

Hall Ticket Number :

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R-20

Code: 20AC45T

II B.Tech. II Semester Regular Examinations August 2022

Managerial Economics & Financial Analysis

(Common to EEE & ME)

Max. Marks: 70

Time: 3 Hours

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

- | | CO | Blooms Level |
|---|-----|--------------|
| 1. Answer ALL the following short answer questions (5 X 2 = 10M) | | |
| a) Explain various types of demand | CO1 | L3 |
| b) What are external economies of scale? Explain any two. | CO2 | L1 |
| c) Explain disadvantages of Joint Hindu family. | CO3 | L3 |
| d) What are the features of capital budgeting? | CO4 | L1 |
| e) What are the advantages of Book Keeping? | CO5 | L1 |

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

- | | Marks | CO | Blooms Level |
|--|-------|-----|--------------|
| UNIT-I | | | |
| 2. a) Define Managerial Economics. Explain its nature. | 6M | CO1 | L1 |
| b) Explain the factors governing demand forecasting. | 6M | CO1 | L2 |
| OR | | | |
| 3. a) Explain various survey methods of demand forecasting. | 6M | CO1 | L2 |
| b) Define Price elasticity of demand? Explain its types. | 6M | CO1 | L1 |
| UNIT-II | | | |
| 4. a) Discuss about Cob-Douglas production function. | 6M | CO2 | L2 |
| b) A High-Tech rail can Carry a maximum of 36000 passengers per annum at a fare of Rs 400. The variable cost of passenger is Rs.150. While the Fixed Costs are 25,00,000 per year. Find The Break-Even Point in terms of number of passengers and also in terms of fare collections. | 6M | CO2 | L4 |
| OR | | | |
| 5. a) Discuss law of variable proportions with assumed data | 6M | CO2 | |
| b) Define ISO-Quant. What are its Features? Explain Briefly | 6M | CO2 | L1 |
| UNIT-III | | | |
| 6. a) Explain the price determination in Monopolistic competitive market. | 6M | CO3 | L2 |
| b) Distinguish between 'partnership' and 'Joint Stock Company' business. | 6M | CO3 | L4 |
| OR | | | |
| 7. a) Describe 'monopoly' and 'perfect competition' with suitable examples. | 6M | CO3 | L2 |
| b) Explain the merits and demerits of government companies | 6M | CO3 | |
| UNIT-IV | | | |
| 8. a) Differentiate between NPV and payback period method. | 6M | CO4 | L4 |
| b) What do you mean by capital? Explain its significance. | 6M | CO4 | L1 |
| OR | | | |
| 9. a) Define long term capital. Explain various sources of long-term capital. | 6M | CO4 | L1 |

9. b) Consider the case of the company with the following two investment alternatives each costing 4,50,000. The details of the cash inflows are as follows:

Year	Cash inflows in Rs.	
	Project-1	Project- 2
1	1,50,000	3,00,000
2	2,50,000	2,00,000
3	3,00,000	1,50,000

Calculate:

- i. Pay Back Period ii. Accounting Rate of Return (ARR)

6M CO4 BL3

UNIT-V

10. a) Discuss in detail how a liquidity and solvency ratios are useful in the financial statements.
- b) Define accounting. Explain various Principles of accounting.

6M CO5 L4

6M CO5 L1

OR

11. From the following trial balance of Mr. Suresh and Co. as at December 31, 2020, prepare trading, profit and loss account for the year ending December 31, 2020 and a balance sheet as on that date:

	Dr (Rs)	Cr (Rs)
Purchase of materials	32,000	-
Productive wages	13,000	-
Sales	-	60,000
Salaries	4,000	-
Traveling expenses	1,000	-
Carriage inwards	550	-
Insurance	300	-
Commission	650	-
Rent and rates	1,000	-
Cash in hand	350	-
Cash at bank	5,550	-
Repairs	600	-
Sundry expenses	110	-
Mortgage	-	6,100
Buildings	8,000	-
Machinery	3,000	-
Furniture	1,000	-
Stock in hand (1.1.2020)	11,500	-
Capital	-	21,310
Sundry debtors	9,000	-
Sundry creditors	-	4,200
Total	91,610	91610

12M CO5 BL3

Adjust the following:

- a) Depreciate the following:
- Building @ 10 % per annum
 - Machinery @ 20 % per annum
 - Furniture @ 15 % per annum
- b) Provide for bad debts Rs.100
- c) Outstanding insurance Rs.50
- d) Closing stock Rs. 12,000

*** End ***

Hall Ticket Number :

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R-20

Code: 20AC41T

II B.Tech. II Semester Regular Examinations August 2022

Probability and Statistics

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

Max. Marks: 70

Time: 3 Hours

- Note: 1. Question Paper consists of two parts (**Part-A** and **Part-B**)
 2. In Part-A, each question carries **Two mark**.
 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 | Blooms Level |
|---|----|--------------|
| a) The aerokopter AK 1-3 is an ultra-lightweight manned kit helicopter with a high rotor tip speed. A sample of 8 measurements of speed, in meters per second yielded 204, 208, 205, 211, 207, 201, 201, 203. Find the mean and mode for this sample. | 1 | L1 |
| b) State the addition theorem of probability. Explain it if the events are (i) mutually exclusive and (ii) Independent. | 2 | L1 |
| c) Write the conditions for which binomial distribution can be approximated by Poisson distribution. | 3 | L1 |
| d) Discuss about the errors that occur in sampling. | 4 | L1 |
| e) Write the test statistic for the difference between two variances. | 5 | L1 |

PART-B

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

Marks CO Blooms Level

UNIT-I

2. Calculate the mean, median and mode for the frequency distribution given below:

Height (nm)	205-245	245-285	285-325	325-365	365-405	Total
Frequency	3	11	23	9	4	50

12M 1 L2

OR

3. a) Find Karl Pearson's coefficient of correlation between sales and expenses of the following 10 firms:

Firm	1	2	3	4	5	6	7	8	9	10
Sales	50	50	55	60	65	65	65	60	60	50
Expenses	11	13	14	16	16	15	15	14	13	13

6M 1 L3

- b) Calculate Spearman's rank correlation coefficient between advertisement cost and sales from the following data:

Advertisement cost ('000 Rs)	39	65	62	90	82	75	25	98	36	78
Sales (Lakhs)	47	53	58	86	62	68	60	91	51	84

6M 1 L3

UNIT-II

4. a) Two cards are drawn at random from an ordinary deck of 52 cards. What is the probability of getting two aces if

- (i) the first card is replaced before the second card is drawn;
 (ii) the first card is not replaced before the second card is drawn?

6M 2 L3

- b) State and prove Baye's theorem.

6M 2 L2

OR

5. A random variables X has the following probability function:

x	0	1	2	3	4	5	6	7
P(x)	0	K	2K	2K	3K	K ²	2K ²	7K ² +K

Determine: (i) K (ii) Evaluate $P(X < 6)$ (iii) Evaluate $P(0 < X < 5)$ (iv) mean and variance

12 C02 L5

UNIT-III

6. a) Fit a binomial distribution to the following data:

x:	0	1	2	3	4	5
f:	10	10	30	25	15	10

6M 3 L3

- b) Given a random variable having the normal distribution with mean 16.2 and variance 1.5625, find the probabilities that it will take on a value (i) greater than 16.8, (ii) between 13.6 and 18.8.

6M 3 L3

OR

7. a) If a random variable X follows Poisson distribution such that $P(X = 1) = P(X = 2)$, find (i) the mean and variance of the distribution (ii) $P(X = 0)$.

6M 3 L3

- b) An automatic machine fills distilled water in 500 ml bottles. Actual volumes are normally distributed about a mean of 500 ml, and standard deviation 20ml.

(i) What proportion of the bottles are filled with water outside the tolerance limit of 475 ml to 525 ml?

(ii) To what value does the standard deviation need to be adjusted if 99% of the bottles must be within tolerance limits?

6M 3 L3

UNIT-IV

8. a) A random sample of size 100 is taken from a population with standard deviation 5.1. Given that the sample mean is 21.3, construct a (i) 95% (ii) 98% confidence interval for the population mean.

8M 4 L3

- b) Write the procedure in testing the hypothesis.

4M 4 L1

OR

9. a) Suppose that we want to estimate the true proportion of defectives in a very large shipment of adobe bricks, and that we want to be at least 95% confidence that the error is at most 0.04. How large a sample will we need if (i) we have no idea what the true proportion might be;

(ii) we know that the true proportion doesn't exceed 0.12?

6M 4 L3

- b) To test the claim that the resistance of electric wire can be reduced by more than 0.050 ohm by alloying, 32 values obtained for standard wire yielded mean of 0.136 ohm and standard deviation 0.004 ohm, and another 32 values obtained for alloyed wire yielded mean 0.083 ohm and standard deviation 0.005 ohm. At 0.05 level of significance, does this support the claim?

6M 4 L3

UNIT-V

10. Two horses A and B were tested according to the time (in seconds) to run a particular track with the following results. Test whether the two horses have the same running capacity?

Horse A	28	30	32	33	33	29	34
Horse B	29	30	30	24	27	29	--

12M 5 L3

OR

11. From the following data find whether there is any significant liking in the habit of taking soft drinks among the categories of the employees.

Soft drinks	Clerks	Teachers	Officers
Pepsi	10	25	65
Thumsup	15	30	65
Fanta	50	60	30

12 5 L1

*** End ***

Code: 20A341T

II B.Tech. II Semester Regular Examinations August 2022

Theory of Machines
(Mechanical Engineering)

Max. Marks: 70

Time: 3 Hours

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

PART-A

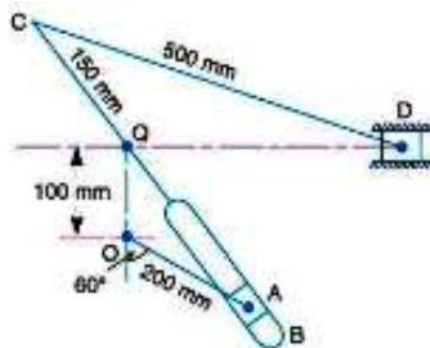
(Compulsory question)

1. Answer ALL the following short answer questions (5 X 2 = 10M)	CO	Blooms Level
a) What is the significance of degrees of freedom of a kinematic chain when it functions as a mechanism?	1	L2
b) Explain the application of gyroscopic principles to aircrafts.	2	L2
c) Explain the terms Contact ratio and Pressure angle as related to gears.	3	L2
d) What is the effect of variation of pressure on the rails in locomotives?	4	L2
e) In a multi-rotor system of torsional vibrations, if the number of rotors is n, how many number of nodes does it possess?	5	L2

PART-B

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

	Marks	CO	Blooms Level
UNIT-I			
2. Sketch and explain the various inversions of a single slider crank chain.	12M	1	L2
OR			
3. What is the condition for correct steering? Discuss the relative advantages and disadvantages of the two types of steering gear mechanisms.	12M	1	L2
UNIT-II			
4. Fig. 1 shows a quick return motion mechanism in which the driving crank OA rotates at 120 r.p.m. in a clockwise direction. For the position shown, determine the magnitude and direction of 1. the acceleration of the block D ; and 2. the angular acceleration of the slotted bar QB.			

**Fig.1**

	12M	2	L4
OR			
5. A turbine rotor of a ship as mass of 3500kgs it has a radius of gyration of 0.45 meters and speed of 3000r.p.m. clockwise when looking from stern. Determine the gyroscopic couple and its effects on the ship.			
i) When ship is steering to the left on the curve of 100 mm radius at a speed of 36 km/hr			
ii) When ship is pitching in a simple harmonic motion, the bow falling with its maximum velocity. The period of pitching is 40 seconds and total angular displacements between the two extreme positions of the pitching is 12°.	12M	2	L3

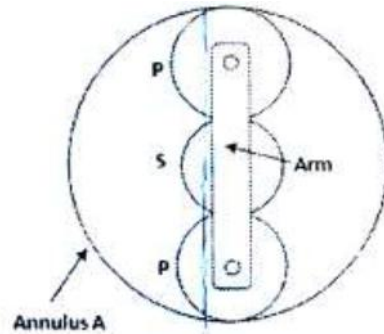
UNIT-III

6. Two 20° involute spur gear mesh externally and give a gear ratio of 3. The module is 3 mm and the addendum is equal to 1.1 modules. If the pinion rotates at 120 rpm, determine: i) minimum number of teeth on each wheel to avoid interference ii) contact Ratio.

12M 3 L4

OR

7. An epicyclic gear train as shown in Fig.2, has a sun wheel S of 30 teeth and two planet wheels P of 50 teeth. The planet wheel mesh with the internal teeth of a fixed annular A. The driving shaft carrying the sun wheel rotates at 300 rpm. The driven shaft is connected to an arm which carries the planet wheel. Determine the speed of the driven shaft.

**Fig.2**

12M 3 L4

UNIT-IV

8. A shaft carries four masses A, B, C and D of magnitude 200 kg, 300 kg, 400 kg 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 anticlockwise 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 100 mm, find their magnitudes and angular positions.

12M 4 L4

OR

9. An inside cylinder locomotive has its cylinder centre lines 0.7 m apart and has a stroke of 0.6 m. The rotating masses per cylinder are equivalent to 150 kg at the crank pin, and the reciprocating masses per cylinder to 180 kg. The wheel centre lines are 1.5 m apart. The cranks are at right angles. The whole of the rotating and $\frac{2}{3}$ of the reciprocating masses are to be balanced by masses placed at a radius of 0.6 m. Find the magnitude and direction of the balancing masses. Find the fluctuation in rail pressure under one wheel, variation of tractive effort and the magnitude of swaying couple at a crank speed of 300 r.p.m.

12M 4 L4

UNIT-V

10. A shaft 1.5 m long, supported in flexible bearings at the ends carries two wheels each of 50 kg mass. One wheel is situated at the centre of the shaft and the other at a distance of 375 mm from the centre towards left. The shaft is hollow of external diameter 75 mm and internal diameter 40 mm. The density of the shaft material is 7700 kg/m^3 and its modulus of elasticity is 200 GN/m^2 . Find the lowest whirling speed of the shaft, taking into account the mass of the shaft.

12M 5 L4

OR

11. The two rotors A and B are attached to the end of a shaft 500 mm long. The mass of the rotor A is 300 kg and its radius of gyration is 300 mm. The corresponding values of the rotor B are 500 kg and 450 mm respectively. The shaft is 70 mm in diameter for the first 250 mm ; 120 mm for the next 70 mm and 100 mm diameter for the remaining length. The modulus of rigidity for the shaft material is 80 GN/m^2 . Find : 1. The position of the node, and 2. The frequency of torsional vibration.

12M 5 L4

*** End ***

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R-20

Code: 20A343T

II B.Tech. II Semester Regular Examinations August 2022

Design of Machine Elements - I

(Mechanical Engineering)

Max. Marks: 70

Time: 3 Hours

- Note: 1. Question Paper consists of two parts (**Part-A** and **Part-B**)
 2. In Part-A, each question carries **Two mark**.
 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 = 10 M) | CO | Blooms Level |
| a) List any two important mechanical properties of materials. | | CO1 | L2 |
| b) What is finite and infinite life with respect to endurance stress? | | CO2 | L2 |
| c) Explain preloading of bolts. | | CO3 | L2 |
| d) What are the stresses induced in a rectangular cross section key? | | CO4 | L2 |
| e) Why hollow shafts are preferred over solid shafts? | | CO5 | L2 |

PART-B

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

Marks	CO	Blooms Level
-------	----	--------------

UNIT-I

- | | | | | |
|----|---|-----|-----|----|
| 2. | A vertical steel rod of rectangular cross section 1.2 m long is struck axially by a load of 1 kN that falls on to it from a height of 30 mm. The maximum instantaneous stress is to be limited to 120 MPa. Taking the width of the rectangle as twice its thickness, find the width and thickness. E = 200 GPa. | 12M | CO1 | L4 |
|----|---|-----|-----|----|

OR

- | | | | | |
|----|---|-----|-----|----|
| 3. | A bolt is subjected to a tensile load of 30 kN and a shear load of 15 kN. The material has a yield stress of 400 MPa. Taking the factor of safety as 2, find the root diameter of the bolt as per the following theories of failure:
a) Maximum normal stress theory
b) Maximum shear stress theory and
c) Maximum distortion energy theory. | 12M | CO1 | L6 |
|----|---|-----|-----|----|

UNIT-II

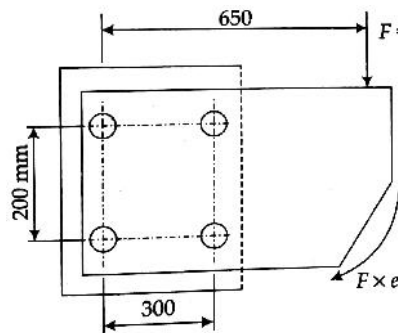
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|----|--|-----|-----|----|
| 4. | What is stress concentration? What are the reasons for stress concentration? How to minimize it? | 12M | CO2 | L2 |
|----|--|-----|-----|----|

OR

- | | | | | |
|----|---|-----|-----|----|
| 5. | A cantilever beam of rectangular cross section has a depth of 180 mm and length of 1.2 m. The free end of the beam is subjected a transverse load that fluctuates from 90 kN downward to 30 kN upward. The material has yield stress of 360 MPa and normal endurance stress in reverse bending of 300 MPa. The load factor for bending is 1. The size and surface factors are 0.85 and 0.9 respectively. Find the width of the beam taking factor of safety as 2.1. | 12M | CO2 | L6 |
|----|---|-----|-----|----|

UNIT-III

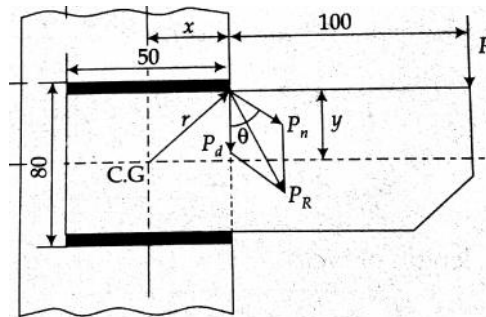
6. Find the diameter of the bolt for a bracket loaded as shown in the figure. The load is $F = 15 \text{ kN}$. The yield stress for the bolt material is 420 MPa and $\text{FOS} = 3$.



12M CO3 L6

OR

7. Determine the size of weld for a bracket welded as shown in the figure. It is subjected to a load of 30 kN . The allowable stress in the weld is 75 MPa .



12M CO3 L6

UNIT-IV

8. A rectangular cross section key $8 \times 7 \times 40 \text{ mm}$ is used to transmit 12 kW at 800 rpm . The shaft diameter is 30 mm . The allowable crushing and shear stresses for the key are 130 MPa and 72 MPa respectively. Check whether the key is safe or not.

12M CO4 L6

OR

9. Design a cotter joint of socket and spigot type, to support an axial load of 90 kN . The rods and cotter are made of the same material with $\tau = 90 \text{ MPa}$, $\sigma_c = 150 \text{ MPa}$ and $\sigma_t = 60 \text{ MPa}$.

12M CO4 L6

UNIT-V

10. Determine the diameters of a hollow steel shaft required to transmit 30 kW at 1500 rpm . The bending moment on the shaft is 1200 N-m . The diameters' ratio is 0.6 . The allowable tensile and shear stresses for the shaft material are 100 MPa and 60 MPa respectively.

12M CO5 L6

OR

11. Design a muff coupling to transmit 7.2 kW at 400 rpm . The following stresses may be used:

Allowable shear stress for shaft and key = 55 MPa
 Allowable shear stress for the Cast Iron sleeve = 10 MPa
 Allowable crushing stress in the key = 110 MPa .

12M CO5 L6

*** End ***

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R-20

Code: 20A342T

II B.Tech. II Semester Regular Examinations August 2022

Fluid Mechanics and Hydraulic Machines

(Mechanical Engineering)

Max. Marks: 70

Time: 3 Hours

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

PART-A

(Compulsory question)

- | | CO | Blooms Level |
|--|-----|--------------|
| 1. Answer ALL the following short answer questions (5 X 2 = 10M) | | |
| a) What is differential manometer? Where it is used? | CO1 | BL1 |
| b) Write the Euler's equation of motion along a streamline. | CO2 | BL1 |
| c) Derive an expression for the force exerted by a jet on moving flat plate. | CO3 | BL2 |
| d) Why does a Pelton wheel not possess any draft tube? | CO4 | BL2 |
| e) State NPSH in centrifugal pump. | CO5 | BL2 |

PART-B

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

- | | Marks | CO | Blooms Level |
|--|-------|-----|--------------|
| UNIT-I | | | |
| 2. 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 | 12M | 1 | L5 |
| OR | | | |
| 3. a) Define and distinguish between steady flow and uniform flow. Give two examples of each flow. | 8M | CO1 | BL2 |
| b) Define stream line. | 4M | CO1 | BL2 |
| UNIT-II | | | |
| 4. a) Explain how Reynold's experiment is conducted and bring its practical uses. | 6M | CO2 | BL3 |
| b) Write Darcy's equation and explain its significance. | 6M | CO2 | BL2 |
| OR | | | |
| 5. A horizontal venturimeter with inlet and throat diameters 30 cm and 15 cm respectively is used to measure the flow of water. The reading of differential manometer connected to the inlet and throat is 20 cm of mercury. Determine the rate of flow. Take Cd=0.98. | 12M | CO2 | BL5 |

UNIT-III

7. A water jet coming out with a velocity of 17m/sec from the nozzle of 4cm in diameter strikes on a series of plates mounted on a wheel which is moving with a velocity of 6m/sec .Obtain the power developed by the wheel and efficiency of the system. 12M CO3 BL4

OR

6. a) Explain the concepts of velocity triangles by considering a jet striking an unsymmetrical moving curved vane tangentially at one of the tips. 6M CO3 BL3
- b) A 150mm diameter jet moving at 30m/s impinges on a curved vane moving at 15m/s in the direction of the jet. The jet leaves the vanes at 60° with the direction of motion of the vanes. Calculate: (i) Force exerted by the jet in the direction of motion of vanes (ii) Work done by the jet per second 6M CO3 BL3

UNIT-IV

8. Differentiate between
- i) Impulse and Reaction turbine
- ii) Radial and Axial flow Turbines
- iii) Inward and Outward Radial flow turbines 12M CO4 BL2

OR

9. a) What is a draft-tube? Why is it used in a reaction turbine? 6M CO4 BL2
- b) A turbine is to operate under a head of 25 meters at 200 rpm. The discharge is $9 \text{ m}^3/\text{sec}$. If the turbine efficiency is 90% determine:
- (i) Specific speed of the turbine (ii) power generated (iii) performance under a head of 20 meters. Also state the type of the turbine. 6M CO4 BL4

UNIT-V

10. A single – acting reciprocating pump running at 50rpm, delivers $0.01 \text{ m}^3/\text{s}$ of water. The diameter of the piston is 200mm and stroke length 400mm. Determine the theoretical discharge of the pump and co-efficient of discharge, and slip and the percentage slip of the pump. 12M CO5 BL4

OR

11. Define a centrifugal pump. Explain the working of a single-stage centrifugal pump with sketches 12M CO5 BL3

*** End ***