difference ($P_A \sim P_B$).	12M	1	2
		UNIT–II			
4.		State Bernoulli's theorem in terms of energy and head. Determine the flow rate of water through a pipe of 300 mm diameter in an inclined position, where a Venturi meter of throat diameter 150 mm is inserted. The pressure difference between the inlet and throat is measured by a liquid of specific gravity 0.7 in an inverted U-tube manometer which gives a reading of 260 mm. The head loss between the inlet and throat is 0.3 times the kinetic head of the pipe.	12M	2	5
		OR			
5.		Two pipes each 500 mm long are available for connecting to a reservoir from which a flow of 0.15 m^3/s is required. If the diameters of the two pipes are 0.40m and 0.2 m, respectively, determine the ratio of the head loss when the pipes are connected in series to the head loss when they are connected in parallel. Neglect minor losses.	12M	2	5

UNIT–III

6.		A water jet moving at 60 m/s is deflected by a vane moving at 25 m/s in a direction 30º to the jet direction. The water jet leaves the blades normally to the motion of the vanes. Draw the inlet and exit velocity triangles for the vane. Assuming, the relative velocity at the exit is 85% that of the inlet and no shock at the inlet, determine the following. i) The vane angle at the inlet and exit ii) The work done per kg of water entering the vanes	12M	3	5

OR

7.	a)	What do you mean Hydroelectric power plant? Give the basis of selection and classification of these plants. Give the detailed construction and working principle of the Hydroelectric plant	6M	3	2
	b)	A free jet moving with a velocity V strikes normally on a series of flat plates moving with a velocity of u and mounted radially on the periphery of a wheel. Determine the efficiency of the plates.	6M	3	5

UNIT–IV

8.		A Pelton wheel turbine develops 9000 Kw under a head of 300m. The turbine speed is 550 rpm and ratio of jet dia to wheel dia is 1/10. The hydraulic, volumetric and mechanical efficiencies are 0.98, 0.95 and 0.92 respectively. The speed ratio is 0.46 and coefficient of velocity is 0.98. Calculate the no of jets.	12M	4	3

OR

9.		A Francis turbine has to be designed to develop 367.5 kW under a head of H = 70 m while running at N= 750 r.p.m. Ratio of width of runner to diameter of runner, n = 0.1, inner diameter is half the outer diameter. Flow ratio = 0.15, hydraulic efficiency = 95%, mechanical efficiency = 84%. Four percent of the circumferential area of runner to be occupied by the thickness of vanes, velocity of flow is constant and the discharge is radial at exit. Calculate: i. The diameter of the wheel, ii. The quantity of water supplied, and iii. The guide vane angle at inlet and runner vane angles at inlet and exit.	12M	4	3

UNIT–V

10.		The outer diameter of the impeller of a Centrifugal pump is 400 mm and the outlet width is 50 mm. The pump is running at 800 rpm and working against a head of 15 m. The vane angle at the outlet is 40° and manometry efficiency is 75%. Determine (i) Flow velocity at the outlet (ii) Wayer velocity leaving the vane (iii) Angle made by the absolute velocity with the motion direction at outlet (iv) Discharge.	12M	5	5

OR

11.		A single-acting reciprocating pump running at 40 rpm discharges 1 m^3 of water per minute. The pump has a stroke of 400 mm, and a bore of 200 mm. The delivery and suction heads are 20 m and 5 m respectively. Determine the slip of the pump and the power required to drive the pump.	12M	5	5

*** End ***