ME502

M S RAMAIAH INSTITUTE OF TECHNOLOGY

(AUTONOMOUS INSTITUTE, AFFILIATED TO VTU)
### BANGALORE – 560 054

SEMESTER END EXAMINATIONS – JANUARY 2016

Course & Branch : **B.E.-Mechanical Engineering**		**Semester** : **V**
Subject : **Dynamics of Machines**		**Max. Marks** : **100**
Subject Code : **ME502**		**Duration** : **3 Hrs**

**Instructions to the Candidates:**
- Answer one full question from each unit.
- Missing data, if any may be suitably assumed

UNIT – I

1. a) Determine the various forces on the links and couple T_2 shown in the figure 1.a. Force of **2000N is** applied at the slider link 4.

    AB=300mm; Bc=600mm; and BD=200mm.   CO1 (16)
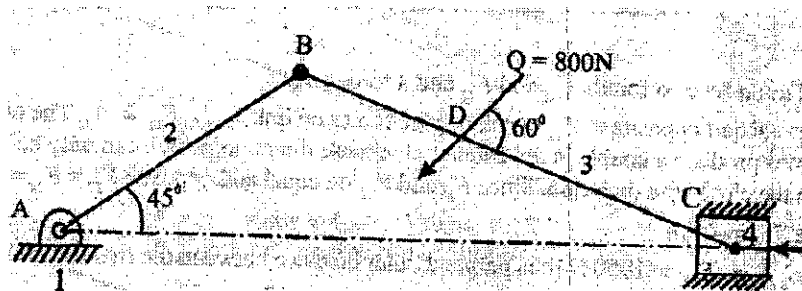
Figure 1.a

   b) What is free body diagram? List any two advantages of free body diagram   CO1 (04)

2   In a four bar Mechanism as shown in Figure Q2, torque T_3 and T_4 have magnitudes of 3000 N-m and 2000 N-m respectively. Take AD=800mm,AB=300mm,BC=700mm and CD=400 mm.For static equilibrium of Mechanism find the required input Torque on the crank.   CO1 (20)
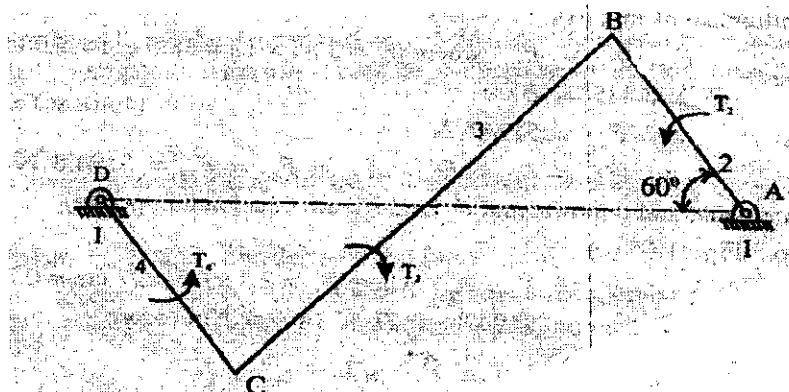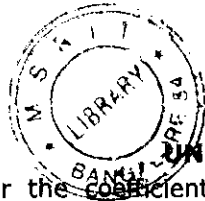

Figure Q2

UNIT - II

3. a) Find a relation for the coefficient of fluctuation of speed in terms of maximum fluctuation of energy and kinetic energy of Flywheel at mean speed.   CO3   (04)

    b) A shaft fitted with a flywheel rotates at 250 rpm and drives a machine. The torque of the machine varies in a cyclic manner over a period of 3 revolutions. The torque raises from 735.75 Nm to 2943 Nm in half revolution, remains constant during next one revolution and drops to 735.75 Nm in the next half revolution. It remains constant at 735.75 Nm during next one revolution and the cycle repeats thereafter.   CO3   (16)
    Determine the power required to drive the machine and percentage fluctuation in speed if the driving torque applied to the shaft is constant and the flywheel weighs 5787.9 N with radius of gyration of 600 mm.

4. a) A 3 Cylinder single acting engine has crank set equal at 120^0 and it runs at 600 rpm.The T.M.D for each cylinder is a triangle, for the power stroke with a maximum torque of 80 Nm at 60^0, after dead centre of the corresponding crank. The torque on the return stroke is Zero. Sketch the T.M.D and determine the following: CO3   (16)
    i)   Power developed.
    ii) Co-efficient of fluctuation of speed if the mass of flywheel is 10 kg and radius of gyration 8 cm.
    iii) Maximum angular acceleration of flywheel.

    b) Prove that the maximum fluctuation of energy is given by $E_f = 0.02C_s E$ for a flywheel where E=Mean K.E. of flywheel and C_s=Total percentage fluctuations of speed.   CO1   (04)

UNIT - III

5. a) Derive an expression to determine the ratio of belt tensions applied to V-belt drive.   CO1   (06)

    b) An open belt running over two pulleys 240 mm and 600 mm diameter connects two parallel shafts 3m apart and transmits 4kW from the smaller pulley that rotates at 300 rpm ,coefficient of friction between the belt and the pulley is 0.3 and the safe working tensions is 10 N per mm width. Determine   CO3   (14)
    i)   Minimum width of belt

    ii) Initial Belt Tension

    iii) Length of belt.

6. a) Explain the method of balancing Four masses rotating in the different planes   CO1   (06)

    b) Four masses 5, 6, M and 8kg are placed at distances 0.8m, 1.2m, and 2m from the first mass. The radius of rotation of all masses is same. Determine the mass and direction of 'M' when the radius of rotation is 0.3m.   CO3   (14)

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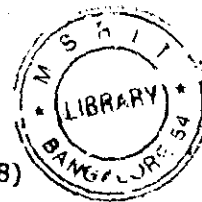
UNIT – IV

7. a) Derive expressions for resultant primary force and resultant secondary force in a V-Engine.   CO1   (08)

   b) The cranks and connecting rods of a 4-Cylinder in-line engine running at 1800rpm are 60 mm and 240mm each respectively and the cylinders are spaced 150mm apart. If the cylinders are numbered 1 to 4 in sequence from one end, the cranks appear at intervals of 90^0 in an end view in the order 1-4-2-3. The reciprocating mass corresponding to each cylinder is 1.5kg.Determine   CO3   (12)

       i) Unbalanced primary and Secondary forces.

       ii) Unbalanced primary and secondary couples with reference to central plane of the engine.

8. a) Define the following terms with reference to governors: CO4   (08)

       i) Stability

       ii) Isichronism

       iii) Effort of governors

       iv) Controlling force and Controlling force curves

   b) A porter governor has equal arms each 250 mm long and pivoted on the axis of rotation. Each ball has a mass of 5kg and mass of central load on the sleeve is 25kg.The radius of rotation of the ball is 150mm when the governor is at maximum speed. Find minimum and maximum speeds and range of speed of the governor.   CO4   (12)

UNIT – V

9. a) What is gyroscopic effect and Derive an expression to determine the gyroscopic couple.   CO5   (08)

   b) The mass of the motor cycle with its rider is 250kg and its center of gravity is 0.6m above the ground level. The total gyroscopic couple due to rotating parts is $91.08 \cos\theta$ Nm.Find the angle of heel if the motor cycle is traveling at 50km per hour and is taking a turn of 30m radius. Show the gyroscopic effect with the help of vector representation.   CO5   (12)

10. The following data relate to a symmetrical circular cam operating on a flat faced follower.   CO4   (20)

   Least radius = 25 mm, Nose radius =8 mm, Lift = 10mm, angle of action of cam $=120^0$. Cam shaft speed = 1000 rpm.

   Determine:

       i) Flank radius,

       ii) Maximum velocity

       iii) Maximum acceleration

       iv) Maximum retardation, if the mass of the follower and valve with which it is in contact is 4kg,

       v) Also find the minimum force exerted by the spring to overcome the inertia of the moving parts.
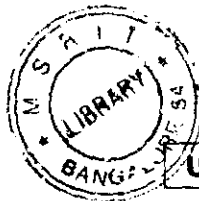
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CV505

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SEMESTER END EXAMINATIONS – JANUARY 2016

Course & Branch	: **B.E.- Civil Engineering**	Semester	: **V**
Subject	: **Hydrology and Water Resources Engineering**	Max. Marks	: **100**
Subject Code	: **CV505**	Duration	: **3 Hrs**

Instructions to the Candidates:
- Answer *one* full question from each unit.
- Any missing data can be appropriately assumed.

UNIT – I

1. a) Define Hydrology. With a neat sketch explain the hydrological cycle.   CO1   (08)

    b) A catchment has 8 rain gauges of which one is a self recording type and 7 are the standard type. For a 5% error in the estimation (€) of the mean rainfall, what should the required no of additional rain gauges if annual precipitation at the 8 stations are: CO1   (12)

Station:	A	B	C	D	E	F	G	H
Rainfall(cm):	74	87	94	88	104	118	60	95

2. a) What are the considerations in locating rain gauge stations?   CO1   (04)

    b) Describe the working of Syphon type of recording rain gauge with nea sketch.?   CO1   (06)

    c) What are the reasons for missing precipitation record at a particular rain gauge station? Discuss the various procedures available to estimate the missing precipitation records?   CO1   (10)

UNIT – II

3. a) Describe a double ring infiltrometer for measuring infiltration rate. What is the significance of the outer ring?   CO2   (10)

    b) A storm with 10 cm precipitation produced a direct runoff of 5.8 cm. Given the time distribution of the storm as below, estimate the ø – index of the storm   CO2   (10)

Time from the start (Hrs)	1	2	3	4	5	6	7	8
Incremental rainfall in each hour (cm)	0.4	0.9	1.5	2.3	1.8	1.6	1.0	0.5

4. a) Describe the ISI standard pan evaporimeter with a sketch. Explain how to reduce the rate of evaporation?   CO2   (06)

    b) What are the components of runoff and explain the factors affecting runoff?   CO2   (08)

    c) Define the term infiltration capacity of a soil. Explain Horton's infiltration capacity curve, with neat sketch?   CO2   (06)

UNIT – III

5. a) List and explain various methods of stream flow measurements?   CO3   (12)

    b) The peak of a flood hydrograph due to a 3-hr effective storm is 270 m³/s. The mean depth of rainfall is 5.9 cm.   CO3   (08)
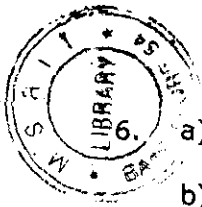
Assuming an average infiltration loss of 0.3 cm/hr and a constant base flow of 20 m³/s. Estimate the peak of the 3-hr unit hydrograph.

6. a) With neat sketch explain the components of hydrograph? Explain the limitations of the unit hydrograph.   CO3   (08)

    b) The following are the ordinates of the flood hydrograph from a catchment area of 780 km² due to 6 hr storm. Derive the 6 hr unit hydrograph of the basin.   CO3   (12)

Time (hrs)	6	12	18	24	6	12	18	24	6	12	18	24	6
Discharge (m³/sec)	40	64	215	360	405	350	270	205	145	100	70	50	40

UNIT – IV

7. a) Write short note on Ground water resources in India?   CO4   (06)

    b) Define (i) Specific Yield (ii) Storage coefficient (iii) Hydraulic conductivity (iv) Transmissivity   CO4   (08)

    c) Derive an expression for the steady state discharge of a well fully penetrating in to a confined aquifer.   CO4   (06)

8. a) Explain artificial method of ground water recharge?   CO4   (08)

    b) A 30 cm well completely penetrates an unconfined aquifer of saturated depth of 40 cm. After a long period of pumping at a steady rate of 1500 lpm. The draw down in two observation wells 25 and 75 m from the pumping well were found to be 3.5 and 2.0 m respectively. Determine the transmissivity of the aquifer? What is the drawdown ¿ the pumping well?   CO4   (12)

UNIT – V

9. a) Explain Various types of reservoirs?   CO5   (06)

    b) Explain how would you determine safe yield from a reservoir of a given capacity?   CO5   (08)

    c) Describe in brief various investigations required for reservoir planning?   CO5   (06)

10. a) What do you understand by mass inflow curve and how is it prepared?   CO5   (06)

    b) Explain with neat sketch the storage zones of reservoir?   CO5   (06)

    c) What is flood routing? Explain the hydrological method of flood routing?   CO5   (08)

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